Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

and

Choice – Based Credit System (CBCS)

in

Bachelor of Technology

B.Tech. (Computer Science and Engineering)

4 Year Degree Program

Revised as on 01 August 2023
Applicable w.e.f. Academic Session 2023-24

AKS University

Satna 485001, Madhya Pradesh, India

Faculty of Engineering and Technology

Department of Computer Science & Engineering

H.O.D.
Department of Computer Science
& Application
AKS University, Satna (M.P.)

Dean
Faculty of Engineering & Technology
AKS University
Shergan, Satna (MP), 485001

Professor B.A. Chopade
Vice-Chancellor
AKS University
Satna, 485001 (M.P.)

A K S University, Satna

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum & Syllabus of B.Tech. (Computer Science & Engineering) Program

(Revised as of 01 August 2023)

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Foreword

I am thrilled to observe the updated curriculum of the Computer Science & Engineering Department for the B. Tech Computer Science & Engineering [CSE] Program, which seamlessly integrates the most recent technological advancements and adheres to the guidelines set forthby AICTE. The revised curriculum also thoughtfully incorporates the directives of NEP-2020 and the Sustainable Development Goals.

The alignment of course outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites of NEP-2020 and NAAC standards. I hold the belief that this revised syllabus will significantly enhance the skills and employability of our students.

With immense satisfaction, I hereby present the revised curriculum for the B. Tech.in Computer Science & Engineering - Artificial Intelligence and Data Science program for implementation in the upcoming session.

Er. Anant Soni
Pro Chancellor & Chairman
AKS University, Satna

01 August 2023

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) **Program**

(Revised as on 01 August 2023)

From the Desk of the Vice-Chancellor

AKS University is currently undergoing a process to revamp its curriculum into an outcome-based approach, to enhance the teaching and learning process. The foundation of quality of quality education lies in the implementation of a curriculum that aligns with both societal and industrial needs, focusing on relevant outcomes. This entails dedicated and inspired faculty members, as well as impactful industry internships. Hence, it is of utmost importance to begin this endeavor by crafting an outcome-based curriculum in collaboration with academia and industry experts. This curriculum design should be informed by the latest technological advancements, market demands, the guidelines outlined in the National Education Policy (NEP) of 2020, and sustainable goals.

I'm delighted to learn that the revised curriculum has been meticulously crafted by the Computer Science & Engineering Department, in consultation with an array of experts from the Computer Science industry, research institutes, and academia. This curriculum effectively integrates the principles outlined in the NEP-2020 guidelines, as well as sustainable goals. It also adeptly incorporates the latest advancements in Computer Science manufacturing technology.

Furthermore, the curriculum takes into account the specific needs of the Indian Computer Science industry, focusing on the production of cost-effective, high-quality Computer Science. It extends its reach to optimizing power consumption by including insights on waste heat recovery systems utilized in Computer Science plants. This inclusion not only imparts knowledge but also encourages students' independent thinking for potential enhancements in this area.

The curriculum goes beyond theoretical learning and embraces practical applications by incorporating the utilization of industrial and domestic waste in Computer Science production. To enhance students' skills, the curriculum integrates Hands-On Training, industrial visits, on-the-job training experiences, research, and progress. This well-rounded approach ensures that students receive a comprehensive education, fostering their skill development and preparing them for success in the Computer Science industry.

I am confident that the updated curriculum for Computer Science & Engineering will not only enhance students' technical skills but also contribute significantly to their employability. During the process of revising the curriculum, I am pleased to observe that the Computer Science & Engineering department has diligently adhered to the guidelines provided by the AICTE. Additionally, they have maintained a total credit requirement of 170 for the B. Tech Computer Science & Engineering program.

It's worth noting that curriculum revision is an ongoing and dynamic process, designed to address the continuous evolution of technological advancements and both local and global concerns. This ensures that the curriculum remains responsive and attuned to the changing landscape of education and industry. AKS University warmly invites input and suggestions from industry expert technocrats and Alumni students to enhance the curriculum and make it more student-centered. Your valuable insights will greatly contribute to shaping an education that best serves the needs and aspirations of our students.

AKS University, Satna — ***Professor B. A. Chopade***

01 August 2023 — *Vice-Chancellor*

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Preface

As part of our commitment to ongoing enhancement, the Department of Computer Science & Engineering consistently reviews and updates its B.Tech. Computer Science & Engineering program curriculum every three years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands.

During this procedure, the existing curriculum for the B.Tech. - Computer Science & Engineering [CSE] Program undergoes evaluation by a panel of technocrats, industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formulated and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body.

This curriculum closely adheres to the AICTE model syllabus distributed in May 2023. It seamlessly integrates the guidelines set forth by the Ministry of Higher Education, Government of India, through NEP-2020, as well as the principles of Sustainable Development Goals. To foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planningand execution, Report Writing, Seminars, and Industrial on-the-job training, have been incorporated. Furthermore, in alignment with AICTE's directives, the total credit allocation for the B. Tech Computer Science & Engineering program is capped at 176 credits.

This curriculum is enriched with course components in alignment with AICTE guidelines, encompassing various disciplines such as Fundamental Science Concepts: 24 credits, Engineering Science: 25 credits, Humanities and Social Sciences: 16 credits, Core Program Courses: 66 credits, Elective Program Courses: 9credits, Open Electives: 9 credits, Project and Practical Training: 17 credits, Seminars: 3 credits, Indian Knowledge System: 2 credits, Sustainable Development Goals: 2 credits.

To ensure a comprehensive learning experience, detailed evaluation schemes and rubrics have also been meticulously provided.

For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini-projects are meticulously outlined.

We hold the belief that this dynamic curriculum will undoubtedly enhance the independent thinking, skills, and overall employability of the students.

Professor Akhilesh A. Waoo
Associate Dean and Head CS/IT

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Introduction:

Department of Computer Science & Engineering was established in the year 2012. The Computer Science department at AKS University, Satna is fully committed to preparing its students with a vision, creativity, and newness so that they can face the challenges of the corporate world. Highly qualified and experienced faculty members of the department play a major role in the university. The department aims to provide its students with an updated curriculumto analyze, develop, and monitor computers & and their various applications as a blend of theory, practical, projects, and seminars. The main goals are to enhance problem-solving skills, innovative thinking, analytics, teamwork, developing good communication skills, and readiness to learn new technologies such as artificial intelligence, IoT, machine learning, cloud computing, network security, etc. Top of Form

Vision

The aim of the Computer Science & Engineering Department is to proceed in the Information Technology field, produce skilled graduates, conduct impactful research, and contribute to the betterment of society through technology.

Mission

M01: To produce skilled students, contribute to research and innovation, and address the societal challenges associated with technology.

M02: To promote innovation and research in computer science.

M03: To educate and train the next generation of technology leaders.

M04: To actively engage with industry and the wider community.

M05: To support and nurture the entrepreneurial spirit and startup culture among its students and faculty.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO 01: To develop technical and managerial skills among the students with practical knowledge to work in IT Industry and able to solve real life problems using technology.

PEO 02: To develop R&D temperament among the students for development, innovation and sustainable technology in IT Industry.

PEO 03: To develop ethical principles among the students and commitment to fulfilling international, national and local needs and social responsibilities with his/her professional excellence.

PEO 04: Ability to understand the impact of professional engineering solutions in societal, economic and environmental contexts and demonstrate knowledge and need for sustainable development

Program Outcomes (POs)

B. Tech. Computer Science & Engineering Graduate will able to perform:

PO1: Engineering knowledge: Use your understanding of physics, math, engineering fundamentals, and your chosen engineering specialty to solve challenging engineering challenges.

PO2: Problem analysis: Using the fundamental concepts of mathematics, the natural sciences, and engineering sciences, identify, formulate, study research material, and analyses difficult engineering problems in order to obtain justified findings.

PO3: Design/development of solutions: Designing complicated engineering problems' solutions and

creating system elements or processes that satisfy the required requirements while taking into account factors like public health and safety, cultural, societal, and environmental considerations.
PO4: Conduct studies of difficult problems: Apply research-based knowledge and research techniques, such as experiment design, data analysis and interpretation, and information synthesis, to provide reliable results and current technological context.
PO5: Utilization of modern tools: Develop, pick, and apply appropriate methods, resources, and modern IT and engineering tools, such as modelling and prediction, to complex engineering operations while being aware of the technologies' limitations.
PO6: Engineers and society: Assess societal, health, safety, legal, and cultural issues and the resulting obligations related to the professional practice of engineering by using reasoning informed by contextual knowledge.
PO7: Environment and sustainability: Understanding the effects of professional engineering solutions in societal and environmental contexts, as well as demonstrating an understanding of the need for sustainable development.
PO8: Ethics: Adhere to professional ethics, obligations, and standards of engineering practice. Apply ethical principles.
PO9: Individual and team work: Work effectively as an individual, a team member or a leader in different teams and in interdisciplinary situations.
PO10: Communication: Effectively communicate complex engineering tasks to the engineering community and the general public. This includes the ability to understand and produce effective reports and design documentation, deliver and receive clear directions, and make good presentations.
PO11: Project management and finance: Show knowledge and grasp of engineering and management principles and apply them to own work as a team member and leader to manage projects and in interdisciplinary settings.
PO12: Life-long learning: Recognize the need for, and possess the readiness and capacity for, autonomous and lifelong learning in the classroom

PROGRAM SPECIFIC OUTCOMES:
PSO1: Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer based systems of various complexity.
PSO2: Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.
PSO3: Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.
PSO4: Learn and use the most recent software innovations in the fields of engineering and computer science.
PSO5: Recognize and examine issues in real life, then offer creative software solutions

Consistency/Mapping of PEOs with Mission of the Department

PEO	M 1	M 2	M 3	M 4	M5
PEO 1	3	2	3	2	2
PEO 2	2	2	2	3	3
PEO 3	2	3	2	1	1
PEO 4	2	2	3	3	3

1*: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-": No correlation*

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

A. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 163 credits, the total number of credits proposed for the four-year B. Tech/B.E. in Computer Science and Engineering (Engineering & Technology) is kept as 163

C. Structure of UG Program in CSE:

The structure of UG program in Computer Science and Engineering shall have essentially the following categories of courses with the breakup of credits as given:

S. No.	Category	Breakup of Credits
1.	Humanities and Social Sciences including Management courses	16
2.	Basic Science Courses	22
3.	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	25
4.	Professional core courses	59

5.	Professional Elective courses relevant to chosen specialization/branch	18
6.	Open subjects – Electives from other technical and /or emerging subjects	9
7.	Project work, seminar and internship in industry or elsewhere	14
8.	Mandatory Courses [Environmental Sciences, Induction Program]	(non-credit)
	TOTAL	**163***

D. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-CS	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses

- **Course level coding scheme:** Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course. Digit at hundred's place signifies the year in which course is offered. e.g. 101, 102 …etc. for first year. 201, 202…. etc. for second year.301, 302 …for third year.

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➢ **Category-wise Courses**

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

(i) Number of Humanities & Social Science Courses: 7

(ii) Credits: 16

Sl. No	Code No.	Course Title	Semester	Hours per week			Total
				Lecture			Tutorial
1	HSMC01	Communication Skills (English)	I	2	0	2	3
2	HSMC08	Sustainable Development Goal (SDG)	I	2	0	0	2
3	HSMC09	Sports & Yoga / NSS / NCC / UCC	I	2	0	0	2
4	HSMC07	Indian KnowledgeSystem	II	2	0	0	2
5	HSMC-301	Universal Human Values	III	2	1	0	3
6	HSMC-401	Management-I (A. Organizational Behaviour)/ B. Finance &Accounting	IV	3	0	0	3
Total Credits							**15**

BASIC SCIENCE COURSE [BSC]

Sl. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	BSC-101	Chemistry-I	I	3	0	2	4
2	BSC-102	Mathematics-I (Calculus and Linear Algebra)	I	3	1	0	4
3	BSC-201	Mathematics-II (Probability and Statistics)	II	3	1	0	4
4	BSC-202	Physics-I (Semi-conductor Physics)	II	3	1	2	5
5	BSC-203	Biology for Engineers	II	3	0	0	3
6	BSC-301	Mathematics-III (Differential Calculus)	III	2	0	0	2
Total Credits							**22**

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ENGINEERING SCIENCE COURSE [ESC]

Sl. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	ESC-201	Basic Electrical Engineering	II	2	1	0	3
2	ESC-202	Engineering Graphics & Design	II	1	0	0	1
3	ESC-101	Programming for Problem Solving	I	3	0	4	5
4	ESC-102	Workshop/Manufacturing Practices	I	1	0	4	3
5	ESC-301	Analog Electronic Circuits	III	3	1	2	5
6	ESC-302	Digital Electronics	III	4	1	4	7
7	ESC-501	Signals and Systems	V	3	0	0	3
8	ESC-103-L	Design and thinking	II	0	0	2	1
Total Credits							**26**

PROFESSIONAL CORE COURSE [PCC]

S No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	PCC CS-301	Data Structure and Algorithms	III	3	1	2	5
2	PCC CS-302	IT Workshop – (Sci Lab/MATLAB)	III	2	0	2	3
3	PCC CS-401	Discrete Mathematics	IV	3	1	0	4
4	PCC CS-402	Computer Organization and Architecture	IV	3	1	2	5
5	PCC CS-403	Operating Systems	V	3	1	2	5
6	PCC CS-404	Design and Analysis of Algorithms	IV	3	1	2	5
7	PCC CS-405	Advanced Programming	IV	3	1	0	4
8	PCC CS-505	Introduction to Database Systems	V	3	1	2	5
9	PCC CS-603	Machine Learning	V	3	1	0	4
10	PCC CS-504	Theory of Computation	VI	3	1	0	4
11	PEC CS-601	Introductory Cyber Security	VI	3	0	4	5
12	PCC CS-601	Computer Networks	VI	3	1	2	5
13	PCC CS-602	Complier Design	VII	3	1	2	5
Total Credits							**59**

PROFESSIONAL ELECTIVE [PEC]

S.	Code	Course Title	Semester	Hours per week	Total

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No	No.			Lecture	Tutorial	Practical	Credits
1	PEC	Elective – I	V	3	0	2	4
2	PEC	Elective-II	VI	3	0	2	4
3	PEC	Elective-III	VII	3	0	0	3
4	PEC	Elective-IV	VII	3	0	2	4
5	PEC	Elective-V	VIII	2	0	2	3
Total Credits							**18**

OPEN ELECTIVE COURSES [OEC]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	OEC	Open Elective – I	VII	3	0	0	3
2	OEC	Open-Elective-II	VIII	2	0	2	3
3	OEC	Open-Elective-III	VIII	3	0	0	3
Total Credits							**9**

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

Sl. No	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	**Tutorial**	**Practical**	
1	PROJ CS-601	Project-I: Minor Project	IV	0	0	4	2
	PROJ CS-602	Evaluation of Internship -I	VI	0	0	4	2
2	PROJ CS-701	Project-II: Major Project-I	VII	0	0	8	4
3	PROJ CS-801	Project-III: Major Projet-II/Internship	VIII	0	0	12	6
						Total Credits	**14**

INDUCTION PROGRAM

Induction program (mandatory)	Three-week duration
Induction program for students to be offered right at the start ofthe first year.	Physical activity Creative Arts Universal Human Values Literary Proficiency Modules Lectures by Eminent People Visits to local Areas

	Familiarization to Department/Branch and Innovations

E. Mandatory Visits/ Workshop/Expert Lectures:

a. It is mandatory to arrange one industrial visit every semester for the students of each branch.

b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.

c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domainspecific industry.

F. Evaluation Scheme (Suggestive only):

d. For Theory Courses:
(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

e. For Practical Courses:
(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

f. For Summer Internship / Projects / Seminar etc.
Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

G. Mapping of Marks to Grades

Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the numberof credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	**Assigned Grade**
91-100	AA/A^+
81-90	AB/A
71-80	BB/B^+
61-70	BC/B
51-60	CC/C^+
46-50	CD/C
40-45	DD/D
< 40	FF/F (Fail due to less marks)
-	F^R (Fail due to shortage of attendance and therefore, to repeatthe course)

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Semester-wise Structure and Curriculum

SEMESTER-I						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credit**
1	BSC102	Mathematics-I	3	1	0	4
2	BSC103	Chemistry-I	3	0	2	4
3	ESC104	Programming for problem solving	3	0	4	5
4	ESC105	Manufacturing practice workshop	1	0	4	3
5	HSMC01	Communication Skills (English)	3	0	0	3
6	HSMC08	Sustainable Development Goal (SDG)	2	0	0	2
7	HSMC09	Sports & Yoga / NSS / NCC / UCC	2	0	0	NC
						21

SEMESTER-II						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credit**
1	BSC104	Mathematics-II	3	1	0	4
2	BSC101	Physics-I	3	1	2	5
3	BSC105	Biology for Engineers	3	0	0	3
4	ESC101	Basic Electrical Engineering	2	1	2	4
5	ESC102	Engineering Graphics and Design	1	0	4	3
6	ESC106	Basic Civil Engineering (Only for CSE Students)	3	0	0	3
7	ESC103-L	Design Thinking and Idea Lab	0	0	2	1
8	HSMC07	Indian Knowledge System	2	0	0	2
						25

SEMESTER III						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	ESC-301	Analog Electronic Circuits	3	0	2	4
2.	PCC CS-301	Data structure and Algorithms	3	0	2	4
3.	ESC-302	Digital Electronics	3	1	0	4
4.	PCC CS-302	IT Workshop (Sci Lab/MATLAB)	2	0	2	3
5.	BSC-301	Mathematics-III (Differential Calculus)	2	1	0	3
6.	HSMC-301	Universal Human Values	3	0	0	3
Total						**21**

Semester IV						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PCC CS-401	Discrete Mathematics	3	1	0	4
2.	PCC CS-402	Computer Organization & Architecture	3	0	2	4
3.	PCC CS-404	Design & Analysis of Algorithms	3	0	2	4
4.	PCC CS-405	Advanced Programming	3	1	0	4
5.	HSMC-401	Management 1 (A. Organizational Behavior/ B.Finance & Accounting)	3	0	0	3
6.	MC	Environmental Sciences	2	0	0	2
7.	PROJ CS-601	Project-I: Minor Project	0	0	4	2
Total						23

SEMESTER-V						
S.no.	**Paper code**	**Subject**	**L**	**T**	**P**	**Credit**
1	ESC-501	Signals & Systems	3	0	0	3
2	PCC CS-505	Introduction to Database Systems	3	1	2	5
3	PCC CS-603	Machine Learning	3	1	0	4
4	PCC CS-403	Operating Systems	3	1	2	5
5	PEC	Elective-I	3	0	2	4
						21
	PEC- Elective-I: **(A) Web Engineering** **(B) Project Management**					

SEMESTER-VI						
S.no.	**Paper code**	**Subject**	**L**	**T**	**P**	**Credit**
1	PCC CS-601	Computer Networks	3	1	2	5
2	PEC CS-601	Introductory Cyber Security	3	0	2	4
3	RC602	Research Methodology and IPR	3	0	0	3
4	PEC	Elective-II	3	0	2	4
5	PCC CS-504	Theory of Computation	3	1	0	4
6	PROJ CS-602	Evaluation of Internship -I	0	0	4	2
						22
	PEC- Elective-II: **(A) Big Data Analytics** **(B) Pattern Recognition & Visual Recognition**					

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SEMESTER-VII						
S.no.	**Paper code**	**Subject**	**L**	**T**	**P**	**Credit**
1	PCC CS-602	Compiler Design	3	1	2	5
2	PEC	Elective-III	3	0	0	3
3	PEC	Elective-IV	3	0	2	4
4	OEC	Open Elective-I	3	0	0	3
5	OEC-I	AI using Python	3	0	2	4
8	PROJ CS-701	Project II: Major Project-I	0	0	8	4
	PEC Elective-III **A** Computational Intelligence **B** B. Wireless & Mobile Computing **PEC Elective-IV** A. Java Programming B. Dot Net Programming with VB.Net & ASP.Net **Open Elective-I** A. Data Mining and Warehousing B. Current Trends and Technologies					**23**

SEMESTER-VIII						
S.no.	**Paper code**	**Subject**	**L**	**T**	**P**	**Credit**
1	PEC	Elective-V	2	0	2	3
2	OEC	Open Elective-II	2	0	2	3
3	OEC	Open Elective-III	3	0	0	3
6	PROJ CS-801	Project-III: Internship/Major Project	0	0	12	6
	PEC Elective-V A. Internet of Things B. Introduction to Robotics **Open Elective-II** A. Statistical Thinking for B. Data ScienceAutonomous Systems **Open Elective-III** A. Cloud Computing B. English for Research Paper Writing					**15**

Semester - I

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FIRST SEMESTER

Course Title: Mathematics –I
Course Code: - BSC 102
Prerequisite: Students should review the fundamentals of calculus and basic knowledge of differential and integration.
Rationale: The program aims to develop advanced problem-solving and analytical skills and prepares students for careers in academia, research, industry, or other sectors that require advanced mathematical expertise.

Course Outcomes (CO):
CO1: Understand the concept of differentiation
CO2: Uderstand the basic concepts of matrices.
CO3: Understand the basic concepts of Limit, continuity and partial derivatives.
CO4: Understand the basic concepts of exact differential equations.
CO5 Understand the basic concepts of definite and improper integrals

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Basic Science Course (BSC)	**BSC 102**	**Mathematics -I**	4	0	1	1	6	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others)
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.)
SL: Self Learning,
C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board ofStudy	CouseCode	Course Title	Scheme of Assessment (Marks)							
			ProgressivRI00 -e*//,HVCS Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number	Class Test 2 (2 best out of 3)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
			3 marks each (CA)	10 marks each (CT)						
BSC	**BSC 102**	**Mathematics -I**	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1

Define and understand the concept of limits, evaluate limits algebraically and graphically, Apply the basic rules of differentiation, including the power rule, product rule, quotient rule, and chain rule. Use linear approximation and differentials to estimate values of functions

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand the concept of local and global extrema. **SO1.2** Understand the geometric interpretation of the derivative as the slope of a tangent line **SO1.3** Apply implicit differentiation to find derivatives of implicitly defined functions **SO1.4** Understand the hypothesis of L' Hospital's rule **SO1.5** Understand the concept of curvature.	-	**Unit-1.0** 1.1.Rolle's Theorem, 1.2. Mean value theorems 1.3. applications, extreme values of functions 1.4.linear approximation, Indeterminate forms 1.5.L' Hospital's rule 1.6 Tutorial-1 1.7. curvature, 1.8. Radius of curvature 1.9evolutes and involutes 1.10Expansion of functions by Maclaurin's series 1.11Expansion of functions by Taylor's series for one variable 1.12 Tutorial- 2	**SL.1** Define the derivative of a function at a point using the limit definition.

SW-1 Suggested Sessional Work (SW):
a. Assignments:

i. Analyze and sketch the graph of a function using information from its derivative.
ii. Identify critical points, inflection points, and concavity.
iii. Apply L'Hôpital's Rule to find limits involving indeterminate forms

b. Mini Project:
Oral presentation, Poster presentation, Power Point Presentation.
c. Other Activities (Specify):
Quiz, Class Test.

CO2

Define and understand the basic concepts of matrices, differentiate between different types of matrices Perform basic matrix operations, use matrices to represent and solve systems of linear equations. Explore more advanced topics, such as linear transformations, matrix norms, and applications in optimization and computer graphics.

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Define and understand the basic concepts of matrices, determinant, etc **SO2.2** Perform basic matrix operations, including addition, subtraction, and scalar multiplication **SO2.3** Understand the connection between matrix equations and systems of linear equations **SO2.4** Define and compute the determinant of a matrix **SO2.5**	-	**Unit-2.0** 2.1. Rank of a Matrix 2.2. Determinant, 2.3. Inverse of a matrix, 2.4-Nullity 2.5. system of linear equations, 2.6. Symmetric, skew-symmetric 2.7 orthogonal matrices 2.8. Eigen values and Eigenvectors, orthogonal transformation, 2.9. diagonalization of matrices, Cayley-Hamilton Theorem, 2.10. linear systems of equations, 2.11 linear independence and linear dependence 2.12 Tutorial-1	**SL.1** Explore more advanced topics, such as linear transformations, matrix norms, and applications in optimization and computer graphics

Understand numerical techniques			

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Write the application of Matrices in Real Life.
ii. Write the properties of Eigen values.
iii. Write a short note on types of matrix with example.
iv. Describe the method of calculation of rank with example

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

CO3

Define and compute partial derivatives of functions of several variables, Define and compute the gradient vector of a scalar function, Apply the chain rule to compute derivatives of composite functions involving multiple variables, Identify critical points of multivariable functions.

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Define and compute partial derivatives of		**Unit-3.0** 3.1. Limit and continuity 3.2. total derivative,	**SL.1** Apply Lagrange multipliers to solve

functions of several variables **SO3.2** Understand the directional derivative and its relation to the gradient vector **SO3.3** Apply the chain rule to compute derivatives of composite functions involving multiple variables **SO3.4** Understand mixed partial derivatives and Clairaut's theorem **SO3.5** Identify critical points of multivariable functions	-	3.3. Euler's theorem on Homogeneous function. 3.4. Application of Euler's theorem in approximation and errors, 3.5. Application of Euler's theorem in errors 3.6. Tangent plane and normal line. 3.7. maxima, minima 3.8 saddle points, 3.9. Method of Lagrange multipliers 3.10. partial derivatives 3.11 Questions of partial differential. 3.12 Tutorial-1	Constrained optimization problems**.**

SW-2 Suggested Sessional Work (SW):
a. Assignments:

i. Write the Application of Euler's theorem in real life.
ii. Explain the difference between differential and partial differential
iii. Write the properties of maxima, minima.
iv. Define saddle points, point of inflection.

b. Mini Project:
Oral presentation,
c. Other Activities (Specify):
Quiz, Class Test.

CO4
Understand the definition of a first-order ordinary differential equation, solve separable differential equations using the separation of variables technique, Sketch direction fields to visualize the behavior of solutions, apply first-order ODEs to model and analyze various phenomena**.**

Approximate Hours

Item	AppXHrs
Cl	12
LI	0

SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the definition of a first-order ordinary differential equation **SO4.2** Solve separable differential equations using the separation of variables technique **SO4.3** Identify and use integrating factors to solve linear first-order ODEs **SO4.4** Identify autonomous differential equations and their significance **SO4.5** Recognize and solve exact differential equations	-	**Unit-4.0** 4.1. Order and degree of equation 4.2Exact equations. 4.3. Questions of Exact equations 4.4. Linear equations 4.5 Tutorial-1 4.6. Bernoulli's equations. 4.7. Equations not of first degree: 4.8. Equations solvable for p, 4.9. Equations solvable for y, 4.10. Equations solvable for x 4.11 Equations Clairaut's type 4.12 Tutorial-2	**SL.1** Apply first-order ODEs to model and analyze various phenomena, such as population growth, chemical reactions, and electrical circuits

SW-2 Suggested Sessional Work (SW):

a. Assignments: Explain degree and order of differential equation with example.

b. Other Activities (Specify):

Quiz, Class Test.

CO5

Understand and state the Fundamental Theorem of Calculus, both parts and apply the Fundamental Theorem to evaluate definite integrals. Apply integration techniques, including substitution, integration by parts, and partial fractions

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand and state the Fundamental Theorem of Calculus **SO5.2** Find antiderivatives of elementary functions **SO5.3** Understand the concept of a definite integral as a limit of Riemann sums **SO5.4** Interpret definite integrals as areas under Curves **SO5.5**	-	**Unit-5.0** 5.1. Evaluation of definite and improper integrals, 5.2. Beta and Gamma functions 5.3. Properties of Beta and Gamma functions, 5.4 Relation between Beta and Gamma functions 5.5. Double integrals (cartesian), 5.6 questions of double integrals 5.7. Change of order of integration in double integrals, 5.8 Change of order of integration questions 5.9. Triple integrals (cartesian), 5.10. simple applications involving cubes and sphere	**SL.1** Apply calculus techniques to analyze curves defined in polar form

Understand and evaluate improper integrals.		5.11 Rectangular parallelepipeds 5.12 Tutorial-1	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Write the application of double and tripal integration.
ii. Write the Properties of Beta and Gamma functions.

b. Mini Project:

Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1 Define and understand the concept of Rolle's Theorem, Mean value theorems and applications, Successive differentiation, Expansion of functions by Maclaurin's and Taylor's series for one variable. Extreme values of functions, linear approximation, Indeterminate forms and L' Hospital's rule, Curvature, Evolutes and Involutes.	12	1	1	14
CO2 Define and understand the basic concepts of matrices, Rank of a Matrix, Determinant, inverse of a matrix, rank-nullity theorem, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices,	12	1	1	14

Eigen values and eigenvectors, orthogonal transformation, Diagonalization of matrices, Cayley-Hamilton Theorem				
CO3 Define and compute Limit, continuity and partial derivatives, total derivative, Euler's theorem on Homogeneous function. Application of Euler's theorem in approximation and errors, Tangent plane and normal line, maxima, minima and saddle points, Method of Lagrange multipliers.	12	1	1	14
CO4 Understand the definition of Exact differential equations, linear differentia equations and Bernoulli's differential equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	12	1	1	14
CO5 Understand and statethe Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, doubleintegrals (cartesian), change of order of integration in double integrals, Triple integrals (cartesian), simple applications involving cubes	12	1	1	14
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**					**Total Marks**
		R	**U**	**A**			
CO-1		02	04	05			11

	Single-variable Calculus						
CO-2	Matrices	03	07	04			14
CO-3	Multivariable Calculus	02	06	02			10
CO-4	First order ordinary differential equations	03	03	02			08
CO-5	Integral Calculus.	03	02	02			07
Total		13	22	15			50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Engineering Mathematics –I will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies

1. Improved Lecture
2. Tutorial
3. Presentation
4. Group Discussion
5. Online sources
6. Seminar
7. Workshop

Suggested Learning Resources:

a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Engineering Mathematics-I ,	D.K, Jain	Shree Ram Prakashan.	7th Edition 2015-16
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	36th Edition, 2010
3	Engineering Mathematics-I	D.C.Agrawal	Shree Sai Prakashan	10th Edition 2018

4	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill	11th Reprint, 2010.

Curriculum Development Team

1. **Dr.Sudha Agrawal, HOD, Department of Mathematics.**
2. **Dr.Ekta Shrivastava , Assistant Professor, Department of Mathematics.**
3. **Mr.Neelkanth Napit, Assistant Professor, Department of Mathematics.**
4. **Mrs.Vandana Soni, Assistant Professor, Department of Mathematics.**
5. **Mr.Radhakrishna Shukla, Assistant Professor, Department of Mathematics.**
6. **Mr.Ghanhyamsen, Assistant Professor, Department of Mathematics.**
7. **Ms. Pushpa Kushwaha, Assistant Professor, Department of Mathematics.**
8. **Ms. Arpana Tripathi, Assistant Professor, Department of Mathematics.**

Cos,POs and PSOs Mapping

Program: B.Tech. CSE
Course Title: Mathematics –I
Course Code: - BSC 102

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO3	PO 1	PO 2	PO6	PO 1	PO 2	PO9	PO 1	PO 2	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development ofsolutions	Conduct studies of difficultproblems	Utilization of moderntools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management andfinance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting- edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its usein multidisciplinary settings	Applying professional engineering solutions for societal improvement whiletaking into account the environmental context, being conscious of professional ethics,and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence andData Science technologies in the fields of engineering and computer science	Recognize andexamine issues in real life, then offercreative software solutions with the help of AI and Data Science Technologies.
CO1: Define and understand the concept of Rolle's Theorem, Mean value theorems and applications, Successive differentiation, Expansion of functions by Maclaurin's and Taylor's series for one variable. Extreme values of functions, linear approximation, Indeterminate forms and L' Hospital's rule, Curvature, Evolutes and Involutes	3	1	2	2	3	2	3	2	2	1	3	2	2	3	1	2	-
CO 2 Define and understand the basic concepts of matrices, Rank of a Matrix, Determinant, inverse of a matrix, rank-nullity theorem, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices, Eigen values and eigenvectors, orthogonal transformation,	2	1	2	2	1	2	3	2	1	1	2	2	2	3	1	2	-

Diagonalization of matrices, Cayley-Hamilton Theorem																
CO3 Define and compute Limit, continuity and partial derivatives, total derivative, Euler's theorem on Homogeneous function. Application of Euler's theorem in approximation and errors, Tangent plane and normal line, maxima, minima and saddle points, Method of Lagrange multipliers.	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**3**	**1**	**2**	**-**
CO4: Understand the definition of Exact differential equations, linear differential equations and Bernoulli's differential equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. cell and corrosion.	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**2**	**2**	**-**
CO5 Understand and state the Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, double integrals (cartesian), change of order of integration in double integrals, Triple integrals (cartesian), simple applications involving cubes	**2**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**2**	**2**	**-**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5, 6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1- - BSC 102.1** Define and understand the concept of Rolle's Theorem, Mean value theorems and applications, Successive differentiation, Expansion of functions by Maclaurin's and Taylor's series for one variable. Extreme values of functions, linear approximation, Indeterminate forms and L' Hospital's rule, Curvature, Evolutes and Involutes.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 Single-variable Calculus (Differentiation): 1.1,1.2,1.3,1.4,1.5,1.6.1.7,1.8,1.9,1.10,1.11,1.12	SL1.1
PO1,2,3,4,5,6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2- - BSC 102.2** Define and understand the basic concepts of matrices, Rank of a Matrix, Determinant, inverse of a matrix, rank-nullity theorem, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices, Eigen values and eigenvectors, orthogonal transformation, Diagonalization of matrices, Cayley-Hamilton Theorem	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Matrices 2.1, 2.2, 2.3, 2.4,2.5,2.6,2.7,2.8,2.9,2.10,2.11,2.12	SL2.1

PO1,2,3,4,5,6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3- - BSC 102.3** Define and compute Limit, continuity and partial derivatives, total derivative, Euler's theorem on Homogeneous function. Application of Euler's theorem in approximation and errors, Tangent plane and normal line,	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 Multivariable Calculus (Differentiation) 3.1, 3.2, 3.3, 3.4, 3.5 ,3.6,3.7,3.8,3.9,3.10,3.11,3.12	SL3.1
	maxima, minima and saddle points, Method of Lagrange multipliers.				
PO1,2,3,4,5,6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO4- - BSC 102.4** Understand the definition of Exact differential equations, linear differential equations and Bernoulli's differential equations. Equations not of first degree: equations solvable for p, equation solvable for y, equations solvable for x and Clairaut's type.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 First order ordinary differential equations 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8,4.9,4.10,4.11,4.12	SL4.1
PO1,2,3,4,5,6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO5- BSC 102.5** Understand and state the Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, double integrals (cartesian), change of order of integration in double integrals, Triple integrals (cartesian), simple applications involving cubes	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5Integral Calculus 5.1, 5.2, 5.3, 5.4, 5.5, 5.6 ,5.7,5.8,5.9,5.10,5.11,5.12	SL5.1

FIRST SEMSTER

Course Code: BSC-103

Course Title: Chemistry-I

Pre- requisite: Students must have fundamental knowledge of mathematics, nature of molecule, valence shell electron pair repulsion theory, and different concentration terms to understand the concept of engineering chemistry.

Rationale: The students studying engineering chemistry should possess foundational understanding about basic mathematics, different Concentration terms and valence shell electron pair repulsion theory tounderstand the basic principle of chromatography and spectroscopic analysis.

Course Outcomes:

After the completion of this course, the learner will able to

CO 1: Apply VSEPR theory to predict the three-dimensional shapes of molecules.

CO 2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drugmolecule.

CO 3: Explain and apply the concept of Intermolecular forces, Hydrogen bond, and transitionmetal complexes.

CO 4 Predict the concept of thermodynamics, free energy & entropy and apply Nernst equation,water chemistry as well as explain concept of acid-base, metallurgy, Emf cell and corrosion.

CO 5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopictechniques.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	BSC 103	Chemistry - I	3	2	2	1	8	4

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, and mini projected.),

SL: Self-Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance	Total Marks (CA+CT+SA+CAT		
BS	Bsc 103	Chemistry - I	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
BS	BSC103-1	Chemistry – I - Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

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CO1: Apply VSEPR theory to predict the three-dimensional shapes of molecules.

Approximate Hours

Item	App X Hrs.
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1. Describe the classification of different types of orbit orbitals **SO1.2** Discuss the fundamental concept of wave function and probability distribution curve **SO1.3** Explain and apply Atomic Spectroscopy: - Energies of atomic orbital's **SO1.4** Apply concept of VSEPR in the determination of geometry of various molecules. **SO1.5** Restate molecular energy level diagram of N2 F2 and O2 molecules.	LI1.1. Determination of specific density of given liquid LI.1.2. Determination of viscosity of given liquid LI.1.3 Paper chromatography, Thin layer Chromatography.	**Unit 1: Atomic and Molecular Structure & Periodic properties** **1.1.** Introduction of orbit, orbitals and electronic configuration **1.2.** Schrodinger wave equation and its derivation. **1.3.** Hybridization and types of Hybridization. Intermixing of orbitals **1.4.** VSEPR theory, bond pair and lone pair repulsion, **1.5.** 1.5 Determinationof geometry of the molecules **1.6.** Molecular orbital theory, **1.7.** Molecular energy level diagram and bond order for homo and hetero atomic molecules **1.8.** Periodicity of atomic size and ionization energy **1.9.** Electron gain enthalpy and typesof electron gain enthalpy	**1.** History of development of periodic table **2.** Electronegativity and its application

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
Applications of molecular orbital theory for the determination of bond order and magnetic behaviour.

b. **Mini Project:**
Hybridization and its application.

c. **Other Activities (Specify):**
Write an essay on different type of chemical bond.

CO 2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drugmolecule.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 understand the concept of representations of 3 dimensional structures SO2.2 explain structural isomers and stereoisomers SO2.3 describe symmetry, chirality and optical activity SO2.4 explains and identify different types of reactions with mechanisms SO2.5 apply the concept of mechanisms to synthesize drug molecules	LI.2.1.To Synthesize drug molecules and determine its percentage yield LI.2.2.To determine the acid value or saponification value of oil/fat LI2.3.To Determine partition coefficient of a organic substance between two immiscible liquids.	**UNIT 2: Stereochemistry, Organic reactions and synthesis of a drug molecule** 2.1 Representations of 3 dimensional structures 2.2 Structural isomers and stereoisomers 2.3 Symmetry and chirality, optical activity and absolute configurations 2.4 enantiomers, diastereomers 2.5 Isomerism in transitional metal compounds 2.6 Introduction to reactions involving substitution reaction 2.7 Addition, elimination, oxidation, reduction reaction 2.8 cyclization and ring openings 2.9 Synthesis of a commonly used drug molecule	1. Plane of polarized light 2. Types of symmetry

SW-2 Suggested Sessional Work (SW):
Assignments: Conformational Isomerism and conformational analysis

CO 3: understand the concept of Intermolecular forces, Hydrogen bond, Transition metalcomplexes by applying this concept

Approximate Hours

Item	App X Hrs.

Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Describe Ionic, dipolar, London dispersion force, vander Waals interaction SO3.2explain Hydrogenbond and types of hydrogen bond SO3.3 Coordination compounds SO3.4 describe Metal ligand bonding by VBT SO3.5 explain Metal ligand bonding by CFT	LI3.1. Synthesis a inorganic metal complex LI3.2. Determine the two acid and two basics radical LI.3.3.Determination of chloride content of water	**Unit-3: Intermolecular forces and Transition metal complexes** **3.1.** Ionic, dipolar, London dispersion force **3.2.** Vander Waals interactions **3.3.** Hydrogen bond, types of hydrogen bond. **3.4.** Coordination compounds **3.5.** Metal ligand bonding by VBT **3.6.** Metal ligand bonding by CFT **3.7.** The energy level diagrams for transition metal ions and their magnetic properties. **3.8.** The energy level diagrams for transition metal ions and their magnetic properties	1. Coordination compounds IUPAC name and Werner theory 2. The energy level diagrams for transition metal ions and their magnetic properties

SW-3 Suggested Sessional Work (SW):

2.2 Assignments: VBT theory, CFT theory, The energy level diagrams for transition metal ions and their magnetic properties

Mini Project: applications of transition metal complexes

Other Activities (Specify):

CO 4: Predict the concept of thermodynamics, free energy & entropy and apply Nernst equation,water chemistry as well as explain concept of acid-base, metallurgy, Emf cell and corrosion.

Approximate Hours

Activity	Appx. Hrs.
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Restate concept of free energy, Free energy, Enthalpy Entropy and types of different thermodynamic system **SO4.2**Discuss the fundamental concept of	LI.4.1. Determination of hardness of water LI.4.2. Determination of alkalinity of water	**Unit 4: Use of free energy in chemical equilibrium** **4.1**Introductionenergy, Enthalpy Entropy, system and surroundings **4.2** Cell notation of cell, Nernst equation and its application	**1.** derivation of Nernst equation.
cell representation standard EMF of cell **SO4.3** Explain and apply different types of concepts used in softening of water and purification of water **SO4.4** Understand and apply concept of corrosion for the development of green corrosion inhibitors **SO4.5** Understand different acid-base concepts, ionic and solubility product of salts	LI.4.3. Chemical analysis of a salt.	**4.3** Water chemistry, Hardness of water, Temporary and permanent hardness **4.4** Water softening methods **4.5** Introduction of Corrosion, Mechanism of corrosion **4.6** Factors affecting rate of corrosion **4.7** Various acid-base concepts, Arrhenius concept, **4.8** Lewis acid-base concept, Bronsted Lowry concept **4.9** Brief idea about ionic and solubility equilibria	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Applications of green corrosion inhibitors

b. Mini Project:

Analysis of water quality parameters.

c. Other Activities (Specify):

Write an essay on acid-base concepts, ionic and solubility product of salts.

CO 5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopictechniques.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand Identification and classification of different types of EMR and vibrational modes in Molecules.	LI.5.1. Verification of Beer- Lambert law LI5.2. Determination	**Unit 5: Spectroscopic techniques and applications** **5.1** Introduction of spectroscopy, discovery, properties and types of electromagnetic radiation.	1. Applications Nuclear magnetic resonance and magnetic resonance imaging
SO5.2 Understand the fundamental principles of vibrational and rotational spectroscopy, including the interaction of light with molecular vibrations, the concept of infrared (IR) **SO5.3** Explain and apply Atomic Spectroscopy: - Energies of atomic orbital's **SO5.4** Understand and apply concept of NMR, Nuclear spin, nuclear resonance**.** **SO5.5** Understand introduction of X-ray Diffraction determination crystallographic structure of materials.	of absorption maximum of a given organic compound. LI.5.3. Determination of cell constant and conductance of solutions.	**5.2** Classification of different types of vibrational modes in molecules (stretching, bending, torsional, etc.).IR activity. **5.3** Energies of atomic orbitals and electronic transition, frank Condon principle. **5.4** Introduction of NMR, **5.5.** Nuclear spin, nuclear resonance **5.6** Principle and instrumentation of NMR **5.7.** Shielding and de shielding of magnetic nuclei. **5.8.** surface characterization techniques **5.9.** Diffraction and scattering	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Applications Nuclear magnetic resonance and magnetic resonance imaging

b. Mini Project:

Fluorescence and its applications in medicine

c. Other Activities (Specify):

Write an essay on surface characterization techniques. Diffraction and scattering.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Lab Instruction (LI)	Sessional Work (SW)	Self-Learning (SL)	Total hour (Cl+Li+SW+Sl)
CO1: Apply VSEPR theoryto predict the three-dimensional shapes of molecules.	09	06	02	01	18

CO2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule	09	06	02	01	18
CO3: Explain and apply the concept of Intermolecular forces, Hydrogen bond, and transition metal complexes	09	06	02	01	18
CO4: Predict the concept of thermodynamics, free energy & entropy and apply Nernst equation, water chemistry as well as explain concept of acid-base, metallurgy, Emf cell and corrosion.	09	06	02	01	18
CO5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse Applications of various spectroscopic techniques.	09	06	02	01	18
Total Hours	45	30	10	05	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Atomic and Molecular Structure & Periodic properties**	03	01	01	05
CO-2	**Stereochemistry, Organic reactions and synthesis of a drug molecule**	02	06	02	10
CO-3	**Intermolecular forces and Transition metal complexes**	03	07	05	15
CO-4	**Use of free energy in chemical equilibrium**	-	10	05	15
CO-5	**Spectroscopic techniques and applications**	03	02	-	05
Total		11	26	13	50

The end of semester assessment for Organic Chemistry I will be held with written examination of 50marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:
1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to NCL, CSIR laboratories
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	A textbook of engineering chemistry	Shyamala Sundara	S. Chand	Edition 2008
2	A Textbook of Engineering Chemistry	Shashi Chawla |	Dhanpat Rai Prakashan	Edition 2020
3	A Textbook of Engineering Chemistry	PC Jain and Monika Jain	Dhanpat Rai Prakashan	Edition2018

Suggested Web Sources:
1. https://nptel.ac.in/course.html
2. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=5
3. https://swayam.gov.in/explorer?category=Chemistry

Mode of Delivery: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point;

LMS/ICT Tools: Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

COs, POs and PSOs Mapping

Program: B.Tech. CSE

Course Title: Chemistry-I
ChemistryCourse Code: BSC103

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO3	PO 1	PO 2	PO6	PO 1	PO 2	PO9	PO 1	PO 2	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult Problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and Financ	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Apply VSEPR theory to predict the three-dimensional shapes of molecules.	3	1	2	2	3	2	3	2	2	1	3	2	2	3	1	2	-
CO2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule.	2	1	2	2	1	2	3	2	1	1	2	2	2	3	1	2	-
CO3: Explain and apply the concept of Intermolecular forces, Hydrogen bond, and transition metal complexes.	2	2	1	1	1	2	2	2	1	2	1	2	1	3	1	2	-
CO4: Predict the concept of thermodynamics, free energy & entropy and apply Nernst equation, water chemistry as well as explain Concept of acid-base, metallurgy, Emf cell and corrosion.	2	2	2	2	3	2	3	2	2	1	2	3	3	3	2	2	-
CO5 Collectively aim to equipstudents with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopic techniques	2	-	-	1	1	3	3	3	1	1	2	2	3	3	2	2	-

Legend:1–Low,2–Medium, 3–High

Course Curriculum Map:

POs &PSOs No.	Cos. No. &Titles	SOs No.	Laboratory instruction (LI)	Classroom Instruction (CI)	Self-Learning(SL)
PO1,2,3,4,5, 6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1:** Apply VSEPR theory to predictthe three-dimensional shapes of molecules.	SO1.1 SO1.2 SO1.3, SO1.4 SO1.5	LI.1.1, LI.1.2, LI.1.3	**Unit-1.0 Atomic and Molecular Structure & Periodic properties** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8, 1.9	History of development of periodic table 2-Elecronegativity and itsapplication
PO1,2,3,4,5, 6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2:** Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI.2.1, LI.2.2, LI.2.3	Unit-2 **Stereochemistry, Organic reactions and synthesis of a drugmolecule** 2.1,2.2,2.3,2.4,2.5,2.6, 2.7, 2.8,2.9	Resonance Raman Spectroscopy, coherent anti-stokes Raman Spectroscopy (CARS).
PO1,2,3,4,5, 6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3:** Explain and apply the concept of Intermolecular forces, Hydrogen	SO3.1 SO3.2 SO3.3	LI.3.1, LI.3.2 LI.3.3	Unit-3 **Intermolecular forces andTransition metal complexes** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8, 3.9	Nature of M-L bond, coordination number, structure and detection of oxidation state.

	bond, and transition metal complexes.	SO3.4 SO3.5			
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 4:** Predict the concept of thermodynamics, free energy & entropyand apply Nernst equation, water chemistry as well as explain concept of acid-base, metallurgy, Emf cell and corrosion	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI.4.1, LI.4.2, LI.4.3	Unit-4: **Use of free energy in** chemical **equilibrium** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	Quadrupole nuclei, quadrupole moments, electric field gradient, coupling constant splitting. Applications
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 5:** Collectively aim to equip studentswith a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applicationsof various spectroscopic techniques.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI.1.1, LI.1.2, LI.1.3	**Unit 5: Spectroscopic** techniques **and applications** 5.1,5.2,5.3,5.4,5.5,5.6,5.7	Low energy electron diffraction and structure of surfaces.

FIRST SEMESTER

Course Code: ESC 104

Course Title: Programming for problem-solving

Pre-requisite: Student should have basic knowledge programming.

Rationale: Problem solving skills can help people develop more skills and build a Promising career.

Course Outcomes:

CO 1: Understand the basic concept of Programming languages, software, algorithm and flowchart.ESC-

CO 2: Acquire knowledge regarding the building blocks of programming language.

CO 3: Apply python for solving basic programming solutions.

CO 4: Create algorithms using learnt programming skills.

CO 5: Understand real world problems and developing computer solutions for those.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	ESC 104	Problem Solving and Programming	3	4	2	1	10	5

Legend: **CI:**Class room Instruction(Includesdifferentinstructionalstrategiesi.e.,Lecture(L)andTutorial (T)and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work(includes assignment, seminar, mini projected.),
SL: Self-Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ESC	ESC 104	Programming for problem solving	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ESC	ESC 104 - L	Programming for Problem Solving Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO 1: Understand the basic concept of Programming languages, software, algorithm and flowchart.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	12
SW	2
SL	1
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO1.1. Understand types of programming languages. **SO1.2.** Utilize Operating System **SO1.3.** Compare compiler, linker, loader **SO1.4.** Create algorithm and flow charts for problem	**LI.1.1.** Running instructions in Interactive interpreter and a Python Script. **LI.1.2.** Write a program to purposefully raise Indentation Error and Correct it. **LI.1.3.** Create Flow chart for an organisation **LI.1.4.** Create Flow chart for an education system **LI.1.5.** Compare various operating systems **LI.1.6.**Write five features of Notepad	**Unit-1 Introduction to Programming** **1.1** Evolution of languages: Machine languages, Assembly languages, High-level languages construction eras. **1.2** Software requirements for programming **1.3** System software like operating system **1.4** compiler, linker, loader **1.5** Application programs like editor. **1.6** Algorithm specification of algorithm **1.7** . Flowcharts	1. Different Types of programming languages examples. 2. Learn about various operating systems.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   1. Create algorithms for some real-life problems.
   2. Create flowcharts for problems.

b. **Mini Project:**
   i. Flow diagram of working of a university.

c. **Other Activities (Specify):**
   NA

CO 2: Acquire knowledge regarding the building blocks of programming language.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	2

SL	1
Total	27

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. To Understand the datatypes **SO2.2.** Identify Expressions **SO2.3.** Apply operators **SO2.4.** Use list, string tuples	**LI.2.1.** Write a program to demonstrate basic data type in python. **LI.2.2.** Write a program to compute distance between two points taking input from the user **LI.2.3.** Write a program add.py that takes 2 numbers as command line arguments and prints its sum. **LI.2.4.** Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . 1/10. **LI.2.5.** Write a program using a for loop that loops over a sequence. What is sequence? **LI.2.6.** Write a program using a while loop	**Unit-2 Datatypes and Operators, Variables, Sequences and Iteration** 2.1. Data Types 2.2. Different types of Datatypes 2.3. Expressions, PrecedenceRules 2.4. Operators 2.5. Types of Operators 2.6. Local Variables 2.7. Global Variables 2.8. List 2.9. String 2.10. Tuples 2.11. Sequence Mutations 2.12. Accumulation Patterns.	1. Operator precedence 2. Scope of variables

	that asks the user for a number, and prints a countdown from that number to zero.		

SW-2 Suggested Sessional Work (SW):

a. Assignments:
1. Compare List and Tuples.
2. String functions with example.

b. Mini Project:
Create a Calculator.

c. Other Activities (Specify):
NA

CO 3: Gain an understanding of the various types of Conditional Statements, Loops, Arraysand Strings.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	12
SW	2
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

O2.1. To Understand the loop types **SO2.2.** Identify the looping Expressions **SO2.3.** Apply arrays **SO2.4.** Use of user defined datatype	**LI.3.1.** Write a Program for checking whether the given number is an even number or not. Using a for loop. **LI.3.2.** Write a program using a while loop that asks the user for a number, and **LI.3.3.** prints a countdown from that number to zero. **LI.3.4.** Write function to compute gcd, lcm of two numbers. **LI.3.5.** Write a program to implement Merge sort. **LI.3.6.** Write a program to implement Selection sort, Insertion sort	**Unit-3 : Conditional Statements, Loops, Arrays and Strings, User Defined Data Types** 3.1 If-else statement, 3.2 For loop, 3.3 While Loop, 3.4 Nested Iteration, 3.5 Concept and use of arrays 3.6 Declaration and usage of arrays, 3.7 2-dimensional arrays, 3.8 Different types of user defined datatypes 3.9 Structure 3.10 Union	i. Loops to access array elements ii. Member access in user defined data type

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Compare the looping statements
2. Use of user defined data type with example.

b. Mini Project:

Create a stopwatch.

c. Other Activities (Specify):

NA

CO.4: Familiarize with a concise overview of the Dictionaries and methods.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	12
SW	2
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO2.1. Understand the concepts of Dictionaries and Dictionary Accumulation **SO2.2.** Identify the Functions/Methods **SO2.3.** Apply functions **SO2.4.** Use of Functions/ Methods	**LI.4.1.** Write a program to count the numbersof characters in the string and **LI.4.2.** store them in a dictionary data structure. **LI.4.3.** Write a program to use split and join methods in the string and **LI.4.4.** trace a birthday of a person with a dictionary data structure. **LI.4.5** Write a program for user define function. **LI.4.6.** Write a program to demonstrate the use of Array.	**Unit-4 : Dictionaries and Dictionary Accumulation, Functions/Methods** 4.1 Dictionary Basics 4.2 Operations 4.3 Methods, Accumulation. 4.4 Advantage of modularizing program into functions. 4.5 Function definition. 4.6 Function Invocation. 4.7 Positional Parameter Passing 4.8 Passing arrays to functions 4.9 Recursion 4.10 Library Functions	i. Preparation of process Dictionary ii. A typical Positional Parameter Passing.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Write a program that reads a string from keyboard and prints the unique words
2. Use of user defined function with example.

b. Mini Project:

Map Two Lists into A Dictionary.

c. Other Activities (Specify):

NA.

CO 5: Comprehend the functions of different File Handling and Memory Management.

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	12
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understanding the file handling task **SO2.2** know the functions of file handling **SO2.3** Importance of .csv file **SO2.4** Use of Memory Management	**LI.5.1.** Write a programto countfrequency of characters in a given file. **LI.5.2.**Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? **LI.5.3**Write a program to read data from a file. **LI.5.4.** Write a program to write data into a file. **LI.5.5.**Write a program to copy data from one file to another. **LI.5.6.**Write a program for memory management	**Unit 5: File Handling and Memory Management** 5.1 File Handling 5.2 Memory Management 5.3 Concepts of files and basic file operations. 5.4 Writing Data to a .csv File. 5.5 Reading Data to from a .csv File. 5.6 Memory Management Operations.	1. Role of file Handling. 2.Working of .csv file

SW-5 Suggested Sessional Work (SW):

a. Assignments:
List the different file handling functions.

b. Mini Project:
Data base management of any fields by using file handling.

c. Other Activities (Specify):
NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)

CO 1**:** At the end of this chapter the student will know the Basic concept of programming.	7	12	2	1	22
CO 2**:**At the end of this chapter the student will use Operators in Programs.	12	12	2	1	27
CO 3: At the end of this chapter the student will describe the control flow Statements.	10	12	2	1	25
CO 4: At the end of this chapter the student will make function and dictionary	10	12	2	1	25
CO 5: Comprehend the functions of .csv and file handling Functions.	6	12	2	1	21
Total Hours	45	60	10	5	120

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO 1	Understand the basic concept of Programming languages, software, algorithm and flowchart.	02	05	01	08
CO 2	Acquire knowledge regarding the building blocks of programming language.	02	03	05	10
CO 3	Apply python for solving basic Programming solutions.	02	03	07	12
CO 4	Create algorithm using learnt programming skills.	1	2	7	10
CO 5	Understand real world problems and developing computer solutions for those.	-	05	05	10

Total	07	18	25	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Programming for problem-solving will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Programming for Problem Solving	R.S. Salaria, Khanna	Khanna Publishing House	2021, 4th Edition
2	Taming Python by Programming	Jeeva Jose	Khanna Publishing House	2019, 3rd Edition
3	Learning Python	Mark Lutz	O'Reilly Media	2013, 5th Edition

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering..

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering (CSE)
Course Code: ESC-104
Course Title: Programming for problem-solving

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Understand the basic concept of Programming languages, software, algorithm and flowchart.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Acquire knowledge regarding the building blocks of programming language	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Apply python for solving basic programming solutions.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Create algorithms using learnt programming skills	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Understand real world problems and developing computer solutions for those.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand the basic concept of Programming languages, software, algorithm and flowchart.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1, LI1.2	Unit-1 Introduction to Programming 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Acquire knowledge regarding the building blocks of programming language.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI 2.3,LI.2.4,LI.2. 5	Unit-2 Datatypes and Operators, Variables, Sequences and Iteration 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Apply python for solving basic programming solutions. .	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3 .3,LI.3.4	Unit-3 Conditional Statements, Loops, Arrays and Strings, User Defined Data Types 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Create algorithms using learnt programming skills.	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2	Unit-4 Dictionaries and Dictionary Accumulation, Functions/Methods: 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Understand real world problems and developing computer solutions for those.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2	Unit-5 File Handling and Memory Management: 5.1,5.2,5.3,5.4,5.5,5.6	

Course Code: **ESC-105**

Course Title: Manufacturing Practice Workshop

Pre- requisite: Basic knowledge of mathematical skill with some scientific Temperament.

Rationale: It is a place of work for preparing variety of jobs/products by using differentkinds of Instruments, hand tools and Machines. In order to prepare the products in workshop, the workshop is divided into many branches according to nature of work. Ex: 1. Fitting shop 2. Welding shop 3. Sheet metal shop 4. M/c Shop 5. Foundry & Forging shop etc

Course Outcomes:

CO1: Understand various production processes, selecting appropriate methods for different material, optimizing manufacturing efficiency and ensuring product quality.

CO2: Acquired proficiency in using hand tools, understanding different types of fits and tolerances, interpreting engineering drawing and precision measurement techniques.

CO3: Develop fundamental skills such as measuring, cutting and joining wood. Gain expertise in handling various carpentry tools and machinery.

CO4: Appreciate and access the use of casting processes in manufacturing and understand theworking of various casting processes.

CO5: Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Engineering Science Core (ESC)	ESC 105	Manufacturing Practice Workshop	1	4	1	1	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA + ESA)
ESC	ESC 105	Manufacturing Practice Workshop	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ESC	ESC 105 - L	Manufacturing Practice Workshop Op Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO 1: Understand various production processes, selecting appropriate methods for different material, optimizing manufacturing efficiency and ensuring product quality.

Approximate Hours

Item	AppX Hrs
CI	03
LI	12
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand various manufacturing processes, materials and technologies. **SO1.2** Acquire knowledge in cost estimation resource management and sustainable manufacturing practices.	1.1 Safety aspects pertaining to common Manufacturing practices. 1.2 Introduction of tools and machines used in Each process. 1.3 Basic instructions and procedures for using Lathe and drilling machine. 1.4 Drawing of a simple workpiece for carrying out various lathe /drilling operations 1.5 Demonstration of different operations during actual performance of work. 1.6 Fire Safety Instructions during the work.	**Unit-1.0 Manufacturing Methods-casting, forming, machining, Joining, advanced manufacturing methods, CNC machining, Additive manufacturing.** 1.1 Define manufacturing and various methods. 1.2 Introduction to casting, forming, machining, joining and advanced manufacturing methods. 1.3 Introduction to CNC machine.	1. Introduction to additive manufacturing.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Mechanical properties of engineering materials. Explain advanced manufacturing methods

CO 2: Acquired proficiency in using hand tools, understanding different types of fits and tolerances, interpreting engineering drawing and precision measurement techniques.

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand different cutting tools like hacksaw, chisels etc. SO2.2 acquire knowledge of various fitting and assembly techniques.	2.1 Safety instructions for using various fitting hand tools. 2.2 Tools Introduction 2.3 Instructions for using proper tools in the correct way 2.4 Drawing of a simple workpiece for carrying out different fitting operations. 2.5 Demonstration of different inspection, checking and measuring methods used for proper fitting work. 2.6 Actual performance of a small simple job.	**Unit-2 Fitting operations & power tools** 2.1 Tools used in fitting shop 2.2 types of clamping tools, marking tools, cutting tools, striking tools. 2.3 Various operations performed on fitting shop	i. Types of drilling tools and threading tools.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explain different striking tools with neat sketch
ii. Explain different types of vices used in fitting shop.

CO3: Develop fundamental skills such as measuring, cutting and joining wood. Gain expertise in handling variouscarpentry tools and machinery

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	1
SL	1
Total	17

Session Outcomes (SOs)	LaboratoryInstruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 proficiency in measuring cutting and assembling wood. **SO3.2** acquire knowledge in using various tools like saws, drills and planes **SO3.3** understand joinery techniques, wood finishing and safety practices	3.1 Safety instructions for using various carpentry tools. 3.2 Carpentry tool's Introduction. 3.3 Instructions for using proper tools in the correct way 3.4 Drawing of a simple workpiece for preparation of common carpentry joinery work. 3.5 Demonstration of different inspection, checking and measuring methods used for proper carpentry work. 3.6 Production of any one type of joints listed below- Dovetail Joint/Corner Joint/Mortise and Tenon Joint etc.	**Unit-3 : Carpentry shop** 3.1 Introduction to carpentry shop 3.2 different methods of seasoning of timber 3.3 carpentry tools	1. Defects in timber,Conversion of wood

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Explain the different operation performed in wood working
ii. Sketch and describe the different joints made in carpentry shop.
iii. Explain the different types of wood working machines used in modern wood work.

b. Mini Project:

i. Production of a simple utility item using different carpentry tools and methods

CO 4: Appreciate and access the use of casting processes in manufacturing and understand theworking of various casting processes.

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	1
SL	1
Total	17

Session Outcomes (SOs)	LaboratoryInstruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 The production of cast metal component, quality control measures and adherence to manufacturing standards	4.1 Safety instructions for foundry shop, pattern making , mould preparation. 4.2 Foundry tools introduction. 4.3 Instructions for using proper tools in the correct way 4.4 Drawing of a simple work piece for preparation of a pattern. 4.5 Instructions for sand preparation, mould preparation, melting and casting properly in the safe manner. 4.6 Production of a simple casting.	**Unit-4 : Metal casting** 4.1 Introduction to foundry shop. 4.2 Pattern, Mould, Casting, pattern allowances, moulding sand. 4.3 Casting procedure, core, gating system.	i. Types of moulding sand. ii. Types of patterns

SW- 4 Suggested Sessional Work (SW):

a. Assignments:

i. Explain different defects in casting.
ii. Explain different casting terms like runner, riser, mould etc.

CO 5: : Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the typeof industrial application.

Item	AppX Hrs
CI	03
LI	12
SW	1
SL	1
Total	17

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 Peforming set up, adjustment of flame and gas pressure, and shutdown procedure for oxyacetylene welding and cutting equipment. **SO5.2** Aquire knowledgeabout setting up and shutting down SMAW Equipment.	5.1 Safety instructions for welding shop. 5.2 Welding tools introduction for Electric Arc Welding process. 5.3 Instructions for using proper tools in the correct way. 5.4 Drawing of a simple welded joint viz. Square butt joint, T joint, Lap joint etc. 5.5 Demonstration of producing a square butt joint using MMAW process. 5.6 Actual production of a welded joint as described above.	**Unit 5: welding shop** 5.1 introduction to welding shop, classification of welding process 5.2 gas welding and its equipment's and techniques 5.3 electric arc welding and brazing process	1. study of TIG and MIG welding process 2. study of thermit welding process

SW-5 Suggested Sessional Work (SW):

Assignments:

What are different types of joints in welding shop?What is the function of flux in gas welding?

Mini Project:

Preparing lap joint using arc welding process

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Laboratory Instruction (LI)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand various production processes, selecting appropriate methods for different material, optimizing manufacturing efficiency and ensuring product quality.	3	1	12	1	17
CO 2: Acquired proficiency in using hand tools , understanding different types of fits and tolerances, interpreting engineering drawing and Precision measurement techniques.	3	1	12	1	17
CO 3: Develop fundamental skills suchas measuring, cutting and joining wood. Gain expertise in handling various carpentry tools and machinery.	3	1	12	1	17
CO 4: Appreciate and access the use ofcasting processes in manufacturing and understand the working of various casting Processes.	3	1	12	1	17
CO 5: Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding processbased on the type of industrial Application.	3	1	12	1	17
Total Hours	15	5	60	5	85

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods, CNC machining, Additive manufacturing	04	05	01	10
CO-2	Fitting operations & power tools	05	04	01	10
CO-3	Carpentry shop	-	05	05	10
CO-4	Metal casting	04	04	02	10
CO-5	Welding shop	05	03	02	10
Total		18	21	11	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Manufacturing Practice Workshop will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter,Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year

1	Elements of Workshop Technology	Hajra Choudhury S.K., Hajra Choudhury A.K. andNirjhar Roy S.K.	Media promoters and publishers private limited, Mumbai	Vol. I 2008 andVol. II 2010
2	Manufacturin g Engineering and Technology	Kalpakjian S. AndSteven S. Schmid	Pearson EducationIndia	Edition, 2002
3	Manufacturin gTechnology	Rao P.N	Tata McGraw HillHouse	Vol. I and Vol. II2007
4	Processes and Materialsof Manufacture	Roy A. Lindberg	Prentice Hall India,	4th edition, 1998
5	Lecture note provided by Dept. of Mechanical Engineering, AKS University, Satna.			

Curriculum Development Team

1. Mr. S.S. Parihar, Head of Deptt. Mech. Engg., AKS University
2. Mr. Alok Ranjan Tiwari , Assistant Professor, Dept. of Mechanichal Engg.
3. Mr Deepak Pandey , Assistant Professor , Dept. of Mechanichal Engg
4. Mr.,Keshav Pratap Singh, Assistant Professor , Dept. of Mechanichal Engg
5. Mr.Amar Soni , Assistant Professor , Dept of Mechanichal Engg
6. Mr K.P Tiwari , Assistant Professor , Dept. of Mechanichal Engg
7. Mr. Ketan Agrawal, Assistant Professor , Dept. of Mechanichal Engg
8. Mr. K.C. Kori, Faculty, Assistant Professor , Dept. of Mechanichal Engg
9. Mr,Lokesh Agrawal, Assistant Professor , Dept. of Mechanichal Engg
10. Mr. Ram Narayan Shukla, Assistant Professor , Dept. of Mechanichal Engg
11. Mr. Rishi Kumar Sharma, Assistant Professor , Dept. of Mechanichal Engg
12. Mr. Naveen Kumar Soni**,** Assistant Professor , Dept. of Mechanichal

Cos,POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: ESC105

Course Title: Manufacturing Practice Workshop

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineerring knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability:	Ethics	Individual and team work:	Communication:	Project management and finance:	Life-long learning				
CO1 : Understand various production processes, selecting appropriate methods for different material, optimizing manufacturing efficiency and ensuring product quality.	2	1	2	2	3	2	2	2	2	1	3	2	2	2	1	2
CO 2 : Acquired proficiency in using hand tools , understanding different types of fits and tolerances, interpreting engineering drawing and precision measurement techniques.	1	1	1	1	3	2	2	2	2	1	2	2	1	2	1	2
CO3 : Develop fundamental skills such as measuring , cutting and joining wood. Gain expertise in handling various carpentry tools and machinery.	2	2	1	1	3	1	2	2	2	1	1	2	1	2	1	1
CO 4: Appreciate and access the use of casting processes in manufacturing and understand the working of various casting processes.	2	2	2	1	3	2	2	2	2	1	2	2	1	2	1	2
CO 5: Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application.	2	1	1	1	1	3	2	2	2	1	2	2	1	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	CO-1: Understand various production processes, selecting appropriate methods for different material, optimizing manufacturing efficiency and ensuring product quality.	SO1.1 SO1.2	1.1 1.2 1.3 1.4 1.5 1.6	Unit-1.0 Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods, CNC machining, Additive manufacturing 1.1,1.2,1.3	As mentioned in page number 2 to 6
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	CO 2 : Acquired proficiency in using hand tools , understanding different types of fits and tolerances, interpreting engineering drawing and precision measurement techniques.	SO2.1 SO2.2	2.1 2.2 2.3 2.4 2.5 2.6	Unit-2 Fitting operations & power tools 2.1, 2.2, 2.3	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	CO3 : Develop fundamental skills such as measuring , cutting and joining wood. Gain expertise in handling various carpentry tools and machinery.	SO3.1 SO3.2 SO3.3	3.1 3.2 3.3 3.4 3.5 3.6	Unit-3 : Carpentry shop 3.1, 3.2,3.3	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	CO 4: Appreciate and access the use of casting processes in manufacturing and understand the working of various casting processes.	SO4.1	4.1 4.2 4.3 4.4 4.5 4.6	Unit-4 : Metal casting 4.1, 4.2,4.3	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	CO 5: Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application.	SO5.1 SO5.2	5.1 5.2 5.3 5.4 5.5 5.6	Unit 5: Welding Shop5.1,5.2,5.3	

FIRST SEMESTER

Course Code: HSMC01

Course Title: Communication Skills

Pre-requisite: Students must have basic knowledge of English language.

Rationale: In order to compete in this fast-growing world, LSWR skills of the students shouldbe well developed and enhanced. Besides, they must have effective communication skills as it plays a vital role in shaping individual's personality and career. It also booststhe confidence and prepares them to face the audience fearlessly.

Course Outcomes:

After completion of the course:

CO.1 Speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self confidence amongst them.

CO.2 Interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.

CO.3 Communicate effectively in Hindi and English languages without hindrances.

CO.4 Convey their messages accurately by understanding thesignificance of grammar as it plays a vital role in improving speaking and writing skills.

CO.5 Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
HSMC	HSMC 01	Communication Skills	3	0	1	1	5	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/HomeAssignment5 number 3 marks each (CA)	Class Test 2 (2 best out Of 3) 10	Seminar one **(Presentation)** (SA)	Class Activity any	Class Attendance	Total Marks (CA+CT+SA+CAT		
HSMC	HSMC01	Communication Skills	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Speak confidently in public as all the topics chosen emphasis on improvingspeaking skills and developing self confidence amongst them.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	1
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Students will be able to introduce themselves		**Unit 1- Self-grooming, Basic Etiquettes and Presentation Skill**	1. Prepare a presentation on the giventopics.
SO1.2 Understand the concept of Oral Presentation SO1.3 Students will be able to dress and present effectively SO1.4 Understand the importance of Body Language SO1.5 Students will be able		1.1 Self-introduction 1.2 Oral Presentation 1.3 Oral Presentation on: The importance of Education 1.4 The importance of English in Today's World 1.5 Necessity of uniforms in a college 1.6 Professional dressing and grooming etiquettes. 1.7 Body Language tips and	2. Prepare a play on the given topics.

to influence mass through skit and dramas.		techniques. 1.8 Role play 1.9 Role play was conducted on following topics: Classroom interaction, 1.10 Hospital Scene and 1.11 Scene at Railway station.	

CO2: Interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the techniques of Group	.	**UNIT 2 – Confidence building skills,**	1. Prepare
Discussion **SO2.2** Understand the concept of Debate **SO2.3** Students will be able to design a professional resume and crack interview **SO2.4** Explain the concept of how to ace in an interview.		**Interview Skills and Resume Writing** 2.1. Group Discussionon 2.2. Group Discussion on impact of covid 19 2.3. Group Discussion on mental health, i 2.4. Group Discussion impact ofsocial media 2.5. Group Discussion on lives, pros and cons of technology 2.6. Students will beable to present debate 2.7. Debate on effectively on (Should the Use of Plastic Be banned? 2.8. Debate on: Should Parents Decide Which Career Their ChildrenWill Pursue? 2.9. . Debate on: Is Artificial Intelligence Useful or Dangerous?) 2.10. Interviews and their Kinds 2.11. Mock Interview Session 2.12. Resume Writing.	debate on given topics 2. Prepare a Resume

CO3: Communicate effectively in Hindi and English languages without hindrances.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	1
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Students will be able to organize and prepare speeches.	.	**Unit-3: Public Speaking Skills& Conversational Skills**	1. Prepare a Speech on the following topics.
SO3.2 Students will be able to think and speak instantaneously. **SO3.3** To make them understand the inquiry procedure at public places. **SO3.4** To enable them to communicate effectivelythrough phones.		3.1 Speech/Anchoring 3.2 Speech/Anchoring on National Science Day 3.3 Valedictory Speech 3.4 Patriotic speech 3.5 Extempore 3.6 Extempore (Pros and Cons of Online teaching 3.7 Extempore: Environment Conservation and 3.8 Extempore: Education of a Girl Child) 3.9 Conversational Topics (Inquiry at bank, Airport, Station and Hospitals). 3.10 Telephonic Conversation(Describing about Your College Day to Your Parents from Hostel 3.11 Talking with Customer Care Executive of Any E-Commerce Company).	2. Prepare on the following conversational topics.

CO.4: Convey their messages accurately by understanding the significance of grammar as it plays a vital role in improving speaking and writing skills.

Approximate Hours

Item	AppXHrs
Cl	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO4.1 Understanding about the use of Prepositions. **SO4.2**Students will be able to understand the usage of Tenses **SO4.3**Undesrtand the concept of Active and Passive Voice **SO4.4**To understand the usage of Modals		Unit-4: Functional Grammar and Vocabulary Building 4.1. Prepositions: Place 4.2. Time 4.3. Direction 4.4. Tenses: Present, Past, Future 4.5. Voice (Active and Passive) 4.6. Modals.	1. Prepare the Structure of Tenses and Active Passive. 2. Prepare 250 Vocabularies.

CO.5: Understanding of The Indian Culture and English Language will be developed throughthe study of Dramas and Poems written by Indian Writers.

Approximate Hours

Item	Appx. Hrs.
Cl	5
LI	0
SW	1
SL	1
Total	7

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
O5.1 Students willbe able to understand the value of Indian Literature (R.K. Narayan) **SO5.2** Students will be able to understand the value of Indian Literature (Nissim Ezekiel) **SO5.3** Students willbe able to understand the value of Indian Literature (Khushwant Singh) **SO5.4** Students will be able to understand the value of Indian Literature (Mulk Raj Anand) **SO5.5** Students will be able to understand the value of Indian Literature (Prem Chand)		**Unit 5-Indian Writing in English& Hindi** 5.1. The Axe- R.K. Narayan 5.2. The Night of the Scorpion- Nissim Ezekiel 5.3. The Portrait of a Lady -Khushwant Singh 5.4. The Lost Child- Mulk RajAnand 5.5. The Shroud- Prem Chand	1. Prepare the summary of all the topics (The Axe, The Night of the Scorpion, The Portrait of a Lady,The Lost Child he Shroud).

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1: Students will be able to speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self confidence amongst Them.	11	1	1	13
CO.2: Students will be able to interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand theImportance of Team Work.	12	1	1	14
CO.3: Students will be able to communicate effectively in Hindiand English languages without hindrances.	11	1	1	13
CO.4: Students will be able to convey their messages accurately by understanding the significance of grammar as it plays a vital role in improving speaking and writing skills.	6	1	1	8
CO.5: The Understanding of Indian Culture and English Language will be developed throughthe study of Dramas and Poems written by Indian Writers.	5	1	1	7
Total Hours	**45**	**5**	**5**	**55**

Suggested Specification Table (ForESA)

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Roleplay
5. Presentations
6. Extempore
7. Speeches
8. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Communication Skills	Dr. Meenu Pandey	Nirali Praksahan.	2020

2	A Practical Guide to English Grammar	K.P. Thakur	Bharti Bhawan Publishers & Distributors.	2018
3	Living English Structure	W. StannardAllen	Dorling Kindersley India Pvt. Ltd.	Fifth Edition,
4	Communication Skills for Engineers	Muralikrishna C., Sunita Mishra	Pearson, New Delhi.	Second edition (2010)
5.	Advanced Language Practice,	Michael Vince	Macmillan Education, Oxford	2003.
6.	English Conversation Practice	Grant Taylor	Tata McGraw Hill Education Private Limited.	1967
7.	Six Weeks to Words of Power	Wilfred Funk	W.R. Goyal Publishers and Distributors.	1990

Curriculum Development Team **Curriculum Development Team**

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B.Tech.(Computer Science & Engineering)
Course Code: HSMC01
Course Title: Communication Skills

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO.1: Students will be able to speak confidently in public as all the topics chosen emphasis on improving speaking	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

skills and developing self confidence amongst them.																	
CO..2: Students will be able to interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO.3: Students will be able to communicate effectively in Hindi andEnglish languages without hindrances.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO.4: Students will be able to convey their messages accurately by understanding the significance of grammar as it plays a vital role in improving speaking and writing skills.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: The Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students will be able to speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self Confidence amongst them.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 Self-grooming, Basic Etiquettes and Presentation Skill 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Students will be able to interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Confidence building skills, Interview Skills and ResumeWriting 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Students will be able to communicate effectively in Hindi and English languages without hindrances	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Public Speaking Skills& Conversational Skills 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Students will be able to convey their messages accurately by understanding the significance of grammar as it plays a vital role in improving speaking and writing skills.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Functional Grammar and Vocabulary Building 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10, 4.11,4.12,4.13,4.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: The Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 **Indian Writing in English& Hindi** Statistics 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10, 5.11,5.12,5.13,5.14,5.15	

First Semester

Course Code: HSMC08

Course Title: **Sustainable Development Goals (SDGs)**

Pre-requisite: Student should have basic knowledge of Environment, Natural resources, Climate change and sustainability.

Rationale: To inculcate the knowledge base on sustainable development with a view to balance our economic, environmental and social needs, allowing prosperity for now and future generations. To train students to undertake major initiatives in the efficient management of natural resources and the prevention of environmental pollution with focus on Sustainable Development.
To use environmental management tools that help to improve the quality of environment, to assess local vulnerabilities with respect to climate, natural disasters and to achieve sustainable developmental needs.

Course Outcomes:

CO1: Examine critically the 17 newly minted UN Sustainable Development Goals and understandthe historical evolution, key theories, and concepts of sustainable development.
CO2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.
CO3: Understand the implications of overuse of resources, population growth and economic growthand sustainability and explore the challenges the society faces in making transition to renewable resourceuse.
CO4: Develop skills to understand attitudes on individuals, society and their role regarding causesand solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.
CO5: Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.

Scheme of Studies:

Board of Study	Course Code	Course Title			Scheme of studies(Hours/Week)			Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
HSMC	HSMC-08	Sustainable Development Goal	2	0	1	1	4	2

Legend: **CI:** Class room Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
HSMC	HSMC-08	Sustainable Development Goal	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Examine critically the 17 newly minted UN Sustainable Development Goals and understandthe historical evolution, key theories, and concepts of sustainable development.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	**8**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand about Sustainable Development **SO1.2** Understand the Need and Importance of SDGs **SO1.3** Understand the historical evolution of SDGs **SO1.4** Gain knowledge of SDGs Different goals and their importance **SO1.**5 Explain the Challenges & strategies of attaining SDGs in countries.		**Unit-1.0 Introduction to Sustainable Development** 1.1 Need and Importance of Sustainable Development 1.2 Historical & Policy perspectives of Sustainable Development 1.3 Sustainable Development: World and India Perspective 1.4 Introduction to 17 SDGs 1.5 Specific learning objectives for different SDGs 1.6 Challenges & strategies of attaining SDGs in developed and developing nations	Different SDG goals details and its importance

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
Overview of SDGs, Sustainable Consumption and Production, Details of 17 SDGs

b. **Other Activities (Specify):**
Note down the different challenges in our state and district to achieve SDG.

CO2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability and measuring.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Explain Sustainable Development **SO2.2** Understand the NEP-2020 and SDG **SO2.3** Discuss higher Education role to achieve SDGs **SO2.4** Explain how education for Sustainable Development **SO2.**5 Explain the measuring techniques for Sustainability .		**Unit-2.0** Special focus on SDG 4-Quality Education and Lifelong Learning 2.1 Focus of NEP-2020 on SDG 2.2 Education for Sustainable Development (ESD): 2.3 Berlin Declaration 2021 on ESD 2.4 Integration of ESD in curriculum and textbooks 2.5 Tools, Systems, and Innovation for Sustainability 2.6 Measuring Sustainability: How do we measure sustainability	1 NEP2020 objectives and concept for SDGs 2 Concept ,Tools and techniques for measuring sustainability

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   Education role to achieve SDGs, the role of education in Sustainable Development, Measuring techniques of sustainability, Sustainability Indicators
b. **Other Activities (Specify):** Seminar and group discussion on ESD and measuring sustainability Millennium Development Goals (MDGs)

CO3: Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.

Approximate Hours

Item	Appx. Hrs.
Cl	06

LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understand current economic issues in the context of the global sustainable development debate. **SO3.2** Outline of health, hygiene and water sanitation issues. **SO3.3** Discuss the renewable energy resources and its importance in present scenario **SO3.4** Explain the importance of sustainable production and consumption **SO3.**5 Explain the problems and solution in rural and urban areas.		**Unit-3.0 Understanding the SDGs** 3.1 Circular economy (basic model of reuse, recycle, and reduce) 3.2 Rural & urban Problems & Challenges 3.3 Sustainable production and consumption 3.4 Renewable energy 3.5 Health & Hygiene, water , sanitation & water management 3.6 Waste Management	1. Water treatment and management practices. 2. Non-renewable energy resources.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
Ecofriendly energy resources importance, types of waste and its management, Urban Problems & Challenges

b. **Other Activities (Specify):**
Visit of waste water treatment plant, Visit of water treatment process.

CO4: Develop skills to understand attitudes on individuals, society and their role regarding causesand solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.

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Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understand environmental sustainability iscrucial in reducing the impacts of climate change **SO4.2** Discuss causes of emission of GHGs and itsconsequences **SO4.3** Explain how climate change and sustainable development both play a role in shaping the human and environmental factors of the world. **SO4.4** Explain the importanceof sustainable production and consumption **SO4.**5 Climate change is disrupting national economiesand affecting lives and livelihoods, especially for themost vulnerable and its mitigation.		**Unit-4.0 Climate Change, Energy and Sustainable Development** 4.1 The greenhouse effect: Causes and Consequences 4.2 Climate Change: A Threat to Sustainable Development 4.3 Adaptation to Current and Future Climate Regimes 4.4 The consequences: crop failure 4.5 Solutions technology and lifestyle changes 4.6 Mitigating Climate Change	**1** Agreement on Climate Change, Trade, and Sustainability Carbon Credit, carbon trading 2.Kyoto Protocol

SW-1 Suggested Sessional Work (SW):

a. Assignments:
Urban Sustainability and Climate Change, Sustainable Development Policies, Agreement on Climate Change, Trade and Sustainability, Resilient cities – What makes a city sustainable, green, and resilient

b. Other Activities (Specify):
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CO5: Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational programme and processes.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the relevance and the concept of sustainability and the global initiatives in this direction **SO4.2** Understand role of Corporations and Ecological Sustainability**.** **SO4.3** Explain role of CSR in Sustainability. **SO4.4** Understand the SD challenge for companies, their responsibility and their potentials for action **SO4.5** Discuss the role of world government for world justice and peace		**Unit-5.0 Sustainable Business Practices:** 5.1 Corporate Social Responsibility 5.2 Sustainable products and services 5.3 Business and Environment 5.4 Corporations and Ecological Sustainability 5.5 Life Cycle Assessment: • LCA Overview and Application 5.6 World peace and justice: • United nations goals for peace and justice • World Government for peace	Local to the Global: Can Sustainable Development Work

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
Consumption Patterns and Lifestyles, Company Perspectives for Environmental Sustainability, an Introduction to Economic Growth

b. **Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (SI)	Total hour (Cl+SW+Sl)
CO1: Examine critically the 17 newly minted UN Sustainable Development Goals and understandthe historical evolution, key theories, and concepts of sustainable development.	6	1	1	8
CO2: Identify and apply methods for assessingthe achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	6	1	1	8
CO3: Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.	6	1	1	8
CO4: Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.	6	1	1	8
CO5: Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	6	1	1	8
Total Hours	30	5	5	40

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Need and Importance of Sustainable Development	03	01	01	05
CO-2	Education for Sustainable Development (ESD): Tools, Systems, and Innovation for Sustainability	02	06	02	10
CO-3	Discuss the sustainable production and consumption	03	07	05	15
CO-4	How Climate Change may be Threat to Sustainable Development	-	10	05	15
CO-5	Role of Corporations and Ecological Sustainability	03	02	-	05
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply A: Analysis E: Evaluate C: Create

The end of semester assessment for Sustainable Development Goals will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to industry, water treatment plant
7. Demonstration
8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT,Blog,Facebook,Twitter,Whatsapp,Mobile,Onlinesources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	The Economics of Sustainable Development: The Case of India (Natural Resource Management and Policy)"	Surender Kumar and Shunsuke Managi	Springer Switzerland	2009
2	Corporate Social Responsibility in Developing and Emerging Markets	Onyeka Osuji	Cambridge	New Edition June 2022
3	Smart Cities for Sustainable Development	Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna	Springer Switzerland	March 2022
4	Sustainable Development: Linking Economy, Society, Environment	Tracey Strange and Anne Bayley		
5	Management Of Resources For Sustainable Devpt	Sushma Goyal	The Orient Blackswan	2016
6	Energy, Environment and Sustainable Development: Issues and Policies	S. Ramaswamy Sathis G. Kumar	Regal Publications	2009
7	The New Map: Energy, Climate, and the Clash of Nations	Daniel Yergin	Penguin Press	September 2015
8	Contributions of Education for Sustainable Development (ESD) to Quality Education:	Laurie, R., Nonoyama-Tarumi, Y., Mckeown, R., & Hopkins, C.	A Synthesis of Research. Journal of Education for Sustainable Development, 10(2), 226–242.	2016
9	Sustainable Results in Development: Using the SDGs for Shared Results and Impact	OECD	OECD Publishing, Paris	2019

10	Development Discourse and Global History from colonialism to the sustainable development goals	Ziai, Aram	Routledge, London & New York	2016
11	Sustainable Development Goals An Indian Perspective,	Hazra, Somnath., Bhukta, Anindya	Springer Switzerland	2020
12	Environmental Ecology, Biodiversity and Climate Change	HM Saxena	Rawat Publication	January 2021
13	https://www.un.org/sustainabledevelopment/			
14	https://www.aiu.ac.in/documents/AIU_Publications/UN-SDG goals			
15	https://www.unesco.org/en/education-sustainable-development			
16	https://onlinecourses.nptel.ac.in/noc23_hs57/preview			
17	https://www.iau-hesd.net/news/5180-berlin-declaration-education-sustainable development-adopted-unesco-esd-conference-17-19			

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: HSMC08
Course Title: Sustainable Development Goals (SDGs)

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Understand the implications of overuse of resources,	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2

population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.																	
CO4: Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5: Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1:** Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	SO1.1 SO1.2 SO1.3 SO1.4		Unit 1: Introduction to Sustainable Development 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2:** Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Special focus on SDG 4-Quality Education and Lifelong Learning: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3:** Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3.0 Understanding the SDGs 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4:** Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4.0 Climate Change, Energy and Sustainable Development 4.1,4.2,4.3,4.4,4.5,4.6	

	quality, credibility and limitations of an argument for solution.				
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5:** Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5.0 Sustainable Business Practices 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

FIRST SEMESTER

Course Code: HSMC09

Course Title: Sports and Yoga

Pre- requisite: Student should have basic knowledge of Applications of Yoga and Meditation and its concepts

Rationale: Students of Yoga should have a legal understanding of Yoga and its original text Yoga. At the same time, they should also have adequate knowledge of Yoga and Meditation in which they should have knowledge of its basic principles and elements.

Course Outcomes:

CO 1: To make the students understand the importance of **Introduction of Yoga.**

CO 2: To make the students understand the importance of **Fundamentals of Yog**

CO 3: To expose the students to a variety of physical and yogic activities aimed at stimulating their continued Inquiry about Yoga, physical education, health and fitness.

CO 4: To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury and Yoga & Lifestyle

CO5: To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Progra mCore	HSMC09	Sports & Yoga	2	0	0	0	2	NC

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO. 1: To make the students understand the importance of **Introduction of Yoga.**

Approximate Hours

Item	AppX Hrs
Cl	06
LI	0
SW	0
SL	3
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
O1.1 Student will able to Understand the Meaning & Importance of Yoga **SO1.2** Student will able to Describe theElements of Yoga,astang yoga SO1.3Student will able to Describe Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas SO1.4Student will able to Understand the Concept of Yoga for concentration & related Asanas SO1.5Student will able to Understand the Concept ofRelaxation Techniques for improving concentration - Yog-nidra	.	**Unit-1. Introduction of Yoga** 1.1 Meaning & Importance of Yoga 1.2 Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas 1.3Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana&Shashankasana) 1.4Relaxation Techniques for improving concentration - Yog-nidra 1.5Relaxation Techniques for improving concentration - Yog-nidra 1.6 Relaxation Techniques for	1.Meaning & Importance of Yoga 2- Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas 3-Relaxation Techniques for improving concentration - Yog-nidra

		improving concentration - Yog-nidra	

CO. 2: To make the students understand the importance of **Fundamentals of Yoga**

Approximate Hours

Item	AppX Hrs
Cl	06
LI	0
SW	1
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Student will able to Understand **Fundamentals of Yoga** **SO2.2**Student will able to Understand the Effect of yoga on the functioning of Various Body Systems	.	**Unit-2. Fundamentals of Yoga** 2.1 Purpose yoga , definition of yoga , need and use of yoga for students. 2.2 Effect of yoga on the functioning of Various Body Systems. 2.3 Effect of yoga on the functioning of Various Body Systems 2.4Circulatory System, 2.5Respiratory System, 2.6 Neuro- System , Muscular System etc.	1. Effect of yoga on the functioning of Various Body Systems 2. **Fundamentals of Yoga** 1.

CO. 3: To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.

Approximate Hours

Item	AppX Hrs
Cl	06
LI	0

SW	1
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Student will able to Understand Meaning & Importance **Physical Fitness, Wellness & Lifestyle** **SO3.2**Student will able to Understand the Components of Physical fitness **SO3.3** Student will able to Describe **SO3.4** Student will able to Understand of Health related fitness **SO3.5** Student will able to Understand of Preventing Health **SO3.6** Student will able to Describe Concept of Positive Life	.	**Unit-3. Physical Fitness, Wellness & Lifestyle** 3.1 o Meaning & Importance of Physical Fitness & Wellness 3.2 Components of Physical fitness 3.3 Components of Health related fitness 3.4 Components of wellness 3.5 Preventing Health Threats through Lifestyle Change 3.6 Concept of Positive Lifestyle	**1.Physical Fitness** **2.Wellness & Lifestyle**

CO. 4: To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury and **Yoga & Lifestyle**

Approximate Hours

Item	AppX Hrs
Cl	06
LI	0
SW	0
SL	1
Total	07

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Student will able to Understand Asanas as preventive measures **SO4.2**Student will able to Understand the Hypertension, Obesity, Back Pain, Diabetes,Asthema,		**Unit-4. Yoga & Lifestyle** 4.1 Asanas as preventive measures. 4.2 Hypertension: Tadasana, Vajrasana, PavanMuktasana, ArdhaChakrasana, Bhujangasana, Sharasana. 4.3 Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, ArdhMatsyendrasana. 4.4 Back Pain: Tadasana, ArdhMatsyendrasana, Vakrasana, Shalabhasana, Bhujangasana. 4.5 Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana,PavanMuktasana, ArdhMatsyendrasana. 4.6 Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	1. Asanas as preventive measures

CO. 5: To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health**&Postures.**

Approximate Hours

Item	AppX Hrs
Cl	06
LI	0

SW	0
SL	1
Total	07

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Student will able to Understand the Meaning and Concept of Postures **SO5.2**Student will able to Understand theCauses of Bad Posture **SO5.3** Student will able to DescribeConcept & advantages of Correct Posture	.	**Unit-5. Postures** 5.1 Meaning and Concept of Postures. 5.2 Causes of Bad Posture. 5.3 Advantages& disadvantages of weight training. 5.4 Concept& advantages of Correct Posture. 5.5 Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; 5.6 Lordosis,Kyphosis, Bow Legs and Scoliosis.	1.Meaning and Concept of Postures

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**

b. **Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: To make the students understand the importance of **Introduction of Yoga.**	6	0	0	3	09
CO2: To make the students understand the importance of **Fundamentals of Yoga**	06	0	1	1	08
CO3: To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.	06	0	1	1	08

CO4: To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury and **Yoga & Lifestyle**	06	0	**0**	1	07
CO5: To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health**&Postures.**	06	0	0	1	07
Total Hours	30	**0**	2	7	39

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
HSMC09.1	**Introduction to Yoga**	5	03	02	10
HSMC09.2	**Fundamentals of Yoga**	04	02	04	10
HSMC09.3	**Physical Fitness, Wellness & Lifestyle**	03	04	03	10
HSMC09.4	**Yoga & Lifestyle**	04	02	04	10
HSMC09.5	**Postures**	04	02	04	10
Total		20	13	17	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Introduction to Yoga will be heldwith written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play

6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Curriculum Development Team

1- Singh S.P. & yogi Mukesh ,Foundation of yoga , standard publication , new Delhi ,2010
2- Swami dherendra brhamchari , yogasana vigyaan , dherendra yoga prakshan , new Delhi 1966
3- Sarswati , swami satyananda , asan pranayama mudra bandha ,yog prakshan trust munger ,2013
4- H.R. nagendra , asan pranayama mudra bandha,swami Vivekananda yog prakshan ,banglore 2002
5- Ishwer Bhardwaj , saral yogashan , satyam publication house , new Delhi 2018
6- Shri ram chauhaan , mudra rahasya , bhartiye yog sansthan , new delhi 2014
7- Dr Vishwanath Prasad sangha , dhyan yog , bhartiye yog sansthan , new delhi 1987
8- Shri Deshraj ,Dhyan sadhna , bhartiye yog sansthan , new delhi 2015
9- bhartiye yog sansthan , new delhi 2014

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: HSMC09

Course Title: Yoga and Sports

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO1: To make the students understand the importance of **Introduction of Yoga.**	-	2	-	-	1	-	1	-	2	1	-	2					
CO2: To make the students understand the importance of **Fundamentals of Yoga**	-	2	-	-	1	-	1	-	2	1	-	2					
CO3: To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry	-	2	-	-	2	-	2	-	2	2	-	2					

about Yoga, physical education, health and fitness.																	
CO4: To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury and **Yoga & Lifestyle**	-	**2**	-	-	**1**	-	**1**	-	**2**	**1**	-						
CO5: To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health**&Postures.**	-	**2**	-	-	**2**	-	**3**	-	**2**	**1**	**2**						

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2	CO1:To make the students understand the importance of Yoga	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 Introduction of Yoga 1.1,1.2,1.3,1.4,1.5,1.6	1,2,3
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2	CO 2 : To make the students understand the Fundamentals of Yoga	SO2.1 SO2.2		Unit-2 Fundamentals of Yoga 2.1, 2.2, 2.3, 2.4,2.5,2.6	1,2
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2	CO3:To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		Unit-3:Physical Fitness, Wellness & Lifestyle 3.1, 3.2, 3.3, 3.4, 3.5 ,3.6,3.7,3.8,3.9,3.10,3.11,3.12	1,2
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2	CO 4: To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury and Yoga & Lifestyle	SO4.1 SO4.2		Unit-4: Yoga & Lifestyle 4.1, 4.2, 4.3, 4.4, 4.5, 4.6	1
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2	CO5: To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health&Postures.	SO5.1 SO5.2 SO5.3		Unit-5:Postures Equations5.1, 5.2, 5.3, 5.4, 5.5, 5.6	1

Semester - II

SECOND SEMESTER

Course Code:	**BSC104**
Course Title:	**Mathematics -II**
Pre-requisite:	Objective of this course is to familiarize the prospective engineers with techniques in Ordinary and partial differential equations and Laplace transform. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.
Rationale:	The program aims to develop the tool of power series and Fourier series for learning advanced engineering mathematics

BSC201.1 Understand the importance of Laplace transforms and elementary properties ofLaplace transform
BSC201.2 To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions
BSC201.3 Demonstrate an understanding of the Vector Calculus
BSC201.4 Define and recognize the method to solve Sequences and series
BSC201.5 Students will create the concept of a Partial Differential Equations

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
BSC	BSC104	Mathematics-II	4	0	1	1	6	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
BSC	**BSC104**	Mathematics -II	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1- Understand the importance of Laplace transforms and elementary properties of Laplace transform

Approximate Hours

Item	AppXHrs
CI	13
LI	0
SW	1
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**

SO1.1 Understand the concept of Laplace transforms of elementary functions **SO1.2**Understand the Laplace transform of derivatives **SO1.3**Understand the Inverse Laplace transform **SO1.4**Understand the Application of Laplace transform		**Unit-1.0** 1.1 Introduction of Laplace transform 1.2 Laplace transforms of elementary functions 1.3 Linearity property 1.4 Properties of Laplace transform, 1.5 Laplace transforms of derivatives 1.6 Laplace transform of Integral 1.7 Multiplication by t^n 1.8 Division by t 1.9 Inverse Laplace transform 1.10 First shifting theorem 1.11 Second shifting Property 1.12 Convolution theorem 1.13 Application of Laplacetransform	**SL1.1** Change of scale property

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**

1. Example on properties of Laplace transform
2. Example on Laplace transform of derivatives
3. Example on Laplace transform of Integral
4. Example on Multiplication by t^n
5. Example on First shifting theorem

b. Mini Project:
Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

CO2- To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions

Approximate Hours

Item	AppXHrs
Cl	11
LI	0
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning
SO2.1 Understand the concept Solving Second order linear differential with variable coefficients **SO2.2**Understand the Solution by variation of parameters **SO2.3** Understand the Power series solutions **SO2.4** Understand the Legendre's equations and Legendre polynomials.		**2.1** Linear differential Equation with constant coefficients **2.2** Complimentary Function and Particular integral **2.3** Solution by Inspection Method **2.4** Solution by change of dependent variable **2.5** Solution by change of independent variable **2.6** Solution by variation of parameters **2.7** Power series solutions (Frobenius method): **2.8** Series for Ordinary Point **2.9** Legendre's equations and **2.10** Bessel's equation and **2.11** Tutorial	**SL2.1**Examples of Frobenius method

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   1. Example on Solution by variation of parameters
   2. Example on Power series solutions:
   3. Example on Legendre's equations and
   4. Example on Legendre polynomials

5. Example on Frobenius method

b. Mini Project:
Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

CO3- Demonstrate an understanding of the Vector Calculus

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1understand the scalar and vector point function **SO3.2** Understand the Line integrals, Surface integrals, Volume integrals **SO3.3** Understand the Gradient, Curl, D divergence **SO3.4**Understand the Gauss Divergence theorems, Stoke's theorems		3.1 Differentiation of vector 3.2 scalar and vector point function 3.3 Directional derivatives 3.4 Gradient 3.5 Curl 3.6 Divergence 3.7 Line integrals, 3.8 Surface integrals 3.9 Volume integrals 3.10 Green's theorems 3.11 Gauss Divergence theorems 3.12 Stoke's theorems	**SL.1**Examples on Stoke's theorems

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**

1. Example on Directional derivatives
2.Example on Gradient
3. Example on Divergence
4.Example on Surface integrals
5.Stoke's theorems

CO4- Define and recognize the method to solve Sequences and series

Approximate Hours

Item	AppXHrs
Cl	13
LI	0
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand Convergence and Divergence of sequence **SO4.2** Understand the Tests for convergence **SO4.3**Understand Fourier series **SO4.4** understand and Calculation of limits		**4.1** Limits of sequence of numbers **4.2** Convergence and Divergence of sequence **4.3** Cauchy sequence **4.4** Calculation of limits **4.5** Infinite series **4.6** Tests for convergence **4.7** Rabbe test and logarithmic test **4.8** Comparison test **4.9** Fourier series **4.10** Even and odd function **4.11** Half range sine and cosine series **4.12** Half range cosine series **4.13** Parseval's theorem	**SL4.1**Some theorem on sequence

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Example on Cauchy sequence
2. Example on Testsfor convergence
3. Example on Comparison test
4. Example on Fourier series
5. Example on Even and odd function

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):Quiz, Class Test.

CO5- BSC104.5 Students will create the concept of a Partial Differential Equations

Approximate Hours

Item	Appx Hrs
Cl	11
LI	0
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the Solutions of first order linear PDE **SO5.2** Understand the Solution tohomogenous and Non-homogenous linear PDE **SO5.3** Understand the First order PDE **SO5.4** Understand PDE of Second order by particular integral method		5.1 Definition of Partial Differential Equations 5.2 First order PDE 5.3 Solutions of first order linear PDE 5.4 Solution to homogenous PDE 5.5 Non-homogenous linear PDE 5.6 PDE of Second order by complimentary function and 5.7 PDE of Second order by particular integral method. 5.8 Lagrange's Linear equation, 5.9 Charpit's method 5.10 Separation of variable method for the solution of heat equations 5.11 wave equations	**SL.1** Problems on PDE

SW-3 Suggested Sessional Work (SW):

a. Assignments

1. Example on linear PDE
2.Example on Solution to homogenous PDE
3.Example on Lagrange's Linear equation,
4.Example on PDE of Second order by complimentary function and5.Example on Charpit's method

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1- Understand the importance of Laplace transforms and elementary properties of Laplace transform	13	1	1	15
CO2- To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions	11	1	1	13
CO3- Demonstrate an understanding of the Vector Calculus	12	1	1	14
CO4- Define and recognize the method to solve Sequences and series	13	1	1	15
CO5-Students will create the concept of a Partial Differential Equations	11	1	1	13
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Understand the importance of Laplace transform and elementary properties of Laplace transform	03	01	01	05

O-2	To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions	02	06	02	10
CO-3	Demonstrate an understanding of the Vector Calculus	03	07	05	15
CO-4	Define and recognize the method to solve Sequences and series	-	10	05	15
CO-5	Students will create the concept of a Partial Differential Equations	03	02		05
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Engineering Mathematics -II will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies

1. Improved Lecture
2. Tutorial
3. Presentation
4. Group Discussion
5. Online sources
6. Seminar
7. Works

Suggested Learning Resources:

a) Books:

S.No.	Title	Author	Publisher	Edition & Year
	Engineering Mathematics-II	D.K, Jain	Shree Ram Prakashan.	7th Edition 2015-16
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	36th Edition, 2010
3	Engineering		Shree Sai Prakashan	10th Edition 2018

4	Mathematics-II Higher Engineering Mathematics	D.C.Agrawal B.V. Ramana	Tata McGraw Hill	11th Reprint, 2010.

Curriculum Development Team

1. Dr.Sudha Agrawal, HOD, Department of Mathematics.
2. Dr.Ekta Shrivastava , Assistant Professor, Department of Mathematics.
3. Mr.Neelkanth Napit, Assistant Professor, Department of Mathematics.
4. Mrs.Vandana Soni, Assistant Professor, Department of Mathematics.
5. Mr.Radhakrishna Shukla, Assistant Professor, Department of Mathematics.
6. Mr.Ghanhyamsen, Assistant Professor, Department of Mathematics.
7. Ms. Pushpa Kushwaha, Assistant Professor, Department of Mathematics.
8. Ms. Arpana Tripathi, Assistant Professor, Department of Mathematics.

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Cos,POs and PSOs Mapping

Program: B.Tech. CSE

Course Title: Mathematics -II

Course Code: BSC104

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO3	PO 1	PO 2	PO6	PO 1	PO 2	PO9	PO 1	PO 2	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development ofsolutions	Conduct studies of difficult problems	Utilization of moderntools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management andfinance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting- edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its usein multidisciplinary settings	Applying professional engineering solutions for societal improvement whiletaking into account the environmental context, being conscious of professional ethics,and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence andData Science technologies in the fields of engineering and computer science	Recognize andexamine issues in real life, then offercreative software solutions with the help of AI and Data Science Technologies.
CO1: Understand the importance of Laplace transform and elementary properties of Laplace transform.	3	1	2	2	3	2	3	2	2	1	3	2	2	3	1	2	-
CO 2 To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions	2	1	2	2	1	2	3	2	1	1	2	2	2	3	1	2	-
CO3 Demonstrate an understanding of the Vector Calculus	2	2	1	1	1	2	2	2	1	2	1	2	1	3	1	2	-
CO4: 4Define and recognize the method to solve Sequences and series.	2	2	2	2	3	2	3	2	2	1	2	3	3	3	2	2	-
CO5 Students will create the concept of a Partial Differential Equations	2	-	-	1	1	3	3	3	1	1	2	2	3	3	2	2	-

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5, 6, 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1-BSC104.1** Understand the importance of Laplace transform and elementary properties of Laplace transform.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.0 Laplace Transform1.1,1.2,1.3,1.4,1.5,1.6.1.7,1.8,1.9,1.10,1.11	SL1.1
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2- BSC104.2** To introduce effective mathematical tools for the solutions of ordinary differential equations and solutions with Bessel functions and Legendre functions	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Ordinary differential equations of higher orders:2.1, 2.2, 2.3, 2.4,2.5,2.6,2.7,2.8,2.9,2.10,2.11,2.12	SL2.1
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3-BSC104.3** Demonstrate an understanding of the	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3Vector Calculus 3.1, 3.2, 3.3, 3.4, 3.5 ,3.6,3.7,3.8,3.9,3.10,3.11,3.12,3.13	SL3.1
	Vector Calculus				
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO4-BSC104.4**Define and recognize the method to solve Sequences and series	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Sequences and series 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8,4.9,4.10,4.11,4.12,4.13	SL4.1
PO1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4	**CO5- BSC104.5** Students will create the concept of a Partial Differential Equations	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5Partial Differential Equations5.1, 5.2, 5.3, 5.4, 5.5, 5.6 ,5.7,5.8,5.9,5.10,5.11	SL5.1

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

(Revised as on 01 August 2023)

SECOND SEMESTER

Course Title: Physics-I

Course Code: BSC101

Prerequisite: Students should review the fundamentals of Electrostatics Magneto statics. Wave optics, and Modern physics

Rationale: The program aims to develop advanced problem-solving and analytical skills and prepares students for careers in academia, research, industry, or other sectors that require advanced physics expertise.

Course Outcomes (CO):

CO1-Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems and to relate to applications to electron optic device and CRO.

CO2- Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevantengineering applications.

CO3- Learn the basic concepts of dual nature of matter, wave packet, and apply them to analyze various relevant phenomenon and to solve related numerical problem.

CO4- Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them in relatingto applications for determination of crystal structure

CO5- Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering**.**

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Basic Science Course (BSC)	BSC101	Physics-1	4	2	1	1	8	5

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others)

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.)

SL: Self Learning,

C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT +SA +CAT+ AT)		
BSC	BSC 101	**Physics -I**	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)					
			Progressive Assessment (PRA)				**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number 7 marks each (CA)	VIVA	Class Attendance (AT)	Total Marks (CA+VV + AT)		
BSC	BSC101 - L	**Physics –I LAB**	35	10	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1-
Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Understand the concept of Electric charge electric field Intensities. **SO1.2** Understand the electrostatic potential, Calculation of electric field and electrostatic potential for a charge distribution **SO1.3** Understand the Dielectrics, Dielectric substance in an electric field **SO1.4** Understand Biot Savart law &	1. Measuring the magnetic field for a straight conductor and on circular conductor loops 2. Measuring the magnetic field for a straight conductor and on circular conductor loops at small currents **3.** Measuring the magnetic field for a straight conductor and on Straight Wire -	**Unit-1.0** 1.1 Electric charge electric field intensities 1.2 electrostatic potential, Calculation of electric field and electrostatic potential for a charge distribution 1.3 Introduction to. Quantization & conservation of charge 1.4 Coulomb′s law, vector form of Coulomb′s law 1.5 superposition principle, charge densities, electric field 1.6 Dielectrics, Dielectric substance in an electric field, V-I phase dependence for ideal & real dielectrics 1.7 Biot Savart law & its	**SL.1** Define Electric charge electric field intensities **SL.2** Define Quantization & conservation of charge

its application **SO1.5** Understand the magnetic Materials.		application 1.8 current carrying conductor moving charge in a magnetic field 1.9 comparison of electric field and magnetic field 1.10 magnetic induction and intensity, magnetization 1.11 Classification of magneticmaterials. 1.12 classification of magnetic materials.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Analyze and sketch the graph of a V-I phase dependence for ideal & real dielectrics
ii. Calculation of electric field and electrostatic potential for a charge distribution
iii. Apply Biot Savart law in different problems.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

C. Other Activities (Specify):

Quiz, Class Test.

CO2-

Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	2
Total	21

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 Define and understand the basic concepts of coherent sources, etc	**1.** To determine the Refractive Index of Prism by using spectrometer.	**Unit-2.0** **2.1** coherent sources, principle of superposition	**SL.1** Define coherent sources, principle of superposition.

SO2.2 Define and understand the basic concepts of Interference of light. **SO2.3** Understand the Michelson′s Interferometer, experiments and their applications **SO2.4** Define and understand the basic concepts of Diffraction of light. **SO2.5** Understand dispersive power of grating and,resolving power of Grating.	2..To determine the wavelength of sodium light by using Newton′s Ring apparatus 3. to determine the wavelength of prominent lines of mercury by plane transmission diffraction grating -	**2.2** Interference:-, definition and types of interference **2.3** Interference from parallel thin films **2.4** wedge shaped films **2.5** Newton′s rings **2.6** Michelson′s Interferometer, experiments and their applications **2.7** Michelson′s Interferometer, experiments and their applications **2.8** Diffraction:- Fresnel diffraction , Fraunhofer diffraction from a single slit diffraction **2.9** double slit diffraction **2.10** N-Slit Diffraction grating **2.11** Dispersive power of gratingand, resolving power of grating. **2.12** dispersive power of grating and,resolving power of grating.	**SL.2** Define Fresnel diffraction, Fraunhofer diffraction from a single slit Diffraction.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Write the application of Interference of light in daily life.
ii. Write the application of diffraction of light in daily life.
iii. Write a short note on Newton′s rings with example.
iv. Describe the method of calculation of Michelson′s Interferometer with example

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

CO3-

Learn the basic concepts of dual nature of matter and wave packet and apply them to analyze various relevant phenomenon and to solve related numerical problem

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6

SW	1
SL	2
Total	21

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 Define Quantum mechanics. **SO3.2** Understand the Wave particle duality **SO3.3** Explain operators in quantum mechanics **SO3.4** Understand Uncertainty principle with elementary proof and applications **SO3.5** To Understand Time-dependent and time independent Schrodinger Equation for wave function.	1.To determine Planck's Constant and work function using photo electric effect. . Davisson–Germer experiment - this showed the existence of electron matter waves and that they would be diffracted by a crystal 3. Compton effect - evidence for particle nature of light -	**Unit-3.0** 3.1 Introduction to Quantum mechanics 3.2 Wave particle duality 3.3 de-Broglie's concept of matter waves 3.4 Free-particle wave function and wave-packets 3.5 Phase & Group velocities and their relationship 3.6 Compton Effect 3.7 Uncertainty principle with elementary proof and applications 3.8 Uncertainty principle with elementary proof and applications 3.9 operators 3.10 Time-dependent and time independent Schrodinger Equation for wave function. 3.11 Time-dependent Schrodinger equation for wave function. 3.12 time independent Schrodinger equation for wave function	**SL.1** Define Wave particle duality. **SL.2** Define operators in Quantum mechanics.
		3.11 Time-dependent and time independent Schrodinger equation for wave function.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Write the Application of Uncertainty principle with elementary proof in real life.
ii. Explain the difference between Time-dependent and time independent Schrodinger equation for wave function.
iii. Write the properties of wave-packets.
iv. Define Phase & Group velocities.

b. Mini Project:
Oral presentation,

C. Other Activities (Specify):
Quiz, Class Test.

CO4-
Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them in relating to applications for determination of crystal structure

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	2
Total	21

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO4.1 Understand the Free electron theory of metals **SO4.2**	1.To draw the characteristics curve of P-n junction. 2.To draw the characteristics curve of zener diode	**Unit-4.0** **4.1** Free electron theory of metals **4.2** Fermi level of Intrinsic and extrinsic	**SL.1** Define Free electron theory of metals **SL.2** Define semiconductors and it's classification.

nderstand the Fermi level of Intrinsic and extrinsic **SO4.3** Understand the Kronig-Penney model and origin of energy bands. **SO4.4** Understand the intrinsic & extrinsic semiconductor **SO4.5** Understand the tunnel diode, and it's applications	3. Study the temperature dependence of resistivity of a semiconductor (Four-probe method) and to determine band gap of experimental material (Ge). -	**4.3** Kronig-Penney model (no derivation) and origin of energy bands. **4.4** classification of conductors, semiconductors and insulators on the basis of energy band theory **4.5** classification of conductors, semiconductors and insulators on the basis of energy band theory **4.6** semiconductors and it's classification **4.7** semiconductors and it's classification **4.8** intrinsic & extrinsic semiconductor **4.9** P-N junction **4.10** Zener diode **4.11** tunnel diode, and it's applications **4.12** Hall effect	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

1. Explain Kronig-Penney model and origin of energy bands.
2. Explain free electron theory of metals.
3. Explain Hall Effect with example.

Oral presentation,

C. Other Activities (Specify):

Quiz, Class Test.

CO5-

Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Understand and state the Fundamental properties of laser beam **SO5.2** Understand and state the Einstein′s theory of matter radiation interaction and A and B coefficients **SO5.3** Understand the different types of lasers **SO5.4** Understand Solid-State laser (Ruby & Nd-YAG) **SO5.5** Understand applications of lasers in science, engineering and medicine.	1. To study the intensity distribution due to diffraction from single slit and to determine the slit width. 2. Study the characteristics of led and laser sources. 3.Energy gap of a material of p-n junction -	**Unit-5.0** **5.1** Absorption **5.2** Stimulated and Spontaneous emission **5.3** coherence, pumping, population Inversion **5.4** Principle & properties of laser beam **5.5** Einstein′s theory of matter radiation interaction and A and B coefficients **5.6** different types of lasers: gas laser (He-Ne), **5.7** different types of lasers: gas laser (He-Ne), **5.8** Solid-State laser (Ruby & Nd-YAG) **5.9** solid-state laser (Ruby & Nd-YAG) **5.10** applications of lasers in science, engineering and medicine. **5.11** applications of lasers in science, engineering and medicine. **5.12** applications of lasers in engineering and medicine.	**SL.1** Define Absorption, Stimulated and Spontaneous emission, coherence, pumping, population Inversion. **SL.2** Define Principle & properties of laser beam.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Write the Principle & properties of laser beam.

ii. Write the applications of lasers in science, engineering and medicine.

b. Mini Project:

Power Point Presentation.

C. Other Activities (Specify):

Quiz, Class Test.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction **(**LI**)**	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1- Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems and to relate to applications to electron optic device and CRO.	12	6	1	2	21
CO2- Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications.	12	6	1	2	21
CO3- Learn the basic concepts of dual nature of matter and wave packet and apply them to analyze various relevant phenomenon and to solve related numerical problem.	12	6	1	2	21
CO4- Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them in relating to applications for determination of crystal structure	12	6	1	2	21
CO5- Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering	12	6	1	2	21
Total Hours	60	30	5	10	105

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Electrostatics & Magnetostatics	02	04	05	11
CO-2	Wave optics	03	07	04	14
CO-3	Quantum mechanics	02	06	02	10
CO-4	Introduction to solids & semiconductors	03	03	02	08
CO-5	Lasers	03	02	02	07

Total	13	22	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Physics-1 will be held with written examination of 50 marks
Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies
1. Improved Lecture
2. Tutorial
3. Presentation
4. Group Discussion
5. Online sources
6. Seminar
7. Workshop

Suggested Learning Resources:

a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	AICTE's Prescribed Textbook: Physics (Introduction to Electromagnetic Theory) with Lab Manual	Bhattacharya & Nag, Engineering Physics	Khanna Book Publishing Company.	2nd Edition 2021
2	Introduction to Electrodynamics	David Griffiths	Tata McGraw Hill	11th Reprint, 2010.
3	Physics	Halliday and Resnick	Tata McGraw Hill	10th Edition 2018
4	Electricity, magnetism and light	W. Saslow	Academic Press	1st Edition 2002
5	Engineering Physics	Malik, Singh	Tata McGraw Hill	10th Edition 2020

Curriculum Development Team
1. **Dr. Omkar Prasad Tripathi HOD, Department of Physics.**
2. **Dr. Lovely Singh Gaharwar , Associate Professor, Department of Physics.**
3. **Dr.C.P. Singh , Assistant Professor, Department of Physics.**
4. **Mr. Saket Kumar, Assistant Professor, Department of Physics**
5. **Mr. Manish Agrawal, Assistant Professor, Department of Physics**

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering (CSE)
Course Code: BSC101
Course Title: Physics-I

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Find how toextend the basic concepts of motion ofcharged particles inelectric magnetic fields to solve numerical problems and to relate to applications toelectron optic device and CRO	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Applyconcepts in Interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Learn thebasic concepts ofdual nature of matter, wave packet,and apply them toanalyze variousrelevant phenomenon and to solve related numerical problem.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4:Recall the basic concepts of crystalstructure and apply them in solving numerical problems based on them in relating to applications for determination ofcrystal structure	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Relate the basic idea of totalinternal reflection to the propagation oflight in an optical fiber and make use ofthe fiber concepts to solve numerical problems and relateto applications inengineering.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems and to relate to applications to electron optic device and CRO.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	2	Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	3	Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3,	CO 3: Learn the basic concepts of dual natureof matter, wave packet,and apply them toanalyze various relevant phenomenon	SO3.1 SO3.2 SO3.3 SO3.4 S03.5	1	Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11	

4, 5	and to solve relatednumerical problem.				
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them in relating to applications for determination of crystal structure	SO4.1 SO4.2 SO4.3 SO4.4 S04.5	4	Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5 Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	2	Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. Computer Science & Engineering Program

(Revisedason01August2023)

SECOND SEMESTER

Course Code: BSC105

Course Title: Biology for Engineers.

Pre-requisite: Student should have basic knowledge of biology

Rationale: Engineering combines scientific knowledge with creative activities to move beyond current knowledge and produce original solutions to important problems. Biological systems are subject to the laws of chemistry and physics, which are also the basis of engineering, biological systems can provide excellent examples of the applications of statics, dynamics, chemical affinities, energy relations, and other concepts taught in undergraduate engineering science courses.

Course Outcomes:

After completion of the course:

CO 1: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

CO 2: To convey the classification of organism underlying criterion, such as morphological, biochemical or ecological be highlighted.

CO 3: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" and understand the molecular basis of coding and decoding genetic information is universal

CO 4: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. To convey that without catalysis life would not have existed on earth

CO 5: To convey the concept of microbes and their role in environment.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
BSC	BSC 105	Biology for Engineers	3	0	1	1	5	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. Computer Science & Engineering Program

(Revisedason01August2023)

Scheme of Assessment:

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/HomeAssignment5number 3 marks each (CA)	ClassTest2(2 bestoutOf3)10	Seminar one **(Presentation)** (SA)	Class Activity any	Class Attendance	Total Marks (CA+CT+SA+CAT		
PCC	BSC 105	Biology For Engineers	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL).As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	2
Total	12

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
1.1 : Why we need to study biology 1.2 To know the differences and similarities between human eye and camera. 1.3 Analyze the mechanism of birds flying with Aircraft 1.4. Gain knowledge about the role of biology with discoveries in living world. 1.5 To understand the concept and amazing facts about living organisms.	**Unit1**.*(2hours)-Introduction* 1.1-Introduction to biology branches and scopes 1.2 : comparison between eye and camera 1.3 : Comparison between Bird flying and aircraft. 1.4 Important discoveries of biology. 1.5 Living organisms, characteristics of living organism 1.6 classification of living organisms	1.1 : Importance of Biology in engineering 1.2 Discuss how biological observations of 18th Century that lead to major discoveries

	1.7 Cell theory 1.8 Discuss how biological observations of 18th Century that lead to major discoveries. 1.9 Understanding Binomial system of nomenclature	

CO2: To convey the classification of organism underlying criterion, such as morphological, biochemical or ecological be highlighted

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	2
Total	12

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
2.1 Hierarchy of life forms at phenomenological level. 2.2: Understand ultra structure of prokaryotic and eukaryotic organism, 2.3 Study mode of nutrition in organism. 2.4 To understand the major types of kingdoms	**Unit2**. *Classification* 2.1 Discuss classification based on (a) cellularity- Unicellular or multicellular 2.2: Discuss classification based on (b)Ultra structure- prokaryotes or eukaryotes. 2.3 classification based on .(c) energy and Carbon utilization – 2.4Autotrophs 2.5 heterotrophs, 2.6 Lithotrophs. 2.7 Molecular taxonomy- 2.8 Three major kingdoms of life. 2.9 Diversity of living organisms	2.1 : Study different examples of uni and multicellular examples 2.2 : Gain knowledge about the basic structure of cell and functions of cell organelles

CO3: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences and Understand the molecular basis of coding and decoding genetic information is universal

.

Approximate Hours

Item	Appx.Hrs.
Cl	9
LI	0
SW	1
SL	4
Total	14

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
3.1 Illustrate how genetic material passes from parent to offspring? Concepts of recessiveness and dominance. 3.2: Understand the cell cycle and its importance and types of cell division. 3.3: Able to realize concept of mapping of phenotype to genes. 3.4 Discuss about the single gene disorders in humans. 3.5 Analyze the molecular basis of information transfer and study the DNA structure and compacting of genome 3.6 Gaining knowledge about the universality and degeneracy of genetic code.	*Unit3.Genetics& Information Transfer* 3.1: Mendel's laws, Concept of segregation and independent assortment. 3.2 Concept of allele. 3.3: cell cycle 3.4 Meiosis and Mitosis 3.5 Genome mapping 3.6 Gene disorders in humans 3.7 DNA as a genetic material. Hierarchy of DNA structure-from single stranded to double helix to nucleosomes. 3.8 Concept of genetic code 3.9 Universality and degeneracy of genetic code	3.1 : Build-up the concept on the phenotype and genotype. Concepts of recessiveness and dominance 3.2 basic knowledge of cell and cell theory 3.3 : Concepts of physical andgenetic mapping. 3.4 : Boost your knowledge on some genetic disorders in human. And mutation.

CO.4 To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. To convey that without catalysis life would not have existed on earth

Approximate Hours

Item	Approx Hrs
Cl	9
LI	0
SW	1
SL	3
Total	13

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
4.1 : In this context discuss monomeric units and polymeric structures. 4.2 To know about the structure and functions of carbohydrates. 4.3 : Able to know about the building blocks of proteins. 4.4 : Understand proteins-structure and function. Hierarchy in protein structure. Primary secondary, tertiary and quaternary structure.	Unit 4- *Biochemistry and metabolism and Enzymes* 4.1 Molecules of life 4.2: Discuss about sugars, 4.3 starch 4.4 cellulose. 4.5 Amino acids 4.6 Proteins 4.7Primary, secondary, tertiary and quaternary structure of proteins. 4.8 Enzyme classification. Mechanism of enzyme action. 4.9 Nucleotides and DNA/RNA.	4.1 : Study about the various disorders related to carbohydrate metabolism. 4.2 Learn names of essential and non-essential amino acids. 4.3 To know about the important enzymes of human body and discuss two examples.

4.5 : Analyze the how does an enzyme catalyze reactions?		

CO.5: To convey the concept of microbes and their role in environment.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	2
Total	12

Session Outcomes (SOs)	**Class room Instruction (CI)**	**Self-Learning (SL)**
5.1: Gain the knowledge of different microscopic techniques. 5.2: To gain knowledge about different bacterial species and strain. 5.3: Understand principle and types of sterilization used in microbiology. 5.4: Study the different components used in media and preparation of medium 5.5 Analyze the microbial growth curve.	**Unit 5**. Microbiology 5.1 Microscopy 5.2 staining methods 5.3 classification of microorganisms(types) 5.4 Concept of single celled organisms 5.5 Concept of species and strains 5.6 Sterilization 5.7Types of sterilization. 5.8media compositions. 5.9 Growth kinetics. 5.5: Growth kinetics.	5.1: Concept of single celled organisms 5.2 Ecological aspects of single celled organisms

Brief of Hours suggested for the Course Outcome: -

Course Outcomes (COs)	**Class lecture (CI)**	**Self-Learning (SL)**	**Sessional work (SW)**	**Total Hours (CI+SL+SW)**
CO 1: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.	9	2	1	12
CO 2: To convey the classification of organism underlying criterion, such as morphological, biochemical or ecological be highlighted.	9	2	1	12
CO 3: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” and understand the molecular basis of coding and decoding genetic information is universal	9	4	1	14
CO 4: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. To convey that without catalysis life would not have existed on earth	9	3	1	13
CO5: To convey the concept of microbes and their role in environment	9	2	1	12
Total Hours	45	13	5	63

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction	02	05	01	08
CO2	Classification	02	03	05	10
CO3	Genetics& Information Transfer	02	03	07	12
CO4	Biochemistry and metabolism and Enzymes	1	3	7	10
CO5	Microbiology	1	05	05	10
Total		13	26	13	50

Legend: R: Remember, U: Understand, A: Apply

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Roleplay
5. Presentations
6. Extempore
7. Speeches
8. Brainstorming

Suggested Learning Resources:

Books:

(a)

S.no.	Title	Author	Publisher	Edition & Year
1	Biology for engineers	Arthur T johanson	CRC Press	Illustrated,2011
2	Biology for engineers	Dr. Tanu Allen Dr. Sohini Singh	vayu education of india	Edition: 1, 2020
3	Biology for engineers	Tanushree Chakraborti	PHI Learning Pvt. Ltd., 2021	2021

Curriculum Development Team Curriculum Development Team

1. Dr. Akhilesh A. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering (CSE)
Course Code: BSC 105
Course Title: Biology for Engineers

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: To convey the classification of organism underlying criterion, such as morphological, biochemical or ecological be highlighted.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" and understand the molecular basis of coding and decoding genetic information is universal	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. To convey that without catalysis life would not have existed on earth.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: To convey the concept of microbes and their role in environment.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Course Curriculum Map

Program Title: B.Tech.(Computer Science & Engineering)
Course Code: BSC 105
Course Title: Biology for engineers

Course Curriculum Map:				
POs & PSOs No.	COs No	SOs No.	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3	**CO 1:** To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry	1.1, 1.2, 1.3, 1.4,1.5	1.1, 1.2, 1.3,1.4,1.5,1,6, 1.7,1.8,1.9	1 SL-1,2,
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3	**CO 2:** To convey the classification of organism underlying criterion, such as morphological, biochemical or ecological be highlighted	2.1, 2.2,2.3,2.4	2.1, 2.2, 2.3,1.2,2.5,2.6, 2.7,2.8,2.9	2 SL-1,2
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3	**CO 3:** To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" and Understand the molecular basis of coding and decoding genetic information is universal	3.1, 3.2,3.3, 3.4,3.5 ,3.6	3.1, 3.2, 3.3,3.4,3.5,3.6, 3.7,3.8,3.9	3 SL-1,2,3,4
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3	**CO 4:** To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. To convey that without catalysis life would not have existed on earth	4.1,4.2, 4.3, 4.4 ,4.5	4.1, 4.2, 4.3,4.4,4.5,4.6, 4.7,4.8,4.9	4 SL-1,2,3,4
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3	**CO5:** To convey the concept of microbes and their role in environment.	5.1, 5.2, 5.3,5.4,5.5	5.1, 5.2, 5.3,5.4,5.5,5.6, 5.7,5.8,5.9	5 SL-1,2,

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (CSE) Program

SECOND SEMESTER

Course Code: **ESC 101**

Course Title: **Basic Electrical Engineering**

Pre- requisite: Students should have basic knowledge of Basic Circuit Elements with brief information of AC, DC, and electromagnetic concepts.

Rationale: A process of introducing formal knowledge of basic electrical elements and AC, DC, and magnetic circuit in electrical and electronic devices along with necessary knowledge about single-phase Transformer and DC machine.

Course Outcomes:

CO1: Apply network theorems to solve electrical DC circuits.

CO2: Understand the concept of sinusoidal quantities and solve single phase AC circuits.

CO3: Analyze the three phase AC circuits and solve series and parallel magnetic circuits.

CO4: Understand the basic operating principle, types, efficiency of Transformers.

CO5: Understand the basic operating principle, types of machines.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Engineering Science Courses (ESC)	ESC-101	BASIC ELECTRICAL ENGINEERING	3	2	1	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
ESC	ESC - 101	BASIC ELECTRICAL ENGINEERING	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
ESC	ESC101-L	BASIC ELECTRICAL ENGINEERING Lab	35	5	5	5	50		50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Apply network theorems to solve electrical DC circuits.

Approximate Hours

Item	AppX Hrs
Cl	07
LI	12
SW	2
SL	1
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the Classification of electrical elements. **SO1.2** Understand the concept of voltage and current source. **SO1.3** Understand the concept of mathematical analysis based on KCL and KVL. **SO1.4** Analyze different network theorems. **SO1.5** Understand the concept of star-delta transformation. .	1. Verification of KVL. 2. Verification of KCL. 3. Identification of different electrical and electronic components. 4. Calculation of Power, Impedance and P.F. in R-L-C Circuits. 5. Verification of Superposition Theorem. 6. Verification of Thevenin's Theorem.	**Unit-1: DC Network** 1.1 Classification of elements – active, passive, unilateral, bilateral, linear, nonlinear, lumped and distributed 1.2 classification of voltage & current sources 1.3 mesh and nodal analysis 1.4 Superposition theorem 1.5 Star-Delta Transformations (Numerical only). 1.6 Thevenin's theorem (Only independent sources).	1. Learn the theoretical concept of circuit element.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Numerical Problems on mesh and nodal analysis.

b. Mini Project:

i. Derive different network theorems.

CO2: Understand the concept of sinusoidal quantities and solve single phase AC circuits.

Approximate Hours

Item	AppX Hrs
Cl	7
LI	2
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 To Understand the concept of sinusoidal periodic waveforms. **SO2.2** To understand the concept of phase difference. **SO2.3** To understand the differenttriangles. **SO2.4** To understand the differentconnections.	1. Study about different types of connection in AC circuit.	**Unit-2 Single-Phase AC Circuits** 2.1 Sinusoidal periodic waveforms: frequency, cycle, time period, peak value, root mean square value, average value, form factor and peak factor. 2.2 Phasor representation of alternating quantities. 2.3 Concept of phase difference 2.4 The j operator 2.5 Rectangular and polar form 2.6 Power Triangle 2.7 Impedance Triangle 2.8 Power factor 2.9 Solution of series, parallel, series-parallel network.	1. Remember different concept related to the Sinusoidal Periodic Waveform.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Numerical Problems on Sinusoidal Network.
ii. Numerical Problems on Power Triangle and Impedance Triangle.
iii. Numerical Problems on Series and Parallel Circuit.

b. Mini Project:

a. Draw the chart of Phasor Representation.

CO.3: Analyze the three phase AC circuits and solve series and parallel magnetic circuits.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	4
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 To Understand the basic concept of three-phase AC circuit. **SO3.2** To understand the different types of connection of three-phase winding. **SO3.3** To Understand the three-phase power equations. **SO3.4** To Understand the concepts of magnetic circuit. **SO3.5** To understand the concept of leakage flux and fringing.	1. Study about the different types of three-phase AC circuits. 2. Study different concepts related with Magnetic Circuit.	**Unit-3 : Three-Phase AC Circuit** 3.1 Introduction 3.2 phase sequence 3.3 balanced load 3.4 Connection of Three-phase Windings (delta and star connection): line and phase quantities. 3.5 phasor diagrams 3.6 Three phase power equations in balanced conditions (Elementary Numerical). 3.7 Magnetic Circuits: Introduction 3.8 magneto motive force (MMF) 3.9 magnetic field strength 3.10 magnetic flux 3.11 reluctance 3.12 Comparison of the electric and magnetic circuits. 3.13 Solution of simple magnetic circuits (only for constant permeability materials). 3.14 Leakage flux and fringing.	1. Basic principle of three-phase AC Circuit.

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Numerical Problems on three-phase load.
   ii. Numerical Problems on Magnetic circuit.

CO4: Understand the basic operating principle, types, efficiency of Transformers.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	8
SW	2
SL	2
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 To Understand the constructional and operational features of Single-phase Transformer. **SO4.2** Understanding the classification of Transformer. **SO4.3** Understand the different concept related with transformer **SO4.4** Derive EMF equation of transformer. **SO4.5** Understand the Phasor Diagram at different loads. **SO4.6** Understand the different concepts related to efficiency for single-phase transformer.	1. Study the construction details of transformer. 2. Perform open circuit and Short Circuit test on single-phase transformer. 3. Study and Verification of Transformer Ratio Polarity. 4. Perform Back to back Test on Transformer	**Unit-4 : Single-Phase Transformer** 4.1 Introduction 4.2 principles of operation 4.3 Construction 4.4 classification of transformers 4.5 Rating of transformer 4.6 EMF equation 4.7 ideal and practical transformer 4.8 phasor diagram under no load and loaded conditions 4.9 losses 4.10 efficiency calculations 4.11 Condition of Maximum Efficiency 4.12 All day efficiency 4.13 (Elementary Numerical)	i. Remember different parts of transformer. ii. Calculate Losses and Efficiency of transformer.

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:

i. Numerical Problems on transformer

b. Mini Project:

i. Draw phasor diagram of transformer at different loads.

CO5: Understand the basic operating principle, types of machines.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the constructional details of DC machines. **SO5.2** Derive EMF and Torque equations. **SO5.3** Evaluate different types of dc machine. **SO5.4** Understanding the Electrical Installation.	1. Study different components of DC Motor and Three Phase Starter. 2. Study of different components of Induction Motor and Star-Delta Starter.	**Unit 5: DC Machines** 5.1 Common Construction features of DC Machines 5.2 EMF equation and torque equation 5.3 types of DC machines (Separately & self-excited) 5.4 Elementary numerical 5.5 Components of LT Switchgear 5.6 Switch fuse unit(SFU) 5.7 MCB, ELCB, MCCB 5.8 Types of wires and cables 5.9 Earthing	1. Remember the Constructional features of DC Machine.

SW-5 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Numerical Problem based on EMF and Torque equation of DC machine.

b. **Mini Project:**
   Draw the chart of different types of cable and earthing.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Lecture (Ll)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Apply network theorems to solveelectrical DC circuits.	7	12	2	1	22
CO2: Understand the concept of sinusoidal quantities and solve single phase AC circuits.	7	2	2	1	12
CO3: Analyze the three phase AC circuits andsolve series and parallel magnetic circuits.	9	4	2	1	16
CO4: Understand the basic operating principle, types, efficiency of Transformers.	10	8	2	2	22
CO5: Understand the basic operating principle, types of machines.	12	4	2	1	19
Total Hours	45	30	10	6	91

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	DC Network	03	01	01	05
CO-2	Single-Phase AC Circuit	02	03	02	07
CO-3	Three-Phase AC Circuit	02	04	04	10
CO-4	Single-Phase Transformer	03	07	05	15
CO-5	DC Machines	01	06	06	13
Total		11	23	16	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Basic Electrical Engineering will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to electrical power plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Basic Electrical Engineering	Fitzrald and Higgonbothom	Tata McGraw-Hill	Fifth
2	Theory and Problems of Basic Electrical Engineering	D.P. Kothari and I. J. Nagrath	Prentice Hall India Learning Private Limited	2016 - Second
3	Basic Electrical Engineering	D. C. Kulshreshtha	McGraw Hill	2009
4	Fundamentals of Electrical Engineering	Ashfaq Hussain	Dhanpat Rai and Co	Third
5	Lecture note provided by Dept. of electrical engineering, AKS University, Satna.			

Curriculum Development Team

1. Dr. Rama Shukla, HOD, Department of Electrical Engineering.
2. Dr. Gauri Richhariya, Assistant Professor, Department of Electrical Engineering.
3. Mr. Umesh Kumar Soni, Assistant Professor, Department of Electrical Engineering.
4. Mr. Achyut Pandey, Assistant Professor, Department of Electrical Engineering.
5. Mr. Ashutosh Dubey, Assistant Professor, Department of Electrical Engineering.
6. Mr. Ajay Singh, Assistant Professor, Department of Electrical Engineering.
7. Mr. Krishna Kumar Tripathi, Assistant Professor, Department of Electrical Engineering.
8. Ms. Deepa Shukla, Assistant Professor, Department of Electrical Engineering.
9. Mr. Pranjal Devendra Mishra, Teaching Associate, Department of Electrical Engineer

Cos, POs and PSOs Mapping

Course Title: B. Tech. Electrical Engineering
Course Code: ESC-101
Course Title: Basic Electrical Engineering

Course Outcomes	Program Outcomes												Program Specific Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	Engineering knowledge	Problem Solving	Design Skills	Laboratory Skills	Team work	Communication Skills	Ethical and Professional Behavior	Lifelong Learning	Global and Societal Impact	Project Management	Adaptability	Professional Development	Apply Electrical and interdisciplinary knowledge to analyze, design and manufacture products to address the needs of the society.	Apply state of the art tools and techniques to conceptualize, design and introduce new products, processes, systems and services.
CO1: Apply network theorems to solve electrical DC circuits.	2	2	3	2	2	1	1	1	2	1	1	2	2	2
CO2: Understand the concept of sinusoidal quantities and solve single phase AC circuits.	2	2	1	3	1	2	1	1	1	1	2	2	2	2
CO3: Analyze the three phase AC circuits and solve series and parallel magnetic circuits.	3	3	2	1	1	2	2	2	1	1	2	3	1	2
CO 4: Understand the basic operating principle, types, efficiency of Transformers.	2	3	3	2	3	2	1	3	2	1	2	2	3	3
CO 5: Understand the basic operating principle, types of machines.	2	3	3	1	2	3	2	3	1	2	2	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-1: Apply network theorems to solve electrical DC circuits.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1, 2, 3, 4, 5, 6	**Unit-1: DC Network** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	As mentionedin page number 3 to 10
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-2: Understand the concept of sinusoidal quantities and solve single phase AC circuits.	SO2.1 SO2.2 SO2.3 SO2.4	1	**Unit-2**: **Single-Phase AC Circuit** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-3: Analyze the three phase AC circuits and solve series and parallel magnetic circuits.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	1, 2	**Unit-3 : Three-Phase AC Circuit** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-4: Understand the basic operating principle, types, efficiency of Transformers.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6	1, 2, 3, 4	**Unit-4: Single-Phase Transformer** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-5: Understand the basic Operating principle, types ofmachines.	SO5.1 SO5.2 SO5.3 SO5.4	1,2	**Unit 5: DC Machines** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9	

Second Semester

Course Code: **ESC 102**

Course Title: Engineering Graphics & Design

Pre- requisite: Student should have basic knowledge of Geometry, Geometrical Shapes, basic knowledge of Computer, Mouse and keyboard use, navigating menus and dialogs, managing files and directories, etc.

Rationale: The students studying Graphics are essential in engineering, allowing engineers to visualize and communicate complex ideas clearly and concisely. Using graphics, engineers can create detailed plans for construction projects, analyses structural components, and convey design concepts to clients and stakeholders.

Course Outcomes:

CO1: Get introduced with Engineering Graphics and visual aspects of design.
CO2: Know and use common drafting tools with the knowledge of drafting standards.
CO3: Apply computer aided drafting techniques to represent line, surface or solid models in different Engineeringviewpoints.
CO4: Produce part models; carry out assembly operation and show working procedure of a designed project work usinganimation.
CO5: To make the student understand the viewing perception of a solid object in Isometric and perspective Projection,Design modulation and simulation by Auto CAD

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (ESC)	ESC 102	Engineering Graphics & Design	1	4	1	1	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
ESC	ESC 102	Engineering Graphics & Design	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ESC	ESC 102 L	Engineering Graphics & Design Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminatingin the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Get introduced with Engineering Graphics and visual aspects of design.

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	2
SL	2
Total	19

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Proficiency in using plain scales for measurement and drawing and understanding of representative factors in scales. SO1.2 Construction of ellipses, parabolas, and hyperbolas using various methods SO1.3 Knowledge and construction of special curves like cycloids, epicycloids, hypocycloids, involutes, and Archimedean spirals. SO1.4 Application of these curves in various engineering and mathematical contexts.	**Unit-1.0 ENGINEERING CURVES & SCALE** **Practice of Following** 1.1 Construction of ellipse by different methods; Normal and Tangent . 1.2. Construction of parabola by different methods; Normal and Tangent. 1.3 Construction of involute such as polygons and circle 1.4 Construction of Cycloid, Epi-cycloid, Hypo-cycloid 1.5 Construction of Simple Scale, 1.6 Diagonal Scale & Scale of Chord	**S Unit-1.0 ENGINEERING CURVE& SCALE** 1.1 Introduction of Engineering Drawing, Drawing material and their uses Application of mini drafter, compass, divider, French curves, pencils grades and their uses. 1.2 Construction of ellipse by different methods; Normal and Tangent .Construction of parabola by different methods; Normal and Tangent. 1.3 Construction of Cycloid, Epi-cycloid, Hypo-cycloid. 1.4 Construction of Simple Scale, Diagonal Scale & Scale of Chord	**1.** Construction of Involutes **2.** Construction of Archimean Spiral

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Ellipes by concentric circle method, Cycloid, Involutes of Circle

b. **Mini Project:**
   i. Model of Hexagon, Pentagon, Square

CO2: Know and use common drafting tools with the knowledge of drafting standards.

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	1
SL	2
Total	18

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Differentiate between various types of projections when and where each type of projection is commonly used in engineering and technical design. SO2.2 Be able to create orthographic projection views of objects, including front view, top view, and side views. SO2.3 Able to project points and lines onto different planes using orthographic projection. SO2.4 Learn how to find the traces of straight lines in orthographic projection and use these traces to determine the positions of lines in different planes.	**Unit-2.0 Projection of Point and Line** **Practice of Following** 2.1 Projection of Point 2.2 Projection of Point in different co-ordinate 2.3 Projection of Straight Line 2.4 Projection of Straight Line in different Position w.t.r. H.P. & V.P. 2.5 Projection of Straight Line in different Position w.t.r. H.P. & V.P. 2.6 Projection of Straight Line in different Position w.t.r. H.P. & V.P.	**Unit-2.0 Projection of Point and Line** 2.1 Introduction of Projection 2.2 Projection of Point 2.3 Projection of Straight Line	1.Point Projection in different co-ordinate 2. Projection of Straight Line in different Position w.t.r. H.P. & V.P.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Projection of point & Projection of Straight Line

CO3: Apply computer aided drafting techniques to represent line, surface or solid models indifferent Engineering viewpoints.

Approximate Hours

Item	AppX Hrs
Cl	03
LI	12
SW	2

SL	2
Total	19

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Projection of Planes like circle and polygons in different positions. SO3.2 Projection of polyhedrons like prisms, pyramids, and solids of revolutions like cylinder, cones in different positions	**Unit-3.0 Projection of Plane & Solid** **Practice of Following** 3.1 Introduction, Projection of plane 3.2 plane perpendicular to any one and parallel to other 3.3 plane perpendicular to any one and inclinedl to other 3.4 Introduction, Projection of solid 3.5 Axis of solid perpendicular to any one and parallel to other 3.6 Axis of solid perpendicular to any one and inclinedl to other	**Unit-3.0 Projection of Plane & Solid** 3.1 Introduction of Projection Plane 3.2 Projection of Plane in different position 3.3 Introduction of projection of Solid 3.4 Projection of solid in different position	1.Preojection of Plane in different Position w.t.r. H.P. & V.P. 2. Projection of solid in different Position w.t.r. H.P. & V.P.

a. **Assignments:**
   i. Draw three problems of projection of plane
   ii. Draw three problems of projection of solid

b. Mini Project:
Make models of plane and solid by thermocol

CO4: Produce part models; carry out assembly operation and show working procedure of a designed project workusing animation.

Approximate Hours

Item	AppX Hrs
CI	03
LI	12
SW	2
SL	2
Total	19

Session Outcomes (SOs)	LaboratoryInstruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Learn the techniques for sectioning right solids using both normal and inclined planes. SO4.2 solve practical problems related to the section of solids and planes. SO4.3 Learn the parallel line method and radial-line method for developing surfaces in right solids including how to create accurate representations.	**Unit-4.0 Development of Solid & Section of Solid** **Practice of Following** 4.1 Sectioning of Cone 4.2 Sectioning of pyramid 4.3Sectioning of Cylinder & Prism 4.4 Development of cylinder and prism 4.5 Development and sectioning of pyramid 4.6 development and sectioning of cone	**Unit-4.0 Development of Solid & Section of Solid** 4.1 Introduction of Sectioning and sectioning lines 4.2 Sectioning of Cone 4.3 Sectioning of pyramid 4.4 Sectioning of Cylinder & Prism 4.5 Development of cylinder and prism 4.6 Development and sectioning of pyramid 4.7 development and sectioning of cone	1. Development and sectioning of cylinder 2. Developme nt and sectioning of prism

a. Assignments:

i. Develop prism and cylinder
ii. Develop pyramid and Cone

CO5: To make the student understand the viewing perception of a solid object in Isometric and perspective Projection, Design modulation and simulation by Auto

Approximate Hours

Item	AppX Hrs
CI	03
LI	12
SW	2
SL	2
Total	19

Session Outcomes (SOs)	LaboratoryInstruction (LI)	Class room Instruction (CI)	Self Learning (SL)

SO5.1 - Students will learn about the scale and the specific axes used in Isometric drawings. SO5.2 - Students will learn the process of converting two-dimensional orthographic (multi view) drawings into isometric Projections. SO5.3 - Students will learn solving practical design and projection problems using CAD software and how to use CAD tools to create detailed drawings and Projections of objects.	**Unit-5.0 Isometric projection and Auto CAD** **Practice of Following** 5.1 Introduction of isometric scale and vies 5.2 Isometric view of circle, cylinder and cone 5.3 Isometric view of prism 5.4 Isometric view of pyramid 5.5 Isometric view by othographic view 5.6 Drawing of different orthographic view of planes and solid by Auto CAD commands	**Unit-5.0 Isometric projection and Auto CAD** 5.1 Introduction of Isometric Projection 5.2 Isometric view of circle, cylinder and cone 5.3 Isometric view of prism and pyramid 5.4 Isometric view by othographic view 5.5 Introduction of Auto CAD 5.5 Description of Auto CAD commands 4.6 Drawing of different orthographic view of planes and solid by Auto CAD commands .	1. Draw Isometric view ofplane and solid 2 Draw Isometric view ofplane and solid by using Auto CAD command

SW-5 Suggested Sessional Work (SW):

a. **Assignments:** Draw Isometric view of a cone resting centrally on a cubeExplain five edit and draw commands

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Lab Lecture (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+LI+SW+Sl)
CO1: Get introduced with Engineering Graphics and visual aspects of design.	3	12	2	2	19
CO2: Know and use common drafting tools with the knowledge of drafting standards.	3	12	1	2	18
CO3: Apply computer aided drafting technique to represent line, surface or solid models in different Engineering View points.	3	12	2	2	19

CO4: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	3	12	2	2	19
CO5: To make the student understand theviewing perception of a solid object in Isometric and perspective Projection, Design modulation and simulation by AutoCAD	3	12	2	2	19
Total Hours	15	60	9	10	94

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Get introduced with Engineering Graphics and visual aspects of design.	03	01	01	05
CO-2	Know and use common drafting tools with the knowledge of drafting standards.	02	06	02	10
CO-3	Apply computer aided drafting technique to represent line, surface or solid models in different Engineering viewpoints.	03	07	05	15
CO-4	Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	-	10	05	15
CO-5	Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	03	02	-	05
Total		11	26	13	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Engineering Graphics & Design will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Computer Aided Engg drawing	VTU Belgaum	Visvesvaraya Tech. University	Revised edition 21 edition 2020
2	Engineering Drawing	Bhatt N.D., Panchal V.M. & Ingle P.R.,	Charotar Publishing House	1999
3	Engineering Drawing	R.K. Dawan	S. Chand Publication.	1985
4	Engineering Drawing	Agrawal and Agrawal	TMH	2018
5	Training Manual			
6	Training Manual			
7	Lecture note provided by Dept. of Mechanical Engineering, AKS University, Satna .			

Curriculum Development Team

1. Mr. S.S. Parihar, Head of Deptt. Mech. Engg., AKS University
2. Mr. Alok Ranjan Tiwari , Assistant Professor, Dept. of Mechanichal Engg.
3. Mr Deepak Pandey , Assistant Professor , Dept. of Mechanichal Engg
4. Mr.,Keshav Pratap Singh, Assistant Professor , Dept. of Mechanichal Engg
5. Mr.Amar Soni , Assistant Professor , Dept of Mechanichal Engg
6. Mr K.P Tiwari , Assistant Professor , Dept. of Mechanichal Engg
7. Mr. Ketan Agrawal, Assistant Professor , Dept. of Mechanichal Engg
8. Mr. K.C. Kori, Faculty, Assistant Professor , Dept. of Mechanichal Engg
9. Mr,Lokesh Agrawal, Assistant Professor , Dept. of Mechanichal Engg

10. Mr. Ram Narayan Shukla, Assistant Professor , Dept. of Mechanichal Engg
11. Mr. Rishi Kumar Sharma, Assistant Professor , Dept. of Mechanichal Engg
12. Mr. Naveen Kumar Soni**,** Assistant Professor , Dept. of Mechanichal Engg

Cos,POs and PSOs Mapping

Course Title: B. Tech CSE

EngineeringCourse Code: ESC 102

Course Title: Engineering Graphics and Design

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Moden tool usage	The engineer and society	Environment and sustainability:	Ethics	Individual and team work:	Communication:	Project management and finance:	Life-long learning	The ability to apply technical & engineering knowledge for Drawing	Ability to understand the day to plant operational problems of Product drawing	Ability to understand the latest Drafting by Auto CAD.	Ability to use the research based innovative knowledge for SDGs
CO1 : Get introduced with Engineering Graphics and visual aspects of design.	1	1	2	2	2	2	3	1	2	2	1	2	2	2	1	-
CO 2 : Know and use common drafting tools with the knowledge of drafting standards.	1	2	2	2	1	2	2	1	1	1	2	3	2	2	2	1
CO3 : Apply computer aided drafting technique to represent line, surface or solid models in different Engineering viewpoints.	2	2	1	1	2	2	2	1	1	2	1	2	2	1	2	2
CO 4: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	3	2	2	-	3	1	3	1	2	1	-	2	3	3	3	2
CO 5: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	1	2	2	-	1	1	3	1	1	1	2	2	3	3	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1 : Get introduced with Engineering Graphics and visual aspects of design.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 ENGINEERING CURVE& SCALE 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentionedin page number 2 to 6
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2 : Know and use common drafting tools with the knowledge of drafting standards.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Projection of Point and Line 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8,2.9,2.10	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3 : Apply computer aided drafting technique to represent line, surface or solid models in different Engineering viewpoints.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 : Projection of Plane & Solid 3.1, 3.2,3.3,3.4,3.5,3.6,3.7,3.8	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 : Development of Solid &Section of Solid 4.1, 4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit 5: Isometric projection and Auto CAD 5.1,5.2,5.3,5.4,5.5	

SECOND SEMESTER

Course Code: ESC 106

Course Title: **Basic Civil Engineering**

Pre-requisite: Student should have basic knowledge of Cement, Concrete, Roads and Infrastructure.

Rationale: The department of civil engineering has been constantly contributing high-quality technical manpower needed by the industry. The broad objective of the department is to achieve recognition for excellence in research and teaching in the Country. The Department is well suited to meet the ever-changing requirements of engineers with courses that combine the study of management, business skills and computers with engineering. The Department also encourages its students to engage in extra-curricular and co-curricular activities, essential for development of team spirit and organizational skills.

Course Outcomes:

CO1 Impart the knowledge on importance of Civil Engineering in the infrastructural developmentof society

CO2: Identify the types, uses and properties of various building materials.

CO3: Identify the type of construction for different components of a building

CO4: Establish an idea about the different types of masonry work

CO5: Analyze various types of roofs and floors.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
ESC	ESC106	**Basic Civil Engineering**	3	0	1	1	5	3

Legend:CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture(L) and Tutorial (T)and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self-Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment**	**Total Marks**
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT +AT)	**(ESA)**	(PRA + ESA)
ESC	ESC106	Basic Civil Engineering	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Importance of Civil Engineering in the infrastructural development of society

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Approximate Hours

Item	AppXHrs
CI	08
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO1. Overview of Civil Engineering. **SO1.2** types of infrastructures **SO1.3** public-private partnership (PPP) **SO1.4** talent shortage and global trends in workshop mobility **SO1.5** skill demands .	.	**Unit-1.0** Importance of Civil Engineering in the infrastructural development of society 1.1 types of infrastructures. 1.2 Effect of infrastructure facilities on economy and environment. 1.3 Role of Civil Engineers in the infrastructural Development Introduction to sub domains of Civil Engineering. 1.4 Industry emerging trends in infra spending through public and public-private partnership (PPP) 1.5 global trends in workshop mobility Concise 1.6 Talent Shortage 1.7 Skill Demand 1.8 PPP	1. Advantages of Infrastructure 2. Public Private Partnership

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Industry emerging trends in infra spending through public and public-private partnership (PPP)

ii. Role of Civil Engineer for Infrastructure Development

b. Mini Project:

i. Affecting Factors of PPP.

c. Other Activities (Specify):

Note on Different fields of Civil Engineering.

CO2: Acquire knowledge regarding Stages in the life of construction.

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Approximate Hours

Item	AppXHrs
Cl	09
LI	0
SW	2
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To what extent you are able to Identify the types, uses and properties of various building materials **SO2.2**To learns about Design, Construction & Maintenance. **SO2.3**To Learn About Demolition / Recycling. **SO2.** To learn about overview of Indian standards **SO2.**5 Interdisciplinary nature of civil engineering projects.	.	Unit- Stages in the life of construction 2.1 Design 2.2 Construction. 2.3 Maintenances 2.4 Repair. 2.5 Recycling; an overview of Indian standards. 2. unit and conversion factors for lengths 2.7 areas, volumes ans weights 28 Opportunities and challenge of India‘s Infrastructure 2.9 Interdisciplinary nature of civil engineering projects.	i. Construction Life Cycle ii. Unit Conversion

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Recycling of Building Materials
   ii. Prepare Detail project on Construction Life Cycle.

b. Mini Project:

Interdisciplinary nature of civil engineering projects.

c. Other Activities (Specify):

Challenges of Indian Infrastructure

CO3: Gain an understanding of the various types of Road in India and their utilization ininfrastructure development**.**

Approximate Hours

Item	AppXHrs
Cl	10
LI	0
SW	2
SL	2
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Types of Roads Used in India **SO3.2**Component and use of Roads **SO3.** Analyze various types of bridges and Its parts. **SO4.** To what extent you are able to Analyze various types of Dams .	.	**Unit-3 :** Types Of Roads Used In Construction 3.1 Types of Roads 3.2 Types of Pavements flexiable & Rigid, 3.3 Road function & Component, 3.4 Road Plan 3.5 Bridges: important parts 3.6 classification of bridges 3.7 Component of Bridges 3.8 Types Of Dams 3.9 Function of Dams 3.10Components & Uses Of Dams	i. History Of Road Development in India ii. Advantages of Bridges & Dams

SW-3 Suggested Sessional Work (SW):

a. Assignments:

iii. Road Plans in India.
iv. Different types of Bridges.

b. Mini Project:
Make Project Report on Dams in India

c. Other Activities (Specify):
Make Report on Road Plans.

CO4: Analyze the strength and properties of various building materials.

Approximate Hours

Item	AppXHrs
Cl	11
LI	0
SW	2
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 To what extent you are ableto Identify the type of construction for different components of a building. **SO4.2** To what extent you are able toEstablish an idea about the different types of masonry work **SO4.3**Understanding the Building Material **SO4.4** Understand the Different grades of Concrete & Steel	.	**Unit-4: Building Materials** 4.1 Properties of common building materials 4.2 Classification of building materials. 4.3 Rocks 4.4 Types Stones & its properties. 4.5 Types Bricks & its properties. 4.6 Types Sand & its properties. 4.7 Types Lime & its properties. 4.8 Types of Cement 1.9 Uses & Various types of Cement Test 1.10Concrete Uses & Properties 4.11. Various Grades used in Steel	i. Preparation of process flow chart of Portland cement manufacture ii. Draw a typical lay out of a cement plant showing various sections.

SW-4 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Identify masonry for the construction of a building
   ii. Describe briefly the dry process cement manufacture.

b. **Mini Project:**
   i. Set out buildings using modern methods.

c. **Other Activities (Specify):**
   Power Point Presentation of Portland cement manufacture.

CO5: Overview of National Highway Authority of India (NHAI)

Item	AppXHrs
Cl	07
LI	0

SW	2
SL	1
Total	9

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 To what extent you are able to Impart the knowledge on importance of Civil Engineering in development of society **SO5.2** Overview of Indian Road Congress **SO5.3** Role of the new technologies in the field of civil engineering		**Unit 5:** Indian Road Congress: 1.1 History of Indian Road Congress. 1.2 Advantages of IRC 5.3 Overview of National HighwayAuthority of India (NHAI) 5.4 Various Road Plan introducedin NHAI 5.5 Overview of American Society of Civil Engineers (ASCE) 5.6 Emerging areas an new technologies in the field of civil engineering 5.7 advance technology in Civil Engineering	1.1 1. History of IRC. 3. Role of ASCEfor Civil Engineers.

SW-5 Suggested Sessional Work (SW):

a. **Assignments:**
   Identify pavement components and design bituminous mixes
   Evaluate structural conditions of pavements.

b. Mini Project:

Prepare Project Report on Road Development in India.

c. Other Activities (Specify):

Advantages of ASCE For Civil Engineers.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Importance of Civil Engineering in the infrastructural development of society .	8	2	02	12
CO2: Acquire knowledge regarding Stages in the life of construction.	09	2	02	13
CO3: Gain an understanding of the various types of Roads in India and their utilization in infrastructure development.	10	2	02	14
CO4: Analyze the strength and properties of various building materials.	11	2	2	15
CO5: Overview of National Highway Authority of India (NHAI)	7	2	1	10
Total Hours	45	10	09	64

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Importance of Civil Engineering in the infrastructural development of society	03	01	01	05

CO-2	Stages in the life of construction	02	06	02	10
CO-3	Types Of Roads Used In Construction	03	07	05	15
CO-4	Building Materials	-	10	05	15
CO-5	Indian Road Congress	03	02	-	05
Total		11	26	13	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Introduction to Introduction to Civil Engineering will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (VideoDemonstration/TutorialsCBT,Blog,Facebook,Twitter,Whatsapp,Mobile,Onlinesources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Law of Contract		Oxford University Press	Anson W.R.(1979)
2	Legal Aspects of Building and Engineering Contract	W. H Duda		Patil, B.S.(1974)

3	Engineering Construction and Architectural management		Vol-10 Iss 2 pp 117-127	Vee, Charles & Skitmore, Martin (2003)
4	Cement Production Principle and Practice	A K Chatterjee		2018
5	Holcim Training Manual			
6	FLS Training Manual			
7	Lecture note provided by Dept. of Cement Technology, AKS University, Satna .			

Curriculum Development Team

1. Mr. Vishutosh Bajpai ,Assistant Professor, Dept. of Civil Engineering
2. Mr. Aditya Budhadra , Assistant Professor, Dept. of Civil Engineering
3. Mrs . Richa Tripathi , Assistant Professor , Dept. of Civil Engineering
4. Mrs. Shraddha Panday , Teaching Associate, Dept. of Civil Engineering
5. Mrs. Garima Panday , Teaching Associate, Dept. of Civil Engineering
6. Mr. Satish Tiwari , Teaching Associate, Dept. of Civil Engineering

Cos, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering
Course Code: ESC 106
Course Title: Basic Civil Engineering

Course Outcomes	Program Outcomes												Program Specific Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	Engineering knowledge	Problem Solving	Design Skills	Laboratory Skills	Team work	Communication Skills	Ethical and Professional Behavior	Lifelong Learning	Global and Societal Impact	Project Management	Adaptability	Professional Development	Apply Electrical and interdisciplinary knowledge to analyze, design and manufacture products to address the needs of the society.	Apply state of the art tools and techniques to conceptualize, design and introduce new products, processes, systems and services.
CO1: Impart the knowledge on importance of Civil Engineering in the infrastructural development of society	2	2	3	2	2	1	1	1	2	1	1	2	2	2
CO2: Identify the types, uses and properties of various building materials.	2	2	1	3	1	2	1	1	1	1	2	2	2	2
CO3: Identify the type of construction for different components of a building..	3	3	2	1	1	2	2	2	1	1	2	3	1	2
CO 4: Establish an idea about the different types of masonry work	2	3	3	2	3	2	1	3	2	1	2	2	3	3
CO 5: Analyze various types of roofs and floors.	2	3	3	1	2	3	2	3	1	2	2	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-1: Impart the knowledge on importance of Civil Engineering in the infrastructural development of society	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	0	**Unit-1:** Importance of Civil Engineering in the infrastructural development of society 1.1, 1.2, 1.3, 1.4, 1.5, 1.6,1.7,1.8	2
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-2: Identify the types, uses and properties of various building materials.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	0	**Unit-2**: **Stages in the life of construction** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	2
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-3: Identify the type of construction for different components of a building.	SO3.1 SO3.2 SO3.3 SO3.4	0	**Unit-3 :** Types Of Roads Used In Construction 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10	2
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-4: Establish an idea about the different types of masonry work	SO4.1 SO4.2 SO4.3 SO4.4	0	**Unit-4: Building Materials** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10	2
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1, 2	CO-5: Analyze various types of roofs and floors.	SO5.1 SO5.2 SO5.3	0	**Unit 5:** Indian Road Congress 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	2

SECOND SEMESTER

Course Code: ESC103 - L

Course Title: Design Thinking & Idea Lab

Pre- requisite: There is no such pre requisite for Design Thinking and Idea. This Course is intended for students from any discipline who require anunderstanding of design thinking for brand, product, and service development.

Rationale: Students will learn a series of design thinking concepts, methods and techniques that are used to bring about innovation in business and in the social sector.
The course will be a mix of lecture, case discussions, participative and immersive learning. It will be a predominantly student driven learning to acquire the requisite skills.

Course Outcomes:

CO1: Identify the problems that fall under the purview of human centered design process for creative problem solving.

CO2: Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using ideation techniques.

CO3: Build simple prototypes for problems using gathered user requirements.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core	ESC103 - L	Design Thinking & Idea Lab	0	2	1	1	4	1

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	HSMC-201	Design Thinking &Idea Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Create empathy maps to visualize user attitudes and develop innovative products or services for a customer baseusing ideation techniques.

Approximate Hours

Item	AppX Hrs
Cl	00
LI	10
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Identifying the problem that can be solved using Design Thinking approach. SO1.2 Obtain the insights into user's problems and make Problem statement. SO1.3 Carry out Brain storming between the groups and generate as many as ideas possible. SO1.4 Obtain the insights to creativity and innovation.	**Unit-1.0 INTRODUCTION TO DESIGN THINKING** 1.1 Definition of Design Thinking, 1.2. Need & Objective of Design Thinking. 1. 3. Stages of Design Thinking Process. 1.4 Brainstorming. 1.5 Innovative Triangle		**1.** Develop ability to express their views.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Detail explanation of Stages of Design Thinking.

b. Mini Project:

i. To create a prototype of users need using Design Thinking Stages.

CO2: Identify the problems that fall under the purview of human centered design process for creative problem solving.

Approximate Hours

Item	AppX Hrs
CI	00
LI	10
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**LaboratoryInstruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Differentiate between Design thinking and Creative thinking. SO2.2 Learn different types of creative thinking techniques for generating creative ideas. SO2.3 Be able to solve a problem using creativity.	**Unit-2.0: Introduction to Creativity** 2.1 Introduction of Creative Thinking. 2.2 Creative Thinking Process 2.3 Creative Problem Solving. 2.4 Creative Thinking Techniques and Tools. 2.5 Divergent and Convergent Thinking.		1. Different Convergent and divergent thinking tools.

SW-2 **Suggested Sessional Work (SW):**

a. **Assignments:**
   i. Presentation by students' team on their own creative work.

b. Mini Project:
   To create a prototype of a product using their own creativity.

CO3: Build simple prototypes for problems using gathered user requirements.

Approximate Hours

Item	AppX Hrs
Cl	00
LI	10
SW	2
SL	1
Total	13

Session Outcomes (SOs)	LaboratoryInstruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding of Prototyping. SO3.2 Develop understanding of various prototype testing methods. S03.3 Understanding of Product Design	**Unit-3.0 Introduction to Prototype** 3.1 Prototyping as a mindset, prototype examples 3.2 Introduction to Rapid Prototyping. 3.3 Process of prototyping-Minimum Viable prototype 3.4 Process of Engineering Product Design 3.5 Stages of Product Design		1. Solving Practical Engineering Problem through Innovative Product Design & Creative Solution

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Presentation by student teams on their own developed prototype.

b. Mini Project:
   Make a prototype using stages of product design

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Lab Lecture (LI)	Sessional Work (SW)	Self-Learning (SL)	Total hour (Cl + LI + SW + SL)
1: Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using ideation Techniques.	00	10	2	1	13
2: Identify the problems that fall under the purview of human centered design process for creative problem solving.	00	10	2	1	13
3: Build simple prototypes for problems using gathered user requirements.	00	10	2	1	13
Total Hours	00	30	06	03	39

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using ideation techniques.	07	05	03	15
CO-2	Identify the problems that fall under the purview of human centered design process for creative problem solving.	06	06	03	15
CO-3	Build simple prototypes for problems using gathered user requirements.	07	07	06	20
Total		20	18	12	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Design Thinking & Idea Lab will be held with practical examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Paul Harris, Basics Design-Design Thinking	Gavin Ambrose	AVA Publishing	2010
2	Prototyping for Designers: Developing the best Digital and Physical Products	Kathryn McElroy	O'Reilly,	2017
3	"Design Thinking – New Product Essentials from PDMA	Michael G. Luchs, Scott Swan, Abbie Griffin	Wiley,	2015
4	Lecture note provided by Dept. of Mechanical Engineering, AKS University, Satna .			

Curriculum Development Team

1. Mr. S.S. Parihar, Head of Deptt. Mech. Engg., AKS University
2. Mr. Abhinav Shrivastava, Assistant Professor, Dept. of Mechanichal Engg.
3. Mr Deepak Pandey , Assistant Professor , Dept. of Mechanichal Engg
4. Mr.,Keshav Pratap Singh, Assistant Professor , Dept. of Mechanichal Engg
5. Mr.Amar Soni , Assistant Professor , Dept of Mechanichal Engg
6. Mr K.P Tiwari , Assistant Professor , Dept. of Mechanichal Engg
7. Mr. Ketan Agrawal, Assistant Professor, Dept. of Mechanichal Engg
8. Mr. K.C. Kori, Faculty, Assistant Professor , Dept. of Mechanichal Engg
9. Mr,Lokesh Agrawal, Assistant Professor , Dept. of Mechanichal Engg
10. Mr. Ram Narayan Shukla, Assistant Professor , Dept. of Mechanichal Engg
11. Mr. Rishi Kumar Sharma, Assistant Professor, Dept. of Mechanichal Engg
12. Mr. Naveen Kumar Soni**,** Assistant Professor , Dept. of Mechanichal Engg

Cos,POs and PSOs Mapping

Course Title: B. Tech CSE

Course Code: ESC103 - L

Course Title: Design Thinking & Idea Lab

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	
	Engineerring Knowledge	Problem analysis	Design/ development of solutions	Conduct investigations of complex problems	Moden tool usage	The engineer and society	Environment and sustainability:	Ethics	Individual and team work:	Communication:	Project management and finance:	Life-long learning	The ability to apply technical & engineering knowledge for Design Thinking.	Ability to understand the day to plant operational problems of Product drawing	Apply appropriate techniques and tools	
CO1: Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using Ideation techniques.	**3**	**2**	1	1	1	2	1	1	**2**	**2**	1	**2**	**3**	**2**	1	
CO 2: Identify the problems that fall under the purview of human centered design process for creative problem solving.	**1**	**3**	1	2	2	2	1	1	**2**	**3**	1	**2**	1	**2**	1	
CO3: Build simple prototypes for problems using gathered user requirements.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**2**	1	**2**	

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self -Learning
PO 1,2, 9,10,12 PSO 1,2	CO1: Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using ideation techniques.	SO1.1 SO1.2 SO1.3 SO1.4	Unit-1.0 INTRODUCTION TO DESIGN THINKING 1.1,1.2,1.3,1.4,1.5.		
PO 1,2, 9,10,12 PSO 2	CO 2: Identify the problems that fall under the purview of human centered design process for creative problem solving.	SO2.1 SO2.2 SO2.3	Unit-2 Introduction to Creativity 2.1, 2.2, 2.3, 2.4, 2.5.		
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,3	CO 3: Build simple prototypes for problems using gathered user requirements.	SO3.1 SO3.2 SO3.3	Unit-3 : Introduction to Prototype 3.1. 3.2, 3.3, 3.4, 3.5.		

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revisedason01August2023)

SEMESTER-II

Course Code: **HSMC-07**

Course Title: Indian Knowledge System

Pre- requisite: Creating awareness among the youths about the true history and past rich culture of India.

Rationale: India has very rich and versatile knowledge system and cultural heritage since antiquity. The Indian Knowledge systems was developed on life science, medical science, literature, drama, art, music, dance, astronomy, mathematics, architecture (Sthapatyaveda), chemistry, aeronautics etc, during ancient period. In this basic course, a special attention is given to the ancient and historical perspective of ideas occurrence in the ancient society, and implication to the concept of material world and religious, social and cultural beliefs. On the closer examination, religion, culture and science have appeared epistemological very rigidly connected in the Indian Knowledge System. This land of Bharat Bhumi has provided invaluable knowledge stuff to the society and the world in all sphere of life.

Course Outcomes:

CO1: To understand the ancient civilization, Indian Knowledge Systems, Concept of Panch Mahabhuta, Origin of name Bharat Varsha, Ancient Rivers, Ancient Universities and ancient agriculture.

CO2: Students will have the ability to learn about ancient books, Religious places, basic concept of Indian dance, music and arts, and fundamental aspects of Sangeeta and Natyashashtra etc.

CO3: Student will be able to gain knowledge on Vedic Science, Astronomy, Astrovastu, Vedic Mathematics, Aeronautics, Metallurgy, Nakhatras, Panchang, Concept of Zero, Pi and pointetc.

CO4: Understanding on ancient Engineering, Science and Technology, Town Planning, Temple architecture, Chemistry and Metallurgy, Metal manufacturing etc.

CO5: Student will able to understand about the Life, Nature and Health through basic concept of Ayurveda and Yoga, Traditional Medicinal Systems, Ethnomedicine, Nature conservation, World Heritage Sites etc.

Scheme of Studies:

			Scheme of studies(Hours/Week)	

Category of Course	Course Code	Course Title	CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	Total Credits (C)
VAC	HSM C-07	Indian Knowledge System	2	0	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Session Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Proposed examination scheme (Marking) as per the recommendation of University Grant Commission (UGC) for Under Graduate Courses in Fundamentals of Indian Knowledge Systems 2022-23 onwards

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
	HSMC07	Indian Knowledge System	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1. To understand Indian Civilization and Indian Knowledge Systems

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 1.1. Understand Overview of Indian Knowledge Systems (IKS) SO 1.2. Understand Classification of Ancient IKS texts SO 1.3. Understand Introduction to Panch Mahabhutas (Earth, Water, Fire, Sky and Air) SO 1.4. Understand Origin of the name Bharatvarsha: the Land of Natural Endowments SO 1.5. Understand Rivers of ancient India (The Ganga, Yamuna, Godawari, Saraswati,		**Unit-1. Indian Civilization and Indian Knowledge Systems** 1.1. Overview of Indian Knowledge Systems (IKS) 1.2 Classification of Ancient IKS texts 1.3 Introduction to Panch Mahabhutas (Earth, Water, Fire, Sky and Air) 1.4 Origin of the name Bharatvarsha: the Land of Natural Endowments 1.5 Rivers of ancient India (The Ganga, Yamuna, Godawari, Saraswati, Narmada, Sindhu and Kaveri)	Golden era of ancient India

Narmada, Sindhu and Kaveri)		1.6 Agriculture system in ancient India, Ancient Universities:	
SO 1.6. Understand Ancient Agriculture and ancient Universities: Takshashila and Nalanda, Gurukul system		Takshashila and Nalanda, Gurukul system	

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Concepts of Panch Mahabhuta, Classification of ancient texts, origin of ancient rivers

b. **Mini Project:**
   i. Ancient Universities: Takshashila and Nalanda,

c. **Other Activities (Specify):**

CO2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1. Understand the Ancient Indian Books: Vedas, Puranas, Shastras,		**Unit-2. Indian Art, Literature and Religious Places**	**1.** Indian Art, Music and Dance

Upanishads, Mahakavyas (Ramayana & Mahabharata), Smrities, Samhitas SO 2.2. Understand the Religious places: Puries, Dhams, Jyotiralinga, Shaktipeeths, Kumbha Mela SO 2.3. Understand the Legendary places of Madhya Pradesh: Ujjain, Chitrakoot, Omkareshwar, Bharhut, Maihar SO 2.4. Understand the Basic concept of Indian Art, Music and Dance, Indian Musical Instruments SO 2.5. Understand the Fundamental aspects of Sangeeta and Natya shastra SO 2.6. Understand the different schools of music, dance and painting in different regions of India		2.1. Ancient Indian Books: Vedas, Puranas, Shastras, Upanishads, Mahakavyas (Ramayana & Mahabharata), Smrities, Samhitas 2.2. Religious places: Puries, Dhams, Jyotiralinga, Shaktipeeths, Kumbha Mela 2.3. Legendary places of Madhya Pradesh: Ujjain, Chitrakoot, Omkareshwar, Bharhut, Maihar 2.4. Basic concept of Indian Art, Music and Dance, Indian Musical Instruments 2.5. Fundamental aspects of Sangeeta and Natya shastra 2.6. Different schools of music, dance and painting in different regions of India	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Visit of Chitrakoot, Maihar and Bharhuta

b. Mini Project:

ii. Kumbhmela, Story of Ramayana and Mahabharata

c. Other Activities (Specify):

CO3: Student will be able to understand Ancient Science, Astronomy and Vedic Mathematics

Approximate Hours

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 3.1. Understand Vedic Cosmology SO 3.2. Understand the Astronomy, Astrovastu, Vedang Jyotish, Nakshatras, Navagraha, Rashis, Vastushastra and their related plants SO 3.3. Understand the Time and Calendar, Panchang SO 3.4. Understand the Concept of Zero, Point, Pi -number system, Pythagoras SO 3.5. Understand the Vedic Mathematics, Vimana-Aeronautics, Basic idea of planetary model of Aryabhatta SO 3.6. Understand the Varanamala of Hindi language based on classification of sounds on the basis of their		**Unit-3. Ancient Science, Astronomy, Mathematics** 3.1. Vedic Cosmology 3.2. Astronomy, Astrovastu, Vedang Jyotish, Nakshatras, Navagraha, Rashis, Vastushastra and their related plants 3.3. Time and Calendar, Panchang 3.4. Concept of Zero, Point, Pi -number system, Pythagoras 3.5. Vedic Mathematics, Vimana-Aeronautics, Basic idea of planetary model of Aryabhatta 3.6. Varanamala of Hindi language based on classification of sounds on the basis of their origin, Basic purpose of science of Vyakarana.	1. Ancient Science, Astronomy and Vedic Mathematics

origin, Basic purpose of science of Vyakarana			

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Varanamala of Hindi language based on classification of sounds on the basis of their origin

b. Mini Project:

1. Nakshatras, Navagraha and their related plants

c. Other Activities (Specify):

CO4: Understand the Engineering, Technology and Architecture

Approximate Hours

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 4.1. Understand the Engineering Science and Technology in Vedic and Post Vedic Era SO 4.2. Understand the Town and Home planning, Sthapatyaveda SO 4.3. Understand the Chemistry and Metallurgy as gleaned from archeological artifacts SO 4.4. Understand the Chemistry of Dyes,		**Unit-4. Engineering, Technology and Architecture** 4.1. Engineering Science and Technology in Vedic and Post Vedic Era 4.2. Town and Homeplanning, Sthapatyaveda 4.3. Chemistry and Metallurgy as gleaned from archeological artifacts	2. Ancient Science, Astronomy and Vedic Mathematics

Pigments used in Paintings, Fabrics, Potteries and Glass SO 4.5. Understand the Temple Architecture: Khajuraho, Sanchi Stupa, Chonsath Yogini temple SO 4.6. Understand the Mining and manufacture in India of Iron, Copper, Gold from ancient times		4.4 Chemistry of Dyes, Pigments used in Paintings, Fabrics, Potteries and Glass 4.5. Temple Architecture: Khajuraho, Sanchi Stupa, Chonsath Yogini temple 4.6. Mining and manufacture in India of Iron, Copper, Gold from ancient times	

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Varanamala of Hindi language based on classification of sounds on the basis of their origin
b. **Mini Project:**
   i. Nakshatras, Navagraha and their related plants
c. **Other Activities (Specify):**

CO5: Understand about the Life, Nature and Health

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 5.1. Understand the Fundamentals of Ayurveda (Charaka & Shushruta) and		**Unit-5. Life, Nature and Health** 5.1.Fundamentals of Ayurveda (Charaka &	1. Concept of Ayurveda and Yoga

Yogic Science (Patanjali), Ritucharya and Dinacharya SO 5.2. Understand the Traditional system of Indian medicines (Ayurveda, Siddha, Unani and Homoeopathy) SO 5.3. Understand Fundamentals of Ethnobotany and Ethnomedicines of India SO 5.4. Understand the Nature Conservation in Indian ancient texts SO 5.5. Understand the Introduction to Plant Science in Vrikshayurveda SO 5.6. Understand the World Heritage Sites of Madhya Pradesh: Bhimbetka, Sanchi, Khajuraho		Shushruta) and Yogic Science (Patanjali), Ritucharya and Dinacharya 5.2. Traditional system of Indian medicines (Ayurveda, Siddha, Unani and Homoeopathy) 5.3. Fundamentals of Ethnobotany and Ethnomedicines of India 5.4. Nature Conservation in Indian ancient texts 5.5 Introduction to Plant Science in Vrikshayurveda 5.6. World Heritage Sites of Madhya Pradesh: Bhimbetka, Sanchi, Khajuraho	2. Traditional system of Indian medicines 3. Ethnobotany and Ethnomedicines of India 4. World Heritage Sites

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Visit to world Heritage Site Khajuraho
b. **Mini Project:**
   i. Ritucharya and Dincharya, Ethnomedicinal plants
c. **Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: To understand Indian Civilization and Indian Knowledge Systems	**6**	**2**	**1**	**9**
CO2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	**6**	**2**	**1**	**9**

CO3: Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	**6**	**2**	**1**	**9**
CO4: Understand the Engineering, Technology and Architecture	**6**	**2**	**1**	**9**
CO5: Understand about the Life,Nature and Health	**6**	**2**	**1**	**9**
Total	**30**	**10**	**5**	**45**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Indian Civilization and Indian Knowledge Systems	**2**	**5**	**1**	**8**
CO 2	Indian Art, Literature and Religious Places	**2**	**6**	**2**	**8**
CO 3	Ancient Science, Astronomy and Vedic Mathematics	**2**	**6**	**5**	**13**
CO 4	Engineering, Technology and Architecture	**2**	**4**	**4**	**10**
CO 5	Life, Nature and Health	**2**	**5**	**2**	**9**
Total		**10**	**26**	**14**	**50**

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Indian Knowledge Systems** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course teacher for above tasks. Teacher can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Religious places, World Heritage Sites

7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:
(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	An Introduction of Indian Knowledge Systems: Conceptand Applications	Mahadevan, B.; Bhat V. R. and Pavana, Nagendra R. N.	Prentice Hall of India.	2022
2	Indian Knowledge Systems: Vol. I and II.	Kapoor, Kapil and Singh, A. K.	D.K. Print World Ltd	2005
3	Science of Ancient Hindus: Unlocking Nature in Pursuit of Salvation	Kumar, Alok	Create pace Independent Publishing	2014
4	A History of Agriculture in India	Randhava, M.S.	ICAR, New Delhi	1980
5	Panch Mahabhuta,	Yogcharya, Jnan Dev	Yog Satsang Ashram	2021
6	The Indian Rivers	Singh, Dhruv Sen	Springer	2018
7	The Wonder That Was India	Basam, Arthue Llewllyn	Sidgwick & Jackson	1954
8	Ancient Cities, Sacred Skies: Cosmic Geometries and City Planning in Ancient India	Malville, J. MacKim & Gujaral, Lalit M.	IGNCA & Aryan Books International, New Delhi	2000
9	The Natya Shastra of Bharat Muni	Jha, Narendra	Innovative Imprint, Delhi	2023
10	Astronomy in India: AHistorical Perspective	Padmanabhan, Thanu	Indian National Science Academy, New Delhi & Springer (India).	2010
11	History of Astronomy in India 2nd Ed.	Sen, S.N. and Shukla, K.S.	INSA New Delhi	2001

12	History of Indian AstronomyA Handbook	Ramasubramanian, K.; Sule, Aniket and Vahia, Mayank	Science and Heritage Initiative, I.I.T. Mumbai and Tata Institute of Fundamental Research, Mumbai	2016
13	Indian Mathematics and Astronomy: Some Landmarks	Rao, Balachandra S.	Jnana Deep Publications, Bangalore, 3rd Edition	. 2004
14	Vedic Mathematics and Science in Vedas	Rao, Balachandra S.	Navakarnataka Publications, Bengaluru	2019
15	A History of Hindu Chemistry	Ray, Acharya Prafulla Chandra	Repbl Shaibya Prakashan Bibhag, Centenary Edition, Kolkata	1902
16	Early Indian Architecture: Cities and City Gates	Coomeraswamy, Anand	Munciram Manoharlal Publishers	2002
17	Theory and Practices of Temple Architecture in Medieval India: Bhojas samrangasutradhar and the Bhojpur Line Drawings	Hardy, Adams	Dev Publishers & Distributors.	2015
18	Indian Science and Technology in Eighteenth Century	Dharmpal	Academy of Gandhian Studies, Hyderabad.	1971
19	Science in India: A Historical Perspective	Subbarayappa, B.V.	Rupa New Delhi	2013
20	Fine Arts & Technical Sciences in Ancient India with special reference to Someswvara's Manasollasa	Mishra, Shiv Shankar	Krishnadas Academy, Varanasi	1982
21	Fundamental Principles of Ayurveda, Volume One	Lad, Vasant D.	The Ayurvedic Press, Alboquerque, New Mexico.	2002
22	Charak Samhita, Chaukhamba	Pandey, Kashinath and Chaturvedi Gorakhnath	Vidya Bhawan, Varanasi	
23	Ayurveda: The Science of Self-Healing	Lad, Vasant D.	Lotus Press: Santa Fe	1984

24	Ayurveda: Life, Health and Longevit	Svoboda, Robert E	Penguin: London	1992
25	Plants in the Indian Puranas	Sensarma, P.	Naya Prokash, Calcutta	1989
26	Indian Cultural Heritage Perspective for Tourism	Singh, L. K.	Gyan Publishing House, Delhi	2008
27	Glimpses of Indian Ethnobotany	Jain, S.K.	Oxford & IBH Publishing Company Private Limited, New Delhi	1981
28	Manual of Ethnobotany	Jain, S.K.	Scientific Publishers, Jodhpur	2010

Curriculum Development Team:

1. Er. Anant Kumar Soni, Hon’ble Pro-Chancellor and Chairman, AKS University, Satna (M.P.).
2. Prof. B.A. Copade, Hon’ble Vice Chancellor, AKS University, Satna (M.P.).
3. Prof. G.C. Mishra, Director, IQAC, AKS University, Satna (M.P.).
4. Prof. R.L.S. Sikarwar, Director, Centre for Traditional Knowledge Research & Application, AKS University, Satna (M.P.).
5. Prof. Kamlesh Chaure, HOD, Department of Biotechnology, AKS University, Satna (M.P.).
6. Dr. Akhilesh Waoo, HoD, Department of Computer Science, AKS University, Satna (M.P.).
7. Dr. Shailendra Yadav, HoD, Department of Chemistry, AKS University, Satna (M.P.).
8. Dr. Kaushik Mukherji, HoD, Department of Management, AKS University, Satna (M.P.).
9. Dr. Neeraj Verma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University, Satna (M.P.)
10. Dr. Dilip Kumar Tiwari, HoD, Department of Yoga, AKS University, Satna (M.P.).
11. Shri Mirza Shamiullah Beg, Department of Arts, AKS University, Satna (M.P.).
12. Shri Vivek Shrivastava, Examination, AKS University, Satna (M.P.).
13. Shri Manish Agrawal, Department of Mining, AKS University, Satna (M.P.).

CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering

Course Code : HSMC07

Course Title: Indian Knowledge System

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
	Engineering knowledge	**Problem Analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity**	**Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings**	**Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.**	**Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science**
CO1: To understand Indian Civilization and Indian Knowledge Systems	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	2
CO2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	2	3	2	1	2	2	1	1	1	1	1	1	3	2	3	2
CO3: Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	2	2	2	2	2	2	1	1	1	1	1	2	1	2	1	2
CO4: Understand the Engineering, Technology and Architecture	3	2	3	3	2	3	1	2	2	1	2	3	3	3	2	1
CO5: Understand about the Life, Nature and Health	3	2	3	2	3	2	1	2	1	1	2	3	2	3	2	1

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1:** To understand Indian Civilization and Indian Knowledge Systems	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		**Unit-1. Indian Civilization and Indian Knowledge Systems** 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2:** Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6		**Unit-2. Indian Art, Literature and Religious Places** 2.1, 2.2, 2.3, 2.4, 2.5,2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3:** Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		**Unit-3. Ancient Science, Astronomy, Mathematics** 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4:** Understand the Engineering, Technology and Architecture	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6		**Unit-4. Engineering, Technology and Architecture** 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5:** Understand about the Life, Nature and Health	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6		**Unit-5. Life, Nature and Health** 5.1,5.2,5.3,5.4,5.5,5.6	

Semester - III

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

THIRD SEMESTER

Course Code: ESC-301

Course Title: **ANALOG ELECTRONIC CIRCUITS**

Pre- requisite: Student should have knowledge of fundamental principles of analog electronics.

Rationale: In current scenario the diode, transistors, op-amp are extensively used in various electronic circuits. Such systems are required to design and maintain by engineer. Therefore, the goal of this course is for students to become competent to understand design and maintenance of such type of systems.

Course Outcomes:

CO1: Understanding the fundamental of diode, its characteristics and its various types.
CO2: Understanding the various applications of diode.
CO3: Design and analysis of bipolar junction transistor, its various configurations and applications.

CO4: Design and analysis of junction field effect transistor and metal oxidesemiconductor field effect transistor and its various configurations.
CO5: Design and analysis of op-amp, its characteristics and various applications.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	ESC-301	Analog Electronic Circuits	3	2	1	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	ESC-301	Analog Electronic Circuits	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	ESC 301	Analog Electronic Circuits	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understanding the fundamental of diode, its characteristics and its various types.

Approximate Hours

Item	Approx Hrs
Cl	9
LI	4
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the fundamental of PN junction diode, its working and applications. **SO1.2** Understand the fundamental of Zener diode, its working and applications. **SO1.3** Understand the fundamental of varactor diode, its working and applications.	1. Plot VI characteristics of PN junction diode. 2. Plot VI characteristics of Zener diode. 3. Plot VI characteristics of varactor diode. 4. Plot VI characteristics of photo diode	**Unit-1: Diode** 1.1 Introduction 1.2 PN Junction theory 1.3 Working of diode and its VI characteristics 1.4 Zener diode introduction 1.5 Working, VI characteristics and applications 1.6 Varactor diode introduction 1.7 Working, VI characteristics and applications 1.8 Photo diode introduction 1.9 Working, VI characteristics and applications	1. Fundamental of electronics 2. Semiconductor theory

SO1.4 Understand the fundamental of photo diode, its working and applications.			

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Classify the different types of electronic materials.
2. Discuss the property of semiconductor materials.

CO2: Understanding the various applications of diode.

Approximate Hours

Item	Approx Hrs
Cl	8
LI	3
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
O2.1 Understanding application of diode as rectifier. **SO2.2** Understanding working of various types of clipper circuits and its applications. **SO2.2** Understanding working of various types of clamper circuits and its applications.	1. Plot the input and output waveform of half wave rectifier. 2. Plot the input and output waveform of full wave rectifier. 3. Plot the input and output waveform of	**Unit-2: Applications of diode** 2.1 Rectifier (introduction) 2.2 Half wave rectifier 2.3 Full wave rectifier using diode 2.4 Bridge rectifier 2.5 Clipper circuit 2.6 Types of clipper circuits and its applications. 2.7 Clamping circuit 2.8 Types of clamper circuits and its applications.	1. Working of diode. 2. Concept of series and parallel circuits.

	bridge rectifier.		

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. How diode works as rectifier.

ii. Explain working of various types of clipping circuits.

iii. Explain working of various types of clamping circuits.

CO3: Design and analysis of bipolar junction transistor, its various configurations and applications.

Approximate Hours

Item	Approx Hrs
Cl	9
LI	3
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
O3.1 Understand the working of NPN and PNP transistor. **SO3.2** Understand the working of CB configuration of transistor. **SO3.3** Understand the working of CE configuration of transistor. **SO3.4** Understand the working of CC configuration of transistor. **SO3.4** Understand how transistor works as a switch. **SO3.4** Understand how transistor works as an	1. Plot input and output characteristics of CB configuration of transistor. 2. Plot input and output characteristics of CE configuration of transistor. 3. Plot input and output characteristics of CC configuration of transistor.	**Unit-3: Bipolar Junction Transistor Circuits** 3.1 Basic Structure 3.2 Types, mode of biasing 3.3 Working of NPN transistor 3.4 Working of PNP transistor 3.5 Configurations of BJT. 3.6 Current gain of CB, CE and CC configuration. 3.7 Relation between α, β and γ 3.8 BJT as switch 3.9 BJT as amplifier	1. Properties of N type and P type semiconductor.

amplifier.			

SW-3 **Suggested Sessional Work (SW):**

a. **Assignments:**

i. Explain how transistor works as an amplifier.

ii. Explain how transistor works as a switch.

CO4: Design and analysis of junction field effect transistor and metal oxide semiconductorfield effect transistor and its various configurations.

Approximate Hours

Item	Approx Hrs
Cl	8
LI	3
SW	1
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the working of JFET. **SO4.2** Understand the working of depletion type MOSFET. **SO4.3** Understand the working of enhancement type MOSFET.	1. Plot drain and transfer characteristic of JFET. 2. Plot drain and transfer characteristic of depletion type MOSFET. 3. Plot drain and transfer characteristic of enhancement type MOSFET.	**Unit-4: Field Effect Transistor Circuits** 4.1 Introduction of FET. 4.2 Structure of JFET 4.3 Working of N channel JFET 4.4 Working of P channel JFET 4.5 Drain and transfer characteristics of JFET 4.6 Structure of MOSFET 4.7 Working of deletion type MOSFET and its characteristics 4.8 MOSFET as an amplifier	1. Difference between of BJT and FET.

SW-4 **Suggested Sessional Work (SW):**

a. **Assignments:**

i. Explain working of N channel JFET.

ii. Explain working of depletion type MOSFET.

iii. Explain working of enhancement type MOSFET.

CO5: Design and analysis of op-amp, its characteristics and various applications.

Approximate Hours

Item	Approx Hrs
Cl	11
LI	4
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand working of op-amp and its various applications.	**1.** Working of inverting and non-inverting op amp. **2.** Inverting op amp as summing amplifier. **3.** Non inverting op amp as summing amplifier. **4.** Op-amp as difference amplifier.	**Unit 5: OP AMP and its applications** 5.1 Introduction of op amp. 5.2 Inverting amplifier. 5.3 Non inverting amplifier. 5.4 Application of op amp (summing amplifier) 5.5 Application of op amp (subtractor circuit) 5.6 Application of op amp (Integrator and differentiator circuit) 5.7 Application of op amp (Logarithmic amplifier) 5.8 Application of op amp (Anti logarithmic amplifier) 5.9 Application of op amp (voltage to Current converter). 5.10 Application of op amp (current to voltage converter). 5.11 Application of op amp in oscillator circuits.	1. Basic mathematical formulas.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Calculate the gain of inverting and non-inverting op amp.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understanding the fundamental of diode, its characteristics and its various types.	9	1	1	11
CO2: Understanding the various applications of diode.	8	1	1	10
CO3: Design and analysis of bipolar junction transistor, its various configurationsand applications.	9	1	1	11
CO4: Design and analysis of junction field effect transistor and metal oxide semiconductor field effect transistor and its various configurations.	8	1	1	10
CO5: Design and analysis of op-amp, its characteristics and various applications.	11	1	1	13
Total Hours	45	5	5	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Diode	04	03	01	8
CO-2	Applications of diode	06	03	02	11
CO-3	Bipolar Junction Transistor Circuits	04	03	01	8
CO-4	Field Effect Transistor Circuits	05	04	02	11
CO-5	OP AMP and its applications	04	04	04	12
Total		23	17	10	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Analog Electronic circuit will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Practical Design Demonstration
5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
6. Brainstorming

Suggested Learning Resources:

(a) **Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Integrated Electronics	Millman and Halkias	Mc Graw Hill	
2	Electronics Devices and Circuits	R. Boylested and L. Nashelsky	Prentice Hall India	
3	Electronics Devices and Circuits	Millman and Halkias	TMH Edition	
4	Analog Electronics Analysis and Synthesis	Malcolm Goodge	TMH Edition	
5	Electronics Principles	Malvino	TMH Edition	
6	Lecture note provided by Dept. of Computer Science & Engineering, AKS University, Satna.			

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering
Course Code: ESC-301
Course Title: ANALOG ELECTRONIC CIRCUITS

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO1: Understanding the fundamental of diode, its characteristics and its various types.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Understanding the various applications of diode.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Design and analysis of bipolar junction transistor, its various configurations and applications.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Design and analysis of junction field effect transistor and metal oxide semiconductor field effect transistor and its various configurations.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5:Design andanalysis of op-amp, its	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
racteristics and various applications.																	

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understanding the fundamental of diode, its characteristics and its various types.	SO1.1 SO1.2 SO1.3 SO1.4	4	Unit-1 **Diode** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8.1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understanding the various applications of diode.	SO2.1 SO2.2 SO2.3	3	Unit- Applications of diode 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Design and analysis of bipolar junction transistor, its various configurations and applications.	SO3.1 SO3.2 SO3.3 SO3.4	3	Unit-3 **Bipolar Junction Transistor Circuits** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Design and analysis of junction field effect transistor and metal oxide semiconductor field effect transistor and its various configurations.	SO4.1 SO4.2 SO4.3	3	Unit-4 **Field Effect Transistor Circuits** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Design and analysis of op-amp, its characteristics and various applications.	SO5.1	4	Unit-5 **OP AMP and its applications** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9, 5.10,5.11	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

THIRD SEMSTER

Course Code: PCC CS-301

Course Title: Data structure and Algorithms

Pre- requisite: Basics of programming

Rationale: Study of Data structures will help students to understand structuring and managing of data. Insights from data structures help students in industry placements. Good knowledge of Data structure will provide students chance to appear in product bases companies also students will able to develop problem solving skills after the study of this subject.

Course Outcomes:

On successful completion of this course, the students will be able to:

COl. Understanding abstract specification of data-structures and their implementation.

CO2 Understanding time and space complexity of programs and data-structures.

CO3 Knowledge of basic data-structures, their applications and relative merits.

CO4 Ability to convert an algorithmic solution to a program using suitable data-structures and analyze the trade-offs involved in terms of time and space complexity.

CO5 Acquire basic knowledge of the graphs.

Scheme of Studies:

Board of Study	**Course Code**	**Course Title**			**Scheme of studies (Hours/Week)**			**Total Credits (C)**
			Cl	**LI**	**SW**	**SL**	**Total Study Hours (CI+LI+SW+SL)**	
Program Core (PCC)	PCC CS-301	Data structure and Algorithms	3	2	2	1	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks (PRA + ESA)**
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PCC CS-301	Data structure and Algorithms	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	**Scheme of Assessment (Marks)**						
			Progressive Assessment (PRA)					**End Semester Assessment (ESA)**	**Total Marks (PRA+ ESA)**
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCc	PCC CS-301	Data structure and Algorithms	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Col: Understanding abstract specification of data-structures and their implementation.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the Requirement of datastructure. **SO1.2** Understanding standard for data structure. **SO1.3** Understanding types of complexity. **SO1.4** Critically evaluate various types of complexity. **SO1.**5 Understand asymptotic Notation. .	LI01.1 WAP to create and insert elements in Linked list LI01.2 WAP to create a doubly linked list LI01.3 WAP to create and delete elements in Circular linked list	**Unit-I** **Introduction and basic terminology** 1.1 Concepts of Data and Information. Classification of Data structures 1.2 Memory representation Data structures operations and its cost estimation 1.3 Introduction to linear data structures, Linked List: Representation of linkedlist in memory 1.4 Circular linked list, 1.5 doubly linked list 1.6 Application of linkedlist 1.7 Notion of data-structures and algorithms. 1.8 1.11$logn$, n,	1. Learning about various complexity.

		2^n: understanding growthofthese functions, and applications (binary search and extensions to similar problems) 1.9 Worst-case, average- case time/space complexity and their relative merits. Asymptotic Notation: $O($ $), \Omega($ $)$	

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
i. Critically evaluate worst case complexity,
ii. Explain Asymptotic Notation.

b. **Mini Project:**
Compare various Complexities.

c. **Other Activities (Specify):**
Find out the best Complexity.

CO2: Understanding time and space complexity of programs and data-structures.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

O2.1 To Understand the need for Abstract data types. **SO2.2** To learn about array. **SO2.3** To understand the role of link list. **SO2.4** To understand doubly link list.	LI02.1 WAP to understand recursion LI02.2 WAP to insert and delete elements in DQueue. LI02.3 WAP to insert and delete elements in Binary trees	**Unit-2 Abstract Data-types, Arrays, Linked Lists, Stacks, Queues Dictionary ADT, Trees, Binary Trees** 2.1Abstract data-type (ADTs): arrays and linked list ADTs. 2.2 Stacks, Queues: ADTs and implementations using arrays, linked lists. 2.3 Application of Stack: Conversion of infix to postfix notation using stack, evaluation of postfix expression 2.4 Recursion. Different implementation of queue 2.5 Circular queue 2.6 Concept of Dqueue 2.7 Doubly linked lists: ADT and implementation 2.8 Dictionary ADT: implementation using array, linked lists, binary search. 2.9 Tree ADT and examples Implementation of trees and basic traversal algorithms Binary trees and inorder traversal and Project metrics.	i.Try to Implement Link list.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Prepare a program of Binary tree insertion.

ii. Explain TREE traversal.

b. Mini Project:

Implement basic tree traversal.

CO3 Knowledge of basic data-structures, their applications and relative merits

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Learning about priority queue design concept. **SO3.2** Understand heap. **SO3.3** Differentiate between queue and heap. **SO3.4** Understand heap sort	LI03.1 WAP to implement heap using arrays. LI03.2 WAP to impement a Tree and calculate height of a tree LI03.3 WAP to implement B - Trees	**Unit-3 Priority Queues and Heaps** 3.1 Priority Queue ADT 3.2 Queue simulation 3.3 Application of queues. 3.4 Definition of heaps 3.5 Implementation of Priority Queues using heaps and running time analysis 3.6 Implementation of heaps using arrays. 3.7 Heap-sort 3.8 Tree: Definitions Height, depth, order, degree 3.9 B tree B+ tree	1. Learning various approaches of implementing heap and queues.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Explain top-down and bottom-up approach of heap.

ii. Evaluate types of queue.

b. Mini Project:

iii. Create a program on priority queue.

c. Other Activities (Specify):

i. Design and develop a program on heap.

CO4 Ability to convert an algorithmic solution to a program using suitable data-structures and analyze the trade-offs involved in terms of time and space complexity.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO4.1 Understanding different types of trees. **SO4.2** Learn about different types of tree insertion. **SO4.3** Creating M-way search trees.	LI04.1 WAP to implement Binary search and linear search LI04.2 WAP to implement AVL Trees LI04.3 WAP to implement Dictionary	**Unit-4 : Binary Search Trees, AVL Trees, 2-4 trees** 4.1 Binary Search Trees: definition and some basic algorithms. 4.2 Implementation of Dictionary ADTs using Binary Search trees and running time analysis 4.3AVL trees: height balance condition, rotations, and implementation of dictionary ADT 4.4 2-4 Trees: Multi-way search trees, 4.5 implementation of dictionary ADT, Informal discussion of extension to B -trees and removal 4.6 Graphs: Introduction, Directed and Undirected Graphs	i. Differentiate between binary tree and 2-3 trees.

		4.7 Graph Traversal: DepthFirst Search 4.8 Breadth First Search 4.9 Graph algorithm: Minimum Spanning Tree, Dijkstra's shortest path	

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:

i. Write down the types of trees.
ii. Explain the working of red black trees.

b. Mini Project:

i. Write a program to implement all types of trees.

c. Other Activities (Specify):

Develop the ability to create height balance trees..

CO5 Acquire basic knowledge on hashing.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 Understand the scope of sorting **SO5.2** Understand the need of Hashing **SO5.3** Learn about different sorting techniques.	LI05.1: WAP to implement Hash Table LI05.2: WAP to implement Quick Sort LI05.3: WAP to impement Selection sort	**Unit 5- Hashing and sorting** 5.1.Map ADT 5.2Hash Tables and implementation of Map using Hash Tables Design of hash functions 5.3 Collision resolution schemes: chaining, open addressing schemes like linear probing,	1. Learn different sorting techniques.

		quadratic probing, double hashing 5.5 Applications of Hashing: finding duplicates, set intersection, etc. Tries: implementation of Map ADT using tries. 5.6 Compressed tries and suffix tries. 5.7Bubble sort, insertion sort, selection sort. 5.8 Merge sort and divide and conquer paradigm, Quick sort: 5.9 Radix sort, Shell Sort	

SW-5 Suggested Sessional Work (SW):

a. **Assignments**
   i. Find out challenges in different sorting methods.
   ii. what is hashing? Explain different methods of hashing.

b. Mini Project:
   i. Implement sorting in C.

c. **Other Activities (Specify):**
   Explain hashing.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1 Understanding abstract specification of data-structures and their implementation	9	**6**	2	1	21
CO2 Understanding time and spacecomplexity of programs and data-structures	9	6	2	1	21
CO3 Knowledge of basic data-structures, their applications and relative merits	9	6	2	2	21

CO4 Ability to convert an algorithmic solution to a program using suitable data- structures and analyze the trade-offs involved interms of time and space complexity.	9	**6**	2	1	21
CO5 Acquire basic knowledge on hashing.	9	**6**	2	1	21
Total Hours	45	**30**	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO1	**Understanding abstract specification of data-structures and their implementation**	02	01	01	04
CO2	**Understanding time and space complexity of programs and data-structures**.	02	04	02	08
CO3	**Knowledge of basic data-structures, their applications and relative merits**	03	05	04	12
CO4	**Ability to convert an algorithmic solution to a program using suitable data-structures and analyze the trade-offs involved in terms of time and space complexity.**	02	08	05	15
CO5	**Acquire basic knowledge on hashing.**	03	05	03	11
Total		12	23	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for DATA STRUCTURE will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit any software development company
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Data Structures and Algorithms in Java	Michael T. Goodrich and Roberto Tamassia, John Wiley & Sons;	McGraw Hill International edition	3rd Edition 2004
2	Data Structures and Algorithms in Python	Michael T. Goodrich and Robert	Khanna Publishing Co.	1st edition.

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science andEngineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science andEngineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science andEngineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science andEngineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering

Course Code: PCC CS-301

Course Title: Data Structure and Algorithm

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Understanding abstract specification of data-structures and their implementation	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO 2 : Understanding time and space complexity of programs and data-structures	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO3. Knowledge of basic data-structures, their applications and relative merits	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO 4: Ability to convert an algorithmic solution to a program using suitable data-structures and analyze the trade-offs involved in	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**

terms of time and space complexity																	
CO 5: Acquire basic knowledge of the graphs.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Understanding abstract specification of data-structures and their implementation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	3	**Unit-I** Introduction and basic terminology 1.1,1.2,1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12	As mentioned in page number _ to _
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understanding time and space complexity of programs and data-structures	SO2.1 SO2.2 SO2.3 SO2.4	3	**Unit-2** Abstract Data-types, Arrays, Linked Lists, Stacks, Queues Dictionary ADT,Trees, Binary Trees 2.1, 2.2, 2.3, 2.4, 2.5,2.6,2.7, 2.8, 2.9, 2.10, 2.11, 2.12	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3. Knowledge of basic data-structures, their applications and relative merits.	SO3.1 SO3.2 SO3.3 SO3.4	3	**Unit-3** Priority Queues and Heaps 3.1,3.2,3.3,3.4,3.5, 3.6, 3.7, 3.8,3.9, 3.10, 3.11, 3.12	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Ability to convert an algorithmic solution to a program using suitable data-structures and analyze the trade-offs involved in terms of time and space complexity.	SO4.1 SO4.2 SO4.3	3	**Unit-4:** Binary Search Trees, AVL Trees, 2-4 trees 4.1,4.2,4.3,4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Acquire basic knowledge of the graphs.	SO5.1 SO5.2 SO5.3	3	**Unit 5- Hashing and sorting** 5.1,5.2,5.3,5.4,5.5,5.6,5.6,5. 7,5.8,5.9,5.10,5.11,5.12	

THIRD SEMESTER

Course Code: **ESC-302**

Course Title: Digital Electronics

Pre-requisite: Student should have basic knowledge of Signal, Circuit, and Computer Fundamentals.

Rationale: Study of Digital electronics help students to develop knowledge of digital electronics. Topics like logic gates, flip flops and k-Map helps students to understand concepts of digital circuits.

Course Outcome:

CO1. Understanding of numerical values in various number systems and perform number conversions between different number systems and understand the importance and need for verification,testing of digital logic and design for testability.

CO2. Able to design, simulate, built and debug complex combinational circuits based on anabstract functional specification.

CO3. Able to design, simulate, built and debug complex sequential circuits based on an abstract functional specification.

CO4. Understand the concepts of Registers and Counters and their implementation.

CO5. Make aware of the role of digital components and circuits in computing and solving real-world problems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
ESC	ESC-302	Digital Electronics	4+1	0	1	1	7	5

Legend: CL: Class room Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T)and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, miniprojector etc.),

SL: Self Learning,

C: Credits.

Note:
SW&SLhastobeplannedandperformedunderthecontinuousguidanceandfeedbackofte acherto ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment**	**Total Marks**
			Class/Home Assignment 5number 3 marks each (CA)	Class Test2 (2bestout of3) 10 marks each (CT)	Seminar one (SA)	Class Activity anyone (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**(ESA)**	(PRA+ESA)
ESC	ESC-302	Digital Electronics	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1.Understanding of numerical values in various number systems and perform number conversions between different number systems and understand the importance and need for verification,testing of digital logic and design for testability.

Item	AppXHrs
Cl	15
LI	0
SW	2
SL	2
Total	19

session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand different number systems **SO1.2** Learn about ASCII code and BCD codes **SO1.3**Understand the concept of parity, complement's & (r-1)'s, subtraction with complements, signed Binary numbers **SO1.4** Learn about error detecting & correcting codes. Basic Theorems & Properties of Boolean algebra. **SO1.5**Understand the laws of Boolean algebra **SO1.6**Understand the Negative logic, Alternate logic gate representation, canonical and standard Forms, laws of Boolean algebra **SO1.7**Learn to calculate sum of min-terms & product of max-terms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps	.	**Module 1: Number Systems and Codes** 1.1 Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal 1.2 Number system with radix r, gray codes. Alphanumeric codes – ASCII code and BCD codes. 1.3 Concept of parity, complement's& (r-1)'s, subtraction with complements, signed Binary numbers. 1.4 Error Detecting & Correcting codes. 1.5 Basic Theorems & Properties of Boolean algebra: AND, OR, NOT operators 1.6 laws of Boolean algebra, 1.7 Demorgon's	1. Practice the base conversion in number systems 2. Study the laws of Boolean Algebra.

SO1.8 Understand solving digital problems using Maps **SO1.9**Understand the Exclusive OR & Exclusive NOR circuits		theorem, Boolean expression & logic diagram 1.8 Negative logic 1.9 Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms) 1.10 sum of min-terms & product of max-terms, conversion between canonical forms. 1.11 Truth table & maps, 2,3,4,5 and 6 variable maps 1.12 Solving digital problems using Maps, don’t care conditions, Tabular minimization. 1.13 Sum of product & product ofsum reduction 1.14 Exclusive OR & Exclusive NOR circuits, 1.15 Parity generator & checkers	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain with example how decimal number is converted to Binary and Vice-versa.
2. Describe the laws of Boolean algebra.

CO2. Able to design, simulate, built and debug complex combinational circuits based on an abstract functional specification

Item	AppXHrs
Cl	13
LI	0
SW	2
SL	2
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Learn about adder and subtractor **SO2.2** About Analysis of design, Universal building blocks and Implementation of any logic circuit with only NAND gates or with only NOR gates **SO2.3** Learn about Binary serial adder, parallel adder, serial/parallel adder **SO2.4** Understand BCD adder, Binary multiplier, Magnitude comparator		**Module 2: Combinational Circuits** 2.1 Design procedure, Adders (half and Full), subtractor (half and full) code convertors 2.2 Analysis of design 2.3 Universal building blocks 2.4 Implementation of any logic circuit with only NAND gates or with only NOR gates 2.5 Binary serial adder 2.6 parallel adder 2.7 serial/parallel adder 2.8 Look ahead carry generator, BCD adder, Binary	Study about combinational circuit

SO2.5 Learn about Decoder, Demultiplexer, Encoder **SO2.6** Understand priority encoder, Multiplexers & implementation of combinational logic diagram		multiplier, Magnitude comparator 2.9 Decoder 2.10 Demultiplexer 2.11 Encoders 2.12 priority encoder 2.13 Multiplexers & implementation of combinational logic diagram	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Draw two combinational logic circuit with only NAND gates and two with only NOR gates

ii Differentiate between Multiplexer and Demultiplexer

CO3.Able to design, simulate, built and debug complex sequential circuits basedon an abstract functional specification

Item	AppXHrs
Cl	12
LI	0
SW	2
SL	2
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
O3.1 Learn about Latches, SR latch with NAND & NOR gates, D latch **SO3.2**Understand Edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop **SO3.3**Understand clocked sequential circuit, state table, state diagram **SO3.4** Understand state		**Module-3.0 Sequential Logic Circuit** 3.1 Latches, SR latch with NAND & NOR gates, D latch 3.2 Edge triggered flipflop, 3.3 J-K flip flop 3.4 T flip flop 3.5 Master slave flipflop	

reduction state equations, state assignments, flip flop excitation table & characteristic equations **SO3.5**Learn about Design procedure for sequential circuits, Design with state reduction, Applications of flipflop		3.6 Analysis of clocked sequentialcircuit, statetable 3.7 state diagram 3.8 state reductionstate equations 3.9 state assignments,flip flop excitationtable & characteristic equations 3.10 Design procedure for sequential circuits 3.11 Designwith state reduction, 3.12 Applications of flipflop	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Differentiate between J-K flipflop and T flipflop.

ii. Elaborate some uses/applications of flipflop.

CO4.Understand the concepts of Registers and Counters and their implementation

Item	AppXHrs
Cl	11
LI	0
SW	2
SL	2
Total	15

session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand Asynchronous and Synchronous counter		**Module-4.0 Registers and Counters** 4.1 Asynchronous and Synchronous	Study about commonly used counters and registers.

SO4.2 Learn about counters with MOD numbers, Down counter, UP/DOWN counter **SO4.3** Understand about propagation delay in ripple counter, programmable counter, pre-settable counter **SO4.4** Learn about BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches		counter 4.2 counters with MOD numbers, Down counter 4.3 UP/DOWN counter 4.4 propagation delay in ripple counter 4.5 programmable counter, pre-settable counter 4.6 BCD counter, cascading, counter applications 4.7 Decoding in counter 4.8 Decoding	
SO4.5 learn about Ring Counter, Johnson counter, rotate left & rotate right counter **SO4.6** Understand Registers – Buffer, Shift left, shift right, shift left/Right registers **SO4.7** Understand parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers		glitches 4.9 Ring Counter, Johnson counter, rotate left & rotate right counter 4.10 Registers – Buffer, Shift left, shift right, shift left/Right registers 4.11 parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Draw the circuit diagram of Johnson counter and explain how it works.

ii. Differentiate between Synchronous and asynchronous counters. Also give examples.

CO5.Make aware of the role of digital components and circuits in computing andsolving real-world problems

Item	AppXHrs
Cl	9
LI	0
SW	2
SL	2
Total	13

session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Learn about Random Access Memory, Timing waveform, Memory Decoding **SO5.2** Understand Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit implementation **SO5.3** Learn about Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL) **SO5.4** Understand about sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation		**Module -5.0** **Memory and Signal** 5.1 Random Access Memory, Timing waveform, Memory Decoding 5.2 Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit implementation 5.3 Type of ROMs 5.4 combinational PLDs 5.5 Programmable Logic Array (PLA) 5.6 Programmable Array Logic (PAL) 5.7 sequential programmable device. Analog todigital conversion – Ramp type, dual slope, integration, successive	Study real world applications

SO5.4 Understand about parallel conversion,parallel/ serial conversion, convertor specifications, Digital to Analog convertors – Binary weighted & R/2R D to A convertors		approximation 5.8 parallel conversion, parallel/ serial conversion, convertor specifications, 5.9 Digital to Analog convertors – Binary weighted & R/2R D to A convertors	

SW-1 Suggested Sessional Work (SW)

a. Assignments:

i. Describe the internal construction of Random-access memory and how it works.

ii. Explain the working of Binary weighted and R/2R digital to analog convertor.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1.Understanding of numericalvalues in various number systems and perform number conversions between different number systems and understand the importance and need for verification, testing of digital logic and design for testability	15	2	2	19
CO2.Able to design, simulate,built and debug complex combinational circuits based on an abstract functional specification	13	2	2	17
CO3.Able to design, simulate, built and debug complex sequential circuits based on an abstract functional specification	12	2	2	16
CO4.Understand the concepts ofRegisters and Counters and their implementation	11	2	2	15
CO5.Make aware of therole of digital components and circuits in computing and solving real-world	09	2	2	13

problems				
Total Hours	60	10	10	80

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Understanding of numerical values in various number systems and perform number conversions between different number systems and understand the importance and need for verification, testing of digital logic and design for testability	03	04	03	10
CO2	Able to design, simulate, built and debug complex combinational circuits based on an abstract functional specification	05	03	02	10
CO3	Able to design, simulate, built and debug complex sequential circuits based on an abstract functional specification	05	03	02	10
CO4	Understand the concepts of Registers and Counters and their implementation	04	05	01	10
CO5	Make aware of the role of digital components and circuits in computing and solving real-world problems	03	05	2	10
Total		20	17	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Digital Electronics will be held with written examination of 50 marks

Note.DetailedAssessmentrubricneedtobepreparedbythecoursewiseteachersforabovetasks

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visited IT Industry.

7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/ Tutorials, Blog, Facebook, Twitter, WhatsApp, Mobile, Online Course)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Fundamentals of digital circuits	A. Anand Kumar	PHI	
2	Digital Logic & Computer design	M Mano	PHI	
3	Digital Electronics	D.C. Green	Pearson Education Asia.	
4	Digital Principles andapplications	Malvino, Leech	TMH	
5	Digital Electronics	A K Maini	Wiley India	

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering
Course Code: ESC-302
Course Title: *Digital Electronics*

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO 1: Understanding of numerical values in various number systems and perform number conversions between different number systems and understand the importance and need for verification, testing of digital logic and design for testability.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Able to design, simulate, built and debug complex combinational circuits based on an abstract functional specification.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3

CO 3: Able to design, simulate, built and debug complex sequential circuits based on an abstract functional specification.	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO 4: Understand the concepts of Registers and Counters and their implementation.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO 5: Make aware of the role of digital components and circuits in computing and solving real-world problems.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understanding of numerical values in various number systems and perform number conversions between different number systems and understand the importance and need for verification, testing of digital logic and design for testability.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8 SO1.9	0	Unit-1: Number Systems and Codes 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10, 1.11,1.12,1.13,1.14,1.15	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: : Able to design, simulate, built and debug complex combinational circuits based on an abstract functional specification.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6		Unit-2 Combinational Circuits 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Able to design, simulate, built and debug complex sequential circuits based on an abstract functional specification.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 Sequential Logic Circuit 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the concepts of Registers and Counters and their implementation.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6 SO4.7		Unit-4 Registers and Counters 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10, 4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Make aware of the role of digital components and circuits in computing and solving real-world problems.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Memory and Signal 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

THIRD SEMESTER

Course Code: PCC CS-302

Course Title: IT Workshop (Sci Lab/MATLAB)

Pre-requisite: Student should have basic knowledge of Signal, Circuit, Computer fundamentals.

Rationale: Study of MATLAB helps students to understand mathematical tools for practical implementation. Digital Image processing is the field where the MATLAB can play a very vital role. By learning the logics of MATLAB students will able to make good projects of DIP and Data Interpretation.

Course Outcomes:

CO1: Write fundamental programs in MATLAB, creating variables and mathematicalfunctions.
CO2: Understand how to program matrix operations, array operations and how to solve thesystem of linear equations.
CO3: Program the fundamentals concepts of basic Plotting consisting of simple and multipledata sets in one plot.
CO4: Understand how to program M-file scripts, M- file functions, Input –output Arguments andprogram control flow operators, loops, flow structures.
CO5: Use the debugging process and debugging M-files.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	PCC CS-302	IT Workshop (Sci Lab/MATLAB)	2	2	2	1	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title PCC CS-302	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PC	PCC CS-302	IT Workshop (Sci Lab/MATLAB)	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PC	PCC CS – 302	IT Workshop (Sci Lab/MATLAB)	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom

Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Write fundamental programs in MATLAB, creating variables and mathematicalfunctions.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding the basics of MATLAB. **SO1.2** Understanding errors and making corrections. **SO1.3** Understanding presidency of operations. **SO1.4** Understanding workspace and work session.	**LI.1.1.** Write a program for demonstrating precedence of operators. **LI.1.2.** Write a program for demonstrating the appearance of floating-point numbers. **LI.1.3.** Write a program for entering multiple statements per line.	**Unit-1.0 Introduction to MATLAB** 1.1 History and features 1.2 Creating MATLAB variables 1.3 Error messages and making corrections 1.4 Controlling the hierarchy of operations or precedence 1.5 Controlling the appearance of floating-point number 1.6 Managing the workspace and work session, and entering multiple statements per line	1. Learning basics of MATLAB programming.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Work Space

2. Work Session

b. Mini Project:
Appearance of floating-point number

c. Other Activities (Specify):
NA

CO2: Understand how to program matrix operations, array operations and how to solvethe system of linear equations.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understanding basics of Matrix and Vector. **SO2.2** Understanding indexing and spacing. **SO2.3** Understanding special matrix and sub matrix. **SO2.4** Understanding linear equations.	**LI.2.1.** Write steps for entering a vector. **LI.2.2.** Write steps for matrix indexing. **LI.2.3.** Write steps for array operations.	**Unit-2.0 Matrix, array and basic mathematical functions** 2.1 Matrix generation and indexing 2.2 Entering a vector and matrix 2.3 Colon operator and linear spacing 2.4 Creating a sub-matrix and special matrix 2.5 Matrix & Array operations and functions 2.6 Solving linear equations	1. Learning various operations associated with matrix, vector, and array.

SW-2 Suggested Sessional Work (SW):

a. Assignments:
1. Array Operations
2. Matrix Operations

b. Mini Project:
Linear Spacing

c. Other Activities (Specify):
NA

CO3: Program the fundamentals concepts of basic Plotting consisting of simple andmultiple data sets in one plot.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding basics of plotting. **SO3.2** Understanding title, labels, and annotation. **SO3.3** Understanding multiple data sets. **SO3.4** Understanding line style and colors.	**LI.3.1.** Write steps for adding axis labels and annotations. **LI.3.2.** Write steps for multiple data sets. **LI.3.3.** Write steps for line style and color.	**Unit-3.0 Basic plotting** 3.1 Creating simple plots 3.2 Adding titles 3.3 Axis labels 3.4 Annotations 3.5 Multiple data sets in one plot 3.6 Specifying line styles and colors	1. Learning plotting of data sets using MATLAB.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Adding titles
2. Adding labels

b. Mini Project:

Multiple Data Sets

c. Other Activities (Specify):

NA

CO4: Understand how to program M-file scripts, M- file functions, Input –outputArguments and program control flow operators, loops, flow structures.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding basics of M-File. **SO4.2** Understanding different M-File functions. **SO4.3** Understanding input/output arguments. **SO4.4** Understanding different operators and structures.	**LI.4.1.** Write a script for relational and logical operator. **LI.4.2.** Write a script for looping control structure. **LI.4.3.** Write a script for conditional control structure.	**Unit-4.0 Introduction to programming** 4.1 M-File Scripts and functions 4.2 Input and output arguments 4.3 Input to a script file 4.4 "if ... end" structure 4.5 Relational and logical operators 4.6 "for ... end" & "while ... end" loop	1. Learning M-File scripting along with operators and control structures.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. M-File Scripts
2. M-File Operations

b. Mini Project:

Input/Output Arguments

c. Other Activities (Specify):

NA.

CO5: Use the debugging process and debugging M-files.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO5.1 Understanding debugging process. **SO5.2** Understanding setting and running breakpoints. **SO5.3** Understanding values examination. **SO5.4** Understanding M-File correction.	**LI.5.1.** Write steps for setting breakpoints. **LI.5.2.** Write a program for examining value. **LI.5.3.** Write a steps for correcting an M-File.	**Unit-5.0 Debugging M-files** 5.1 Debugging process 5.2 Preparing for debugging 5.3 Setting breakpoints 5.4 Running with breakpoints 5.5 Examining values 5.6 Correcting and ending debugging 5.7 correcting an M-file.	1. Learning debugging process of M-File by using breakpoints.

SW-5 Suggested Sessional Work (SW):

a. Assignments:
1. Setting Breakpoints
2. Running Breakpoints

b. Mini Project:
Correcting M-File.

c. Other Activities (Specify):
NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: At the end of this chapter the student will write fundamental programs in MATLAB, creating variables and mathematical functions.	6	6	2	1	15
CO2: At the end of this chapter the student will understand how to	6	6	2	1	15

program matrix operations, array operations and how to solve the system of linear equations.					
CO3: At the end of this chapter the student will program the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot.	6	6	2	1	15
CO4: At the end of this chapter the student will understand how to program M-file scripts, M- file functions, Input – output Arguments and program control flow operators, loops, flow structures.	6	6	2	1	15
CO5: At the end of this chapter the student will use the debugging process and debugging M-files.	6	6	2	1	15
Total Hours	30	30	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Write fundamental programs in MATLAB, creating variables and mathematical functions.	02	05	01	08
CO2	Understand how to program matrix operations, array operations and how to solve the system of linear equations.	02	03	05	10
CO3	Program the fundamentals concepts of	02	03	07	12

	basic Plotting consisting of simple and multiple data sets in one plot.				
CO4	Understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures.	1	2	7	10
CO5	Use the debugging process and debugging M-files.	1	04	05	10
Total		08	17	25	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for IT Workshop (Sci Lab/MATLAB) will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Digital Image Processing using MATLAB	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins	Pearson Education	2004, 2nd Edition
2	MATLAB: A Practical Introduction to Programming and Problem Solving	Stormy Attaway,	Butterworth-Heinemann.	2018, 3rd Edition

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PCC CS-302
Course Title: IT Workshop (Sci Lab/MATLAB)

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Write fundamental programs in MATLAB, creating variables and mathematical functions.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO2: Understand how to program matrix operations, array operations and how to solve the system of linear equations.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO3: Program the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot.	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO5: Use the debugging process and debugging M-files.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Write fundamental programs in MATLAB, creating variables and mathematical functions.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1, LI1.2, LI.1.3	Unit-1 Introduction to MATLAB 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Understand how to program matrix operations, array operations and how to solve the system of linear equations.	SO2.1 SO2.2 SO2.3 SO2.4	LI.1.1, LI1.2, LI.1.3	Unit-2 Matrix, array and basic mathematical functions 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Program the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot.	SO3.1 SO3.2 SO3.3 SO3.4	LI.1.1, LI1.2, LI.1.3	Unit-3 Basic plotting 3.1, 3.2, 3.3, 3.4, 3.5, 3.6,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures.	SO4.1 SO4.2 SO4.3 SO4.4	LI.1.1, LI1.2, LI.1.3	Unit-4 Introduction to programming 4.1, 4.2, 4.3, 4.4, 4.5, 4.6,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Use the debugging process and debugging M-files.	SO5.1 SO5.2 SO5.3 SO5.4	LI.1.1, LI1.2, LI.1.3	Unit-5 Debugging M-files 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

THIRD SEMESTER

Course Code: BSC-301

Course Title: Mathematics-III (Differential Calculus)

Pre- requisite: Student should have basic knowledge of signal circuit computer fundamentals

Rationale: By the study of this subject student will understand the concept of probability, linear algebra, numerical method and statistics. these topics are helpful in concept building for students to learn machine learning, data science and other advanced technology were understanding of math's concept is very necessary

Course Outcomes:

CO1: Understand the concept of Calculus and linear Algebra

CO2: Understand the importance of Algebraic properties withregard to working within various number systems.

CO3: Students will Evaluate Rank and Determinant of Matrices.

CO4: Students will compute the Expansion of beta and Gammafunctions

CO5: Understand the Matrices and vector spaces

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study	
BSC	BSC-301	Mathematics -lll (Differential Calculus)	2	0	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	
BSC	BSC-301	Mathematics-lll (Differential Calculus)	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand the concept of Calculus and linear Algebra.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	00
SW	01

SL	01
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand the concept of Calculus **SO1.2** Evaluation of definite and improper integral. **SO1.3** Apply Beta and gamma functions and its properties.		**Unit-1.0 understand concepts of Calculus & linear algebra** 1.1 The concept of definite and improper integral 1.2 Beta and Gamma function. 1.3 Properties of beta and Gamma functions. 1.4. Application of definite Integrals to evaluate surface areas 1.5 Volumes of revolutions 1.6 Application of integration. 1.7 Application of derivatives. 1.8 Differential Equations. 1.9 Application of Beta and gamma function of definite integral.	1. To solve numerical based question 2. How to Evaluate double Integrals over general Regions.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based question on Calculus integration.
ii. Evaluation of definite and improper integrals.
iii. Properties of Beta and Gamma functions.
iv. Numerical based on definite Integrals.
v. Numerical based on improper integrals.

CO2: Understand the importance of Algebraic properties with regard toworking within various number systems.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand some Theorems on Calculus **SO2.2** Use of integration on Calculus **SO2.3** Maxima and Minima.	.	**Unit-2.0 Understand the Differential of Calculus; Maxima and minima.** 2.1. Calculus. 2.2. Definition & properties of Calculus. 2.3. Some Theorems of Calculus. 2.4. Rolle’s Theorems. 2.5. Mean value theorems. 2.6. Taylor's and Maclaurin Theorems with remainders. 2.7. Indeterminate forms. 2.8. L’Hospital ‘s rule. 2.9. Maxima and minima. 2.10. Use of L'Hospita rule	1. Numerical based on Calculus integration. 2. Knowledge of L’Hospital ‘s rule. 3. Numerical based question on Maxima and minima.

SW-1 Suggested Sessional Work (SW):

Assignments:

vi. Numerical based on Calculus integration.
vii. Numerical based question on Maxima and minima.
viii. State and prove Mean value theorem.

CO3: Students will Evaluate Rank and Determinant of Matrices.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand the concept of Matrices. **SO3.2** Algebra of Matrices. **SO3.3** Rank and Determinant of Matrices.	.	Unit-3.0 Understand the Algebra of Matrices. 3.1. Basic concepts of Matrices. 3.2. Various kinds of Matrices. 3.3. Addition and scalar multiplication of two Matrices. 3.4. Matrix multiplication. 3.5. Linear systems of equations. 3.6 Linear Independence. 3.7 rank of a Matrix. 3.8 determinants of Matrix. 3.9 Gauss elimination. Gauss- Jordan elimination.	1. Rank and Determinant of Matrices.

SW-1 Suggested Sessional Work (SW):

Assignments:

ix. Numerical based on Algebra of Matrices.
x. To solve Gauss -Jordan elimination and Cramer Rule.

xi. Multiplication of given two Matrix.

CO4: Students will determine linear independence and dependence of vectors.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the concept of vectors. **SO4.2** Use of vectors. **SO4.3 to** solves linear equation.	.	**Unit-4.0 Linear Independence & dependence of matrix.** 4.1. Definition of. vectors space and its properties 4.2. Linear dependence of vectors. 4.3. Basis of a vector space. 4.4. Dimension of vector space. 4.5. Linear transformation. 4.6. Range and Kernel of a linear map. 4.7. Rank and nullity. .Inverse of a linear transformation. 4.8. Rank- nullity theorem. 4.9. Composition of linear maps. And matrix associated with a linear map.	1. Knowledge of the Basis and Dimension. 2. Numerical based on vectors space.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on vectors space .
ii. Questions based on linear dependence.
iii. State and prove rank- nullity theorem.

CO5: Understand the eigen value and eigen vector or the characteristic vectors.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand the concept of linear equation. **SO5.2 The Concept** of eigen value and eigen vectors. **SO5.3** Orthogonal matrix.	.	**Unit-5.0 Understand the eigen value and eigen vectors.** 5.1. Definition of linear equation 5.2. Eigen values of linear equation. 5.3. Symmetric and skew symmetric matrix 5.4. Characteristic equation. 5.5. Orthogonal Matrices. 5.6. Diagonalization of Matrices. 5.7. Inner product spaces. 5.8. Gram - Schmidt. 5.9. Orthogonalization of Matrices. Properties of eigen vectors.	1. To solve linear equation. 2. The knowledge of eigen values.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of Matrices.
ii. To solve characteristic equation.
iii. Properties of eigen vectors.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1 Understand the concept of Calculus and linear Algebra	9	01	01	11
CO2: Understand the importance of Algebraic properties with regard to working within various number systems	9	1	01	11
CO3: Students will Evaluate Rank and Determinantof Matrices.	9	1	01	11
CO4: Students will determine linear independence and dependence ofvectors.	9	1	01	11
CO5: Understand the eigen value and eigen vector or the characteristic vectors.	9	1	01	11
Total Hours	45	05	05	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Understand the concept of Calculus and linear Algebra	03	02	03	08
CO-2	**Understand the Differential of Calculus; Maxima and minima.**	03	01	05	09
CO-3	Students will Evaluate Rank and Determinant of Matrices.	03	07	02	12
CO-4	**Linear Independence & dependence of matrix.**	03	05	05	13
CO-5	**Understand the eigen value and eigen vectors.**	03	02	03	08
Total		15	17	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Mathematics-III (Differential Calculus) will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition
1.	Engineering Mathematics for 1st year.	Veera Rajan t	Tata MC Graw -hill	New Delhi 2008
2	Higher Engineering Mathematics	B.S. Grewal	khanna publishers	35 th addition 2000.
3	Linear algebra ;A modern introduction	D. Poole	Brooks/coole	2nd edition 2005

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Arpana tripathi, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course Title: B. Tech.
Course Code: BSC 301
Course Title: Mathematics III (Differential calculus)

	Program Outcomes												Program Specific Outcomes			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
Course Outcomes	**Engineering knowledge**	**Problem Analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**				
CO 1	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3
CO 2	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3
CO 3	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3
CO 4	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2
CO 5	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO-1: Understand the concept of Calculus and linear Algebra	SO1.1 SO1.2 SO1.3		Unit-1.0 Understand the concept of Calculus 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10.	
PO: 1,2,3,4,5,6,7,8,9,10 ,11,12 PSO:1,2,3,4	CO 2: Understand **the Differential of Calculus; Maxima and minima.**	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Understand **the Differential of Calculus;** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10.	
PO:1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO4: **Linear Independence & dependence of matrix.**	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: Understand the concept of vectors. 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.1 0	
PO: 1,2,3,4,5,6,7,8,9,10 ,11,12 PSO:1,2,3,4	CO 5: **Understand the eigen value and eigen vectors.**	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit5: Understand the concept of linear equation. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8 5.9,5.1	

Third Semester

Course Code: **HSMC-301**

Course Title: Universal Human Values

Pre- requisite: Creating awareness among the students on a holistic perspective about life

Rationale: The purpose is to help develop a holistic perspective about life. A self-reflective methodology of teaching is adopted. It opens the space for the student to explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society and as an unit in nature. Through this process of self exploration, students are able to discover the values intrinsic in them.

Course Outcomes:

CO-I: To understanding Value Education

CO-II: Students will have the ability to learn about Harmony in theHuman Being**.**

CO-III: Student will be able to gain knowledge on Harmony in theFamily and Society.

CO- IV: Understanding Harmony in the Nature/Existence.

CO-V: Student will able to understand about Implications of HolisticUnderstanding-

Scheme of Studies:

Category of Course	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
HSMC	HSMC-301	Universal Human Values	3	0	1	1	5	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Session Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Proposed examination scheme (Marking) as per the recommendation of University Grant Commission (UGC) for Under Graduate Courses in Fundamentals of Univarsal Human Values 2022-23 onwards

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
HSMC	HSMC-201	Universal Human Values	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instructionincluding Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO I. Student will be able to Understand the Value Education

Approximate Hours

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 1.1. Understand Self-exploration as the Process for Value Education SO 1.2. Understand Continuous Happiness and Prosperity – the Basic Human Aspirations SO 1.3. Understand Right Understanding SO1.4. Understand Relationship and Physical Facility SO 1.5. Understand Happiness and Prosperity – Current Scenario SO 1.6. Understand Method to Fulfill the Basic Human Aspirations		**Module-I Understanding Value Education** 1.2 Self-exploration as the Process for Value Education 1.2 Continuous Happinessand Prosperity – the Basic Human Aspirations 1.3 Right Understanding 1.4 Relationship and Physical Facility 1.5 Happiness and Prosperity – Current Scenario 1.6 Method to Fulfill the Basic Human Aspirations	Human values to become a good man

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Continuous Happiness and Prosperity – the Basic Human Aspirations

b. **Mini Project:**
   ii. Relationship and Physical Facility

c. **Other Activities (Specify):**

CO II: Students will have the ability to apply the gained knowledge on Harmonyin the Human Being

Approximate Hours

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1. Understanding Human being as the Co-existence of the Self and the Body SO 2.2. Understand the Distinguishing between the Needs of the Self and Body SO 2.3. Understand the Body as an Instrument of the Self SO 2.4. Understanding Harmony in the Self SO 2.5. Understanding Harmony of the Self with the Body SO2.6. Understand Programme to ensure self-regulation and Health		**Module-II Harmony in the Human Being** 2.1. Human being as the Co-existence of the Self and the Body 2.2. Distinguishing between the Needs of the Self and Body 2.3. Body as an Instrument of the Self 2.4 Harmony in the Self 2.5 Harmony of the Self with the Body .6 Programme to ensure self-regulation and Health	**1.** Harmony in and among human being

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Harmony in the self

b. Mini Project:

ii. Body an an instrument

c. Other Activities (Specify):

N/A

CO III: Student will be able to understand Harmony in the Family and Society

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)

SO 3.1. Understand Harmony in the Family – the Basic Unit of Human Interaction SO 3.2. Understand the Values in Human-to-Human Relationship SO 3.3. Understand the 'Trust' – the Foundational Value in Relationship SO 3.4. Understand the 'Respect' – as the Right Evaluation SO 3.5. Understanding Harmony in the Society SO 3.6. Understand the Vision for the Universal Human Order		**Module III. Harmony in the Family and Society** 3.1 Harmony in the Family – the Basic Unit of Human Interaction 3.2 Values in Human-to-Human Relationship 3.3 'Trust' – the Foundational Value in Relationship 3.4 'Respect' – as the Right Evaluation 3.5 Understanding Harmony in the Society 3.6 Vision for the Universal Human Order	1. Harmony in the society

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Respect the right evaluation

b. Mini Project:

1. Trust is the fundamental value of relationships

c. Other Activities (Specify):

N/A

CO IV: Student will be able to understand Harmony in the Nature/Existence

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)

SO 4.1. Understanding Harmony in the Nature, Interconnectedness SO 4.2. Understand self regulation and Mutual Fulfillment among 4 orders of Nature SO 4.3. Understand the Exploring Four Orders of Nature SO 4.4. Understand the Realizing Existence as Co-existence at All Levels SO 4.5. Understand the holistic Perceptions of Harmony in Existence SO 4.6. Understand the Exploring Co-Existence in Existence		**Module-IV Harmony in the Nature/Existence** 4.1 Harmony in the Nature, Interconnectedness 4.2 Self regulation and Mutual Fulfillment among 4 orders of Nature 4.3 Exploring Four Orders of Nature 4.4 Realizing Existence as Co-existence at All Levels 4.5 The holistic Perceptions of Harmony in Existence 4.6 The Exploring Co-Existence in Existence	i. Harmony in the nature

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Harmony in nature
b. **Mini Project:**
   i. Exploring 4 orders of nature
c. **Other Activities (Specify)**
   N/A

CO V: Students will have the ability to apply the gained knowledge inImplications of Holistic Understanding- A Look at Professional Ethics

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)

SO 5.1. Understand Natural acceptance of Human Values SO 5.2 Understand Definitiveness of (Ethical) Human Conduct SO 5.3. Understand A Basis for Humanistic Education SO 5.4. Understand the Humanistic Constitution and Universal Human Order SO 5.5. Understand Competence in Professional Ethics SO 5.6. Understand Strategies for Transition towards value based Life and Profession		**Module V. Implications of Holistic Understanding- A Look at Professional Ethics** 5.1 Natural acceptance of Human Values 5.2. Definitiveness of (Ethical) Human Conduct 5.3 A Basis for Humanistic Education 5.4 Humanistic Constitution and Universal Human Order 5.5 Competence in Professional Ethics 5.6 Strategies for Transition towards value based Life and Profession	Holistic understanding of human values

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Human conduct
b. **Mini Project:**
   i. Humanistic constitution
c. **Other Activities (Specify):**

N/A

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO. I: Student will be able to understand The Value Education	**6**	**2**	**1**	**9**
CO. II: Students will have the ability to apply the knowledge gained about Harmony in the Human Being	**6**	**2**	**1**	**9**
CO. III: Student will be able to understand the Harmony in the Family and Society	**6**	**2**	**1**	**9**
CO. IV: Understand the Harmony in the Nature/Existence	**6**	**2**	**1**	**9**

CO. V: Understand about theImplications of Holistic Understanding- A Look at Professional Ethics	**6**	**2**	**1**	**9**
Total	**30**	**10**	**5**	**45**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	The Value Education	**2**	**5**	**1**	**8**
CO 2	Harmony in the Human Being	**2**	**6**	**2**	**10**
CO 3	Harmony in the Family and Society	**2**	**6**	**5**	**13**
CO 4	Harmony in the Nature/Existence	**2**	**4**	**4**	**10**
CO 5	Implications of Holistic Understanding- A Look at Professional Ethics	**2**	**5**	**2**	**9**
Total		**10**	**26**	**14**	**50**

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Universal Human Values** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course teacher for above tasks. Teacher can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Religious places, World Heritage Sites
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	JeevanVidya: EkParichaya	A Nagaraj	JeevanVidyaPrakashan, Amarkantak	1998
2	Human Values	A.N. Tripath	New Age Intl. Publishers, New Delhi,	2004
3	Universal Human Values		AICTE	2021
4	Human Values and Professional Ethics	R.R. Gaur, R Sangal and G P Bagaria	Excel Book Publisher	2009
5	Vyavaharvadï. Samajshastra	A Nagaraj	JeevanVidyaPrakashan, Amarkantak	1999
6	Manava Vyavahara Darsana	A Nagaraj	JeevanVidyaPrakashan, Amarkantak	2003
7	Foundations of Ethics and Management,	B P Banerjee	Excel Book	2005
8	Fundamentals of Ethics for Scientists & Engineers	E G Seebauer & Robert L. Berry	Oxford University Press.	2000
9	Engineering Ethichs (including Human Values)	M Govindrajran, S Natrajan and V.S. Senthil Kumar	Eastern Economy Edition, Prentice Hall of India Ltd.	-

Curriculum Development Team:

1. Er. Anant Kumar Soni, Hon’ble Pro-Chancellor and Chairman, AKS University, Satna (M.P.).
2. Prof. B.A. Chopde, Hon’ble Vice Chancellor, AKS University, Satna (M.P.).
3. Dr. Sudhir Rawat, AKS University, Satna (M.P.).
4. Prof. G.C. Mishra, Director, IQAC, AKS University, Satna (M.P.).
5. Prof. R.L.S. Sikarwar, Director, Centre for Traditional Knowledge Research &Application, AKS University, Satna (M.P.).

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code : HSMC-301
Course Title: Universal Human Values

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO. I: Student will be able to understand The Value Education	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO. II: Students will have the ability to apply the knowledge gained about Harmony in the Human Being	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO. III: Student will be able to understand the Harmony in the Family and Society	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO. IV: Understand the Harmony in the Nature/Existence	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO. V: Understand about the Implications of Holistic Understanding- A Look at Professional Ethics	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO. I:** Student will be able to understand The Value Education	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-1 **Understanding Value Education** 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO. II:** Students will have the ability to apply the knowledge gained about Harmony in the Human Being	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6		Unit-2 **Harmony in the Human Being** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO. III:** Student will be able to understand the Harmony in the Family and Society	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		Unit-3 **Harmony in the Family and Society** 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO. IV:** Understand the Harmony in the Nature/Existence	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6		Unit-4 **Harmony in the Nature/Existence** 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO. V:** Understand about the Implications of Holistic Understanding- A Look at Professional Ethics	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6		Unit-5 **Implications of Holistic Understanding- A Look at Professional Ethics** 5.1,5.2,5.3,5.4,5.5,5.6	

Semester - IV

FOURTH SEMESTER

Course Code: **PCC CS-401**

Course Title: **DISCRETE MATHEMATICS**

Pre-requisite:Rationale:

Student should have basic knowledge of Signal, Circuit, Computer fundamentals.
Study of Discrete structure will help the students to learn basics of set theory, group theory, Graph Theoryand many other concepts that are required for learning concepts of Advanced technology, also this subject will help students to understand many applications which are
Using Graphs. This subject is also beneficial for competitive examinations like GATE and NET.

Course Outcomes:

CO1: Understand examples in Computer Science through mathematical terminology and notation.

CO2: Learn how to divide a problem, or a proof, into smaller cases.

CO3: Apply the knowledge of mathematics to solve real-world problems.

CO4: Formulate mathematical claims and be able to construct counterexamples.

CO5: Identify formal algebraic structures and probability in computer science.

Schem of Studies:

Board of Study	**Cours e Code**	**Course Title**			**Scheme of studies (Hours/Week)**			**Total Credits (C)**
			Cl	**LI**	**SW**	**SL**	**Total Study Hours (CI+LI+SW+SL)**	
Progra m Core (PCC)	PCC CS-401	DISCRETE MATHEMATICS	3+1	0	2	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture(L)and Tutorial (T)and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Theory

Board	Cou se	Course Title	**Scheme of Assessment (Marks)**		
			Progressive Assessment (PRA)	**End**	

A K S University, Satna

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

			Class/Ho me Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activit y any one (CAT)	Class Attendan ce (AT)	Total Marks (CA+CT+SA+ CAT+AT)	**Semester Assessme nt (ESA)**	**Total Mark s** (PRA + ESA)
PCC	**PCC CS-401**	Discrete Mathematic s	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI),Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand examples in Computer Science through mathematical terminology and notation.

Approximate Hours

Item	AppXHrs
Cl	15
LI	0
SW	2
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understanding Operations and Laws of Sets. **SO1.2** Explain Partial Ordering Relation. **SO1.**3 discuss Bijective functions, Inverse and Composite Function. **SO1.4** define The Power Set theorem.	.	**Unit-1. Set, Relations, Functions: -** **1.1** Operations and Laws of Sets **1.2** Cartesian Products **1.3** Binary Relation **1.4** Partial Ordering Relation **1.5** Equivalence Relation **1.6** Image of a Set **1.7** Sum and Product of Functions **1.8** Bijective functions **1.9** Inverse and Composite Function **1.10** Size of a Set **1.11** Finite **1.12** infinite Sets	1. To learn about Equivalence Relation. 2. Countable and uncountable Sets.

		1.13 Countable and uncountable Sets **1.14** Cantor's diagonal argument and **1.15** The Power Set theorem.	

SW-1 Suggested Sessional Work (SW):

a. Assignments: -

(1) Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation.

(2) Equivalence Relation, Image of a Set, Sum and Product of Functions,Bijective functions, Inverse and Composite Function.

(3) Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem.

b. MiniProject:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

CO2: Learn how to divide a problem, or a proof, into smaller cases

Approximate Hours

Item	AppXHrs
Cl	7
LI	0
SW	2
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 define Extended Euclid's Greatest Common Divisor algorithm. **SO2.2 discuss** The Fundamental Theorem of Arithmetic. **SO2.3** To learn about Modulararithmetic. **SO2.4 Explain** Proof Methods and Strategies.	.	**Unit-2 (1) Proof strategies: - 2.1** Proof Methods and Strategies. **(2) Modular Arithmetic: -** **2.2**Extended Euclid's Greatest Common **2.3** Divisor algorithm **2.4** The Fundamental Theorem of Arithmetic **2.5**Modular arithmetic **2.6** Coprimality (or Euler's totient function) **2.7** Chinese	SL1.0 The Fundamental Theorem of Arithmetic. SL2.0 Chinese Remainder Theorem.

		Remainder Theorem.	

SW-2 Suggested Sessional Work (SW):

a. Assignments: -

(1) Proof Methods and Strategies.
(2) The Fundamental Theorem of Arithmetic and Modular arithmetic.
(3) Coprimality (or Euler's totient function), Chinese Remainder Theorem.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

CO 3: Apply the knowledge of mathematics to solve real-world problems.

Approximate Hours

Item	AppXHrs
Cl	13
LI	0
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 To Understand Permutation & Combination. **SO3.2** To learn Pigeon-hole principle. **SO3.3 Explain Graphs.** **SO3.4 To** Understand Hamiltonian/ Eulerian Walks,	.	**Unit-3: (1) Combinatorics: -** **3.1.** Permutation & Combination, **3.2** Inclusion-Exclusion **3.3** Pigeon-hole principle **3.4** Generating functions **3.5** Recurrence. **(2) Graphs: -** **3.6** Connected components **3.7** Paths **3.8** Cycles **3.9** Trees 3.10. Hamiltonian/ Eulerian Walks, **3.11 Coloring**, **3.12** Planarity, **3.13** Matching.	1. Permutation & Combination. 2. Hamiltonian/ Eulerian Walks.

SW-3 Suggested Sessional Work (SW):

a. Assignments: -

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

CO4: Formulate mathematical claims and be able to construct counterexamples.

Approximate Hours

Item	AppXHrs
Cl	6
LI	0
SW	2
SL	2
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 To Understand Languages of Propositional logic. **SO4.2** To learn Semantics of First- order logic. **SO4.3** To understand expressing natural languagesentences in languages of propositional	.	**Unit-4 Logic: -** **4.1** Languages of Propositional logic **4.2** and First-order logic **4.3** expressing natural language sentences in languages of propositional and first-orderlogic **4.4** expressing natural language predicates in the language of first-order logic. **4.5** Semantics of First- order logic: interpretation **4.6** and its use in evaluating a formula.	SL1.0 expressing natural language sentences in languages of propositional.SL2.0 Semantics of First-order logic.

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:
- **(1)** Languages of Propositional logic, expressing natural languagesentences in languages of propositional.
- **(2)** Expressing natural language predicates in the language of first-order logic.
- **(3)** Semantics of First- order logic: interpretation and its use in evaluating a formula.

b. Mini Project:
Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
NA

CO5: Identify formal algebraic structures and probability In computer science.

Item	AppXHrs
Cl	19
LI	0

SW	2
SL	1
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	classroom Instruction (CI)	Self-Learning (SL)
SO5.1 To understand Group and Permutation Groups **SO5.2 To learn about** Ring, and Field. **SO5.3 Explain** Probability Distribution. **SO5.4 define** Random variables.		**Unit 5 (1) 5.1 About Algebra: -** **5.2** Group **5.3** Permutation **5.4** Groups **5.5** Cosets **5.6** Normal Subgroups **5.7** Ring **5.8** Field **5.9** Finite fields **5.10 Fermat's** little theorem Homomorphisms, **5.11** Isomorphisms. 5.12 **Discrete probability:** **5.13** Discrete Sample Space **5.14** ProbabilityDistribution **5.15** Random variables **5.16** Expectation **5.17** Variance **5.18** Bernoulli trials **5.19** Conditional probability & independence (Bayes' Theorem).	1. To learn Ring and Field. 2. To learn about Random variables.

SW-5 Suggested Sessional Work (SW):

a. Assignments: -

(1) Group, ring and field.

(2) Discrete Sample Space and ProbabilityDistribution.

(3) Random variables, Expectation, Variance, Bernoulli, Conditional probability & independence (Bayes' Theorem).

b. Mini Project:

NA

c. Other Activities (Specify):

NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand examples in Computer Science through mathematical terminology and notation	15	2	1	18

CO2: Learn how to divide a problem, or aproof, into smaller cases	07	2	1	10
CO3: Apply the knowledge of mathematics to solve real-world problems	13	2	1	16
CO4: Formulate mathematical claims andbe able to construct counterexamples.	06	2	2	10
CO5: Identify formal algebraic structuresand probability In computer science.	19	2	1	22
Total Hours	60	10	6	76

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	**Set, Relations, Functions**	03	01	01	05
CO-2	**Proof strategies, Modular Arithmetic**	02	02	01	05
CO-3	**Combinatorics, Graphs**	03	07	05	15
CO-4	**Logic**	04	06	05	15
CO-5	**Algebra, Discrete probability**	03	04	03	10
Total		15	20	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for DISCRETE MATHEMATICS will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Industrial visit
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Discrete Mathematics and Its Applications.	Rosen, K. H.	_	8th Edition and 2019
2	Logic in Computer Science: Modelling and Reasoning about Systems.	Huth, M., & Ryan, M.	Cambridge University Press	2nd and 2004
3	Discrete Mathematics.	Norman L. Biggs	Oxford University Press.	2nd ed. 2002

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course: B. Tech (Computer Science & Engineering)
Course Code: PCC CS-401
Course Title: DISCRETE MATHEMATICS

Course Outcomes	**Program Outcomes**												**Program Specific Outcome**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
	Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustain ability:	Ethics	Individual and team work:	Communication:	Project management and finance:	Life-long learning	The ability toapply technical & engineering knowledge for productionquality cement	Ability to understandthe day to plant operational problems ofcement manufacture	Ability to understandthe latest cement manufacturingg technology.	Ability to use the research based innovative knowledge for SDGs
CO.1 Understand examples in Computer Science through mathematical terminology and notation	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**
CO.2 Learn how to divide a problem, or a proof, into smaller cases	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO.3 Apply the knowledge of mathematics to solve real-world problems.	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
CO.4 Formulate mathematical claims and be able to construct counterexamples.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**
Co.5 Identify formal algebraic structures and probability in computer science	**2**	**3**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.1** Understand examples in Computer Science through mathematical terminology and notation	SO1.1 SO1.2 SO1.3 SO1.4		Unit- 1.1.1,1.2,1.3,1.4,1.5,1.6,1.7.1.8,.1.9,1.10, 1.11,1.12,1.13,1.14,1.15	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3,4,5	CO 2: Learn how to divide a problem, or a proof, into smaller cases	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1,2.2,2.3.,2.4,2.5,2.6.,2.7	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Apply the knowledge of mathematics to solve real-world problems	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11,3.12.3.13	
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Formulate mathematical claims and be able to construct counterexamples.	SO4.1 SO4.2 SO4.3		Unit-4: 4.1, 4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Identify formal algebraic structures and probability in computer science.	SO5.1 SO5.2 SO5.3 SO5.4		Unit 5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10, 5.11,5.13,5.14,5.15,5.16,5.17,5.18,5.19	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

FOURTH SEMESTER

Course Code: PCC CS-402

Course Title: Computer Organization & Architecture

Pre- requisite: Student should have a basic understanding of Fundamental of Computer.

Rationale: Study of Computer system architecture helps students to learn about the hardware knowledge, memory management, and CPU cycle. How an instruction fetched from memory and till execution how it passes from different stages. Students will understand the working of instruction life cycle.

Course Outcome:

CO1. The key components of a basic computer.

CO2. The key components of a CPU and how the instructions are executed.

CO3. Execution and time taken by instructions in a pipelined processor.

CO4. The need for memory hierarchy and efficiency achieved due to the use of cache.

CO5. How the data is stored and input-output is performed in computers.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	PCC CS-402	Computer Organization &Architecture	3+1	2	1	1	8	5

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
Program Core (PCC)	PCC CS-402	Computer Organization & Architecture	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PCC CS 402	Computer Organization& Architecture	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1 The key components of a basic computer.

Item	AppX Hrs
Cl	7

LI	2
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand Role of Abstraction. **SO1.2** Understand about basic functional units of a computer **SO1.3** learn About Von-Neumann model of computation **SO1.4** Understand A note on Moore's law **SO1.5** Notion of IPC and performance **SO1.**6 Data representation and basic operations.	LI.1.1 Write programs in ARM/RISC V assembly language and test these on an instruction set simulator. Some of these are dependent on I/O facilities provided by the simulator. ● Generate some interesting numbers (example - Happy numbers, Autonomic numbers, Hardy-Ramanujan numbers etc.	**Module-1.0 Introduction**: 1.1 Role of abstraction 1.2 Basic functional units of a computer 1.3 Von-Neumann model of computation 1.4 Anote on Moore's law 1.5 Notion of IPC and performance 1.6 Data representation 1.7 Basic operations.	SL1.0 learn Basics of Computer Fundamental

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create Von-Neumann model of computation.

ii Describe the hardware implementation of logical microoperation.

b. Mini Project:

i. A fixed number of transistors makes a gate. A fixed number of gates makes a functional unit. The clock rate doesn't change. The surface area of a processor chip doesn't change. In2000, the peak performance of a processor was 43.5 MFs/s. From 2006 to 2020, the numberof logic transistors per square centimeter doubled every two years. What was the peak performance of a processor in 2020?

c. Other Activities (Specify):

N/A

CO2. The key components of a CPU and how the instructions are executed.

Item	AppX Hrs
Cl	11
LI	6
SW	2
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
O2.1 Understand CPU registers. Instruction format and encoding **SO2.2** Use of Addressing mode, understand about Instruction set **SO2.3** Understand about Instruction Types, use of instruction decoding and execution **SO2.4** basic instruction cycles Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer(CISC), RISC-V instructions; X86Instruction set.	LI 2.1 Usage of an instruction pipeline visualization tool like RIPES. LI 2.2 Write or generate sequence of instructions and observe the overall pipeline stalls with and without data hazards, control hazards, and with/without data forwarding. LI2.3 Rearrange the sequence of instructions or the program so that the pipeline stalls will be minimized.	**Module-2.0 Instruction Set Architecture (RISC-V)** 2.1 CPU registers 2.2 Instruction format and encoding 2.3 Addressing mode 2.4 Instruction set 2.5 Instruction Types 2.6 instruction decoding 2.8 instruction execution 2.9 basic instruction cycles Reduced Instruction Set Computer (RISC) 2.10 Complex Instruction Set Computer (CISC) 2.11 RISC-V instructions;	SL1.0 Learn Addressing Mode and basics of instructions format

			X86-Instruction set.	

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Describe stored program organization and basic computer organization.
   ii. Explain different instruction format for 8086.
   Iii Discuss the memory reference, register reference and I/O instruction in details.

b. **Mini Project:**
   i. Explain program interrupt cycle with a flowchart.

c. **Other Activities (Specify):**
   Class Presentation

CO3. Execution and time taken by instructions in a pipelined processor.

Item	AppX Hrs
Cl	8
LI	4
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand about Revisiting clocking methodology Amdahl's law. **SO3.2** Building a data path and control **SO3.3** Use of single cycle processor **SO3.4** use multi-cycle processor **SO3.5** instruction pipelining	LI3.1 Instruction pipeline for a particular processor (Eg: Intel I3) LI 3.2 Windows Virtual Memory	**Module-3.0 The Processor** 3.1 Revisiting clocking methodology 3.2 Amdahl's law 3.3 Building a data path and control 3.4 single cycle processor 3.5 multi-cycle processor	**SL 3.1** understand the working of processor.

SO3.6 Notion of ILP **SO3.7** understand about data and control hazards and their mitigations.		3.6 instruction pipelining, 3.7 Notion of ILP 3.8 data and control hazards and their mitigations.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Write about speedup pipeline processor.

ii Discuss the concept of 4-segmant pipeline and different types of hazards thar occur in a pipeline.

Iii Define the DMA in memory.

b. Mini Project:

i. Explain operation 4- segment Arithmetic and instruction pipeline using Time space Diagram.

c. Other Activities (Specify):

Power Point Presentation

CO4. The need for memory hierarchy and efficiency achieved due to the use of cache.

Item	AppX Hrs
Cl	10
LI	8
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand about SRAM AND DRAM, learn locality ofreference	**LI 1.0** What are the different levels of program used	**Unit-4.0 Memory hierarchy** 4.1 SRAM/DRAM 4.2 locality of	SL1.0 Learn about Macro program

SO4.2 Learn about Caching, Learn Trade-offs related to block size **SO4.3** Learn about Associativity, and cache size, understand about Processor-cache interactions for a read/write request **SO4.4** understand about basic optimizations like write-through/write-back caches, Learn Average memory access time. **SO4.5** Learn Cache replacement policies (LRU), Learn about Memory interleaving.	for evaluating the performance of a machine. **LI 2.0** lUsage of an instruction pipeline visualization tool like RIPES Write or generate sequence of instructions and observe the overall pipeline stalls with and without data hazards, control hazards, and with/without data forwarding. **LI3.0** Rearrange the sequence of instructions or the program so that the pipeline stalls will be minimized. **LI4.0** Configure the simulator [gem5 is preferred]to operate on the binaries of the benchmarkas the input.	reference 4.3 Caching: different indexing mechanisms 4.4 Trade-offs related to block size 4.5 Associativity, and cache size 4.6 Processor-cache interactions for a read/write request 4.7 basic optimizations like write-through/write-back caches 4.8 Average memory access time 4.9 Cache replacement policies (LRU) 4.10 Memory interleaving.		

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Define Total execution time.
ii. Define Weighted execution time.
iii. What are the various classes of instruction set architecture.

b. Mini Project:

Define Normal execution time with example.

c. Other Activities (Specify):

Class Test, Presentation

CO5. How the data is stored and input-output is performed in computers.

Item	AppX Hrs
Cl	9
LI	10
SW	1
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand about Memory. **SO5.2** Use of flash memory. **SO5.3** learn about I/O and memory mapping. **SO5.4** learn about data transfer techniques. **SO5.5**. learn Limitation of ILP. use of SMT processor. Learn about multicore systems and cache coherence issues	LI5.1. Extension of the CPU design and I/O programming 5.2 Enhance the design to include all variants of DT instructions. ● Implement multiply group of instructions. LI5.2 Run the program and examine the IPC, cache hit rate, number of conflicts misses andblock replacements. **LI5.3**Modify the block replacement algorithms and see the impact at cache memory performance **LI 5.4** Calculate the	**Unit-5.0** Storage **and I/O, Superscalar processors and multicore systems** 5.1 Introduction to magneticdisks (notion of tracks, sectors) 5.2 flash memory. 5.3 I/O mapped, and memory mapped I/O. 5.4 I/O data transfer techniques: programmed I/O 5.5 Interrupt-driven I/O 5.6 DMA. 5.7 Limits of ILP 5.8 SMT processors 5.9 Introductionto multicore systems and cache coherence issues	1.Computer Memory

	access time, power and are associated with a given cache configuration. **LI 5.5** Rearrange the sequence of instructions or the program so that the pipeline stalls will be minimized.		

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Write the difference between memory mapped I/O and Isolated I/O.

ii What is the drawback of programmed I/O method and how it can be resolved by interrupt initiated I/O.

iii Explain booth multiplication algorithm with the help of example.

b. Mini Project:

i. Explain asynchronous serial transmission.

c. Other Activities (Specify):

Project Presentation

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1. The key components of a basic computer.	7	**2**	1	1	11

CO2. The key components of a CPU and how the instructions are executed.	11	**6**	2	1	20
CO3. Executionand time taken by instructions in a pipelined processor.	08	**4**	1	1	14
CO4. The need for memory hierarchy and efficiency achieved due to the use of cache.	10	8	1	1	20
CO5. How the data is stored and input-output is performed in computers.	9	**10**	1	1	21
Total Hours	45	**30**	6	5	86

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO1.	Introduction	03	04	03	10
CO2.	InstructionSet Architecture	05	03	02	10
CO3.	The Processor	05	02	03	10
CO4.	Memory hierarchy	04	04	02	10
CO5.	Storage I/O and Superscalar processors and multicore systems.	03	05	2	10
Total		20	18	12	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Computer Organization & Architecture will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.
Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
1	Computer Organization & Architecture	Smruti Ranjan Sarangi	McGraw Hill	2004
2	Computer System Architecture	Mano M. Morris, Pearson.	John Wiley and Sons	2007
3	Computer Organization and Embedded Systems", 6th Edition	Carl Hamacher	McGraHill Higher Education	2009
4	Computer Architecture and Organization", 3rd Edition	John P. Hayes	WCB/McGraw-Hill	2007
5	Computer Organization and Architecture: Designing for Performance", 10th Edition	William Stallings	Pearson Education.	2009

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.

3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: PCC CS-402

Course Title: ***Computer Organization & Architecture***

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO 1: The key components of a basic computer.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: The key components of a CPU and how the instructions are executed.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Execution and time taken by instructions in a pipelined processor.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: The need for memory hierarchy and efficiency achieved due to the use of cache.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: How the data is stored and input-output is performed in computers.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The key components of a basic computer.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	1	Unit-1 Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The key components of a CPU and how the instructions are executed.	SO2.1 SO2.2 SO2.3 SO2.4	3	Unit-2 Instruction Set Architecture 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Execution and time taken by instructions in a pipelined processor.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7	2	Unit-3 The Processor 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: The need for memory hierarchy and efficiency achieved due to the use of cache.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	4	Unit-4 Memory hierarchy 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: How the data is stored and input-output is performed in computers.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	5	Unit-5 Storage and I/O, Superscalar processors and multicore systems 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

FOURTH SEMESTER

Course Code: PCC CS-404

Course Title: Design and Analysis of Algorithms

Pre- requisite: Data Structures

Rationale: Study of this subject help students to understand different problem-solving skills like divide and conquer, Dynamic programming, Greedy Strategy and Back Tracking. These problem-solving skills will develop intelligence in student to solve real time problems of society and Industry.

Course Outcomes:

CO.1. Demonstrate knowledge of Graph and its applications.
CO.2. Apply greedy approach and Huffman coding.
CO.3. Use various divide and conquer algorithm and recurrence relation
CO.4. Familiarize with the dynamic programming approach
CO.5. Comprehend the use of concept of computation and network flow.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	PCC CS-404	Design and analysis of algorithms	3+1	2	1	1	8	5

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self-Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of	Cours	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ESA)
			Class/HomeAssignment 5 number	Class Test2 (2 best out of 3)	Seminar one	Class Activity any one (C AT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PCC CS-404	Design and analysis of algorithms	15	20	5	5	5	50	50	100

Practical

Board of Study	**Couse Code**	**Course Title**	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	**Viva1 (5)**	**Viva2 (5) (SA)**	**Class Attendance (AT)**	**Total Marks (CA+CT+SA+ CAT+AT)**			
PCC	PCC CS 404	Design and Analysis of Algorithms	35	5	5	5	50		50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Demonstrate knowledge of Graph and its applications.

Approximate Hours

Item	Appx Hrs
Cl	9
LI	8
SW	2
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of Graph **SO1.2** Compare DFS and BFS **SO1.3** Analyze connectivity of graphs.	1.Program to implement Heap sort 2. Program to implement Quick sort. 3. Program to implement Graph 4. Traversal: Breadth First Traversal and Depth first traversal	**Unit-1.**0 Introduction to algorithm and Applications of Graph Search 1.1 Introduction to Algorithm 1.2 Asymptotic Notations 1.3 Space and time complexity 1.4 Master Method to compute time complexity 1.5 Introduction Graph search algorithm 1.6 Introduction to BFS 1.7 Introduction to DFS 1.8 Checking if an undirected graph is 2-edge connected 1.9 Checking if a directed graph is strongly connected	1. Discuss Terminolog yrelated to graph. 2. See applications of graph.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on back propagation.
ii. Numerical based on radial basis.
iii. Numerical based on recurrent network.

CO2: Apply greedy approach and Huffman coding.

Approximate Hours

Item	AppX Hrs
Cl	7
LI	6
SW	2
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the Concept of Greedyapproach. **SO2.2** Use of Kruskal and prim algorithms. **SO2.3** Demonstrate the use of Huffman coding.	1. Program to implement Knapsack problem using Greedy method. 2. Program to implement Prim's algorithm using Greedy method. 3. Program to implement Kruskal's algorithm using Greedy method	**Unit-2.0** Greedy algorithms 2.1. Introduction to the greedy paradigm 2.2. Activity selection problem 2.3. Job scheduling using deadline 2.4. Fractional knapsack 2.5. Minimum spanning trees 2.6. Prims and kruskal's Algorithm 2.7. HuffMan coding	1. Prim's algorithm for minimum spanning trees. 2. Examples where greedy algorithms are not optimal.

SW-2 Suggested Sessional Work (SW):

Assignments:

i. Explain Greedy Algorithm
ii. Explain prims algorithm

CO3: Use various divide and conquer algorithm and recurrence relation.

Approximate Hours

Item	AppX Hrs
Cl	7
LI	6
SW	2
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of Divide and conquer **SO3.2** Use various Divide and conquer algorithms. **SO3.3** Solve recurrence relation	1. Program to implement Binary Search using Divide and Conquer 2. Program to implement minimum and maximum using Divide and Conquer. 3. Program to implement Merge sort using Divide and Conquer	**Unit-3.0** Divide and Conquer 3.1. Explain why the divide and conquer paradigm is useful. 3.2. Understanding Binary search 3.3. Illustrate the paradigm through Matrix multiplication. 3.4. Writing recurrence relations and solving them. 3.5. Understanding divide and conquer using quick sort and randomized quicksort 3.6. Understanding divide and conquer using merge sort 3.7. Linear time algorithm forfinding the median. 3.8. Randomized divide and conquer algorithm	1. Solve some recurrence relations. 2. Modify Discussed algorithms (e.g., dividing into three parts instead of two parts, or two unequal parts, etc.)and analyze using recurrences. 3. Some Elementary exercises on expectation calculation.

SW-3 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on Fuzzy logic.
ii. Numerical based on Membership Function.
iii. Numerical based on Genetic algorithm.

CO4: Familiarize with the dynamic programming approach.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	6
SW	2
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of Dynamic Programming **SO4.2** Understand the concept of shortest paths **SO4.3** Analyze various dynamic programming algorithms.	1.Program to implement n-Queen's problem using Backtracking 2. Program to implement All Pairs Shortest Path Using Dynamic Programming. 3.Write a program to solve N-QUEENS problem	**Unit-4.0** Dynamic Programming and shortest paths 4.1. Computing Fibonacci numbers and why divide-and- conquer is not a good idea. Idea ofstoring function calls, tables 4.2. Notion of sub problems and optimal substructure 4.3. Illustration through sum of subset problem 4.4. 0/1 knapsack 4.5. Longest common subsequence prolem 4.6. matrix chain multiplication 4.7. Dijkstra's algorithm for single-source shortest paths 4.8. Bellman-Ford for SSSP with negative weights 4.9. Floyd Warshall for APSP	1. Exercises on dynamic programming.

SW-4 Suggested Sessional Work (SW):

Assignments:

i. Explain Bellman ford algorithm
ii. Explain LCS

CO5: Comprehend the use of concept of computation and network flow.

Approximate Hours

Item	AppX Hrs
Cl	17
LI	04
SW	02
SL	02
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the concept of Network flows. **SO5.2** Understand the concept of computations.	1. Write a Program to solve Sum of subsets problem for a given set of distinct numbers. 2.WAP to find Maximum and Minimum of the given set of integer values.	**Unit-5.0** Network flows & Intractability 5.1. The maximum s-t flow problemin capacitated networks 5.2. Ford Fulkerson algorithm or maximum flow 5.3. Max-flow min-cut theorem 5.4. integrality of maximum flow for integral capacities 5.5. Applications of max flow to maximum bipartite matching, max disjoint paths 5.6. Models of computation 5.7. Turing machines 5.8. PRAM model 5.9. Brief discussion on other modelsof computation e.g. PRAM model 5.10. Memory Hierarchy 5.11. Notion of polynomial time computation 5.12. Polynomial time reductions 5.13. Yes and No instances of decision problems 5.14. Decision vs optimization. 5.15. NP and P class	1. Exercises on reductions 2. Exercises on NP-completeness. 3. Problems which areNP-hard but not in NP. 4. Examples of poly time reductions.

		5.16. NP-hardness 5.17. NP-completeness	

SW-5 Suggested Sessional Work (SW):

Assignments:

i. Explain NP Completeness.
ii. Explain Turing Model

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Leboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1 Demonstrate knowledge ofGraph and its applications.	09	8	02	02	21
CO2. Apply greedy approach andHuffman coding.	07	**6**	02	02	17
CO3. Use various divide and conqueralgorithm and recurrence relation	7	**6**	02	02	17
CO4. Familiarize with the dynamicprogramming approach	09	6	02	02	19
CO5. Comprehend the use of conceptof computation and network flow.	17	**4**	02	02	25
Total Hours	45		10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Applications of Graph Search	03	02	03	08
CO-2	Greedy algorithms	03	01	05	09
CO-3	Divide and conquer	03	07	02	12

CO-4	Dynamic Programming and shortest paths	03	05	05	13
CO-5	Network flows & Intractability	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Design and Analysis of Algorithms will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Algorithm Design	Jon Kleinberg and Éva Tardos	Pearson.	1st Edition
2	Algorithms	Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani	MIT Press	3rd Edition

3	Introduction to Algorithms	Thomas H Cormen, Charles E Lieserson, Ronald L Rivestand Clifford Stein	McGraw-Hill	2nd Edition
4	Algorithm Design: Foundations, Analysis, and Internet Examples	Michael T Goodrich and Roberto Tamassia	Wiley	2nd Edition

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Design and Analysis of Algorithms	Prof. Madhavan Mukund	Chennai Mathematical Institute
2.	Design and Analysis of Algorithms	Prof. Abhiram Ranade	IIT Bombay

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

BTech Computer Science & Engineering

Course Code: PCC 404

Course Title: Algorithm Analysis and Design

Course Outcomes	Program Outcomes												Program Specific Outcomes				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO1 1	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO1	2	3	3	3	3	1	1	3	1	1	1	3	2	2	3	3	
CO2	2	3	2	3	2	2	2	2	1	1	1	3	2	3	2	3	
CO3	2	2	2	3	3	2	1	2	1	1	1	3	2	2	2	3	
CO4	2	2	3	2	3	2	1	3	1	2	1	3	2	2	3	2	
CO5	1	2	2	2	3	2	1	3	1	1	1	3	2	2	3	2	

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4,5	CO.1 Demonstrate knowledge of Graph and its applications	SO1.1 SO1.2 SO1.3		Unit-1.0 Applications of Graph Search 1.1,1.2,1.3,1.4,	As Mentioned in Page no._____to _____
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4,5	CO.2 Apply greedy approach and Huffman coding	SO2.1 SO2.2 SO2.3		Unit-2 Greedy algorithms 2.1, 2.2, 2.3, 2.4, 2.5, 2.6,	
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4,5	CO.3 Use various divide and conquer algorithm and recurrence relation	SO3.1 SO3.2 SO3.3		Unit-3: Divide and Conquer 3.1,3.2,3.3,3.4,3.5,3.6,3.7,	
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4,5	CO.4 Familiarize with the dynamic programming approach	SO4.1 SO4.2 SO4.3		Unit-4: Dynamic Programming and shortest paths 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO:1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4,5	CO.5 Comprehend the use of concept of computation and network flow	SO5.1 SO5.2		Unit5: Network flows & Intractability 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10, 5.11,5.12,5.13,5.14,5.16,5.17, 5.18	

A K S University

Faculty of Engineering and Technology
Department of Computer Science & Engineering
Curriculum of B.Tech. (Computer Science & Engineering) Program
FOURTH SEMESTER

Course Code: PCC CS-405

Course Title: Advanced Programming

Pre- requisite: Student should have a basic understanding of Fundamental of Computer & Computer.

Rationale: Study of this subject will help students to learn concepts of Object-oriented programming, like Objects, classes, Inheritance, Polymorphism, Encapsulation, Abstraction and will develop skill to work on industry-oriented codes. Also, these concepts will help students to crack industry interview.

Course Outcome:

CO1. Understanding the build system: IDE, tools for testing, debugging, profiling, andsource code management.
CO2. Students can demonstrate proficiency in object-oriented programming.
CO3. Identify and abstract the programming task involved for a given programmingproblem.
CO4. Learning and using language libraries for building large programs.
CO5. How the data is stored and input-output is performed in computers.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	PCC CS-405	Advanced Programming	4	0	1	1	5	4

Legend:CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment**	**Total Marks**
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**(ESA)**	(PRA+ESA)
(PCC)	PCC CS-405	Advanced Programming	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1 Understanding the build system: IDE, tools for testing, debugging, profiling, and sourcecode management.

Item	Appx. Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understanding the Build System and IDEs **SO1.2** Proficiency in Source Code Management **SO1.3** Terminal Proficiency **SO1.4** Simple Program Development and Debugging **SO1.5** Understanding Debugging Tools:		**Module-1.0 Introduction**: 1.1 Introduction to Programming Environment: Discuss the components of a programming environment including build systems, IDEs, and debugging tools. 1.2 Terminal and Version Control: Introduce terminal/command prompt usage and basic Git commands for version control. 1.3 Setting Up Development Environment: Guide students through setting up IDEs and 1.4 configuring Git for collaborative development. 1.5 Basic Programming Exercises: Conduct	SL1.0 learn Basics of Computer Fundamental & Basics to Advance in Programming.

		hands-on exercises to write, compile, and debug simple programs using the chosen IDE. 1.5 Introduction to Debugging Tools: 1.6 Demonstrate the use of debugging tools such as breakpoints and variable inspection. 1.7 Version Control with GitHub: Walk students through creating GitHub repositories and basic Git workflows. 1.8 Introduction to Object-Oriented Programming: Introduce object-oriented programming principles and concepts. 1.9 Hands-on Class Implementation: Guide students through implementing basic classes, attributes, and methods. 1.10 Review and Feedback: Review student assignments, 1.11 provide feedback oncode quality and adherence to OOP principles.	

SW-1 Suggested Sessional Work (SW):

Faculty of Computer Application Science and Information Technology
Department of Computer Science
Curriculum of BTech (CSE) Program

a. Assignments:

i. Task students with setting up a development environment on their machines, including installing an IDE of their choice (e.g., Eclipse, IntelliJ IDEA) and configuring Git for version control.

ii. Require students to create a GitHub repository and push their code to the repository, demonstrating proficiency in using Git commands for version control.

CO2. Students can demonstrate proficiency in object-oriented programming.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Conceptual Understanding of Object-Oriented Paradigm **SO2.2** Implementation of Classes and Methods: **SO2.3** Understanding Containment and Association **SO2.4** Scope and Parameter Passing		**Module-2.0 Principal of Object-Oriented Programing** 2.1 Inheritance and Polymorphism: Discuss inheritance and polymorphism concepts and their implementation in	SL1.0 Learn Addressing Mode and basics of instructions format

SO2.5 Debugging Techniques		Java. 2.2 Interfaces and Abstract Classes: 2.3 Introduce interfaces and abstract classes, discussing their role in achieving modularity. 2.4 Object Cloning and Immutability: Explore object cloning, 2.5 immutability, and their applications in object-oriented design. 2.6 UML for Modeling: Introduce UML diagrams for visualizing class hierarchies and relationships. 2.7 Coding Exercise: Implement interfaces, 2.8 abstract classes, and object cloning in a sampleproject. 2.9 Design Patterns Overview: Introduce common design patterns and their applications in	

		software design. 2.10 Applying Design Patterns: Discuss strategies for applying design patterns to solve common design challenges. 2.11 Group Project Planning: Initiate group projects wherestudents apply OOP concepts and design patterns to real- world scenarios. 2.12 Project Progress Review: Review group project progress, provide guidance, and address any challenges.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Provide a set of requirements for a simple banking system and ask students to design and implement a class hierarchy to represent various entities such as accounts, customers, and transactions.

ii. Require students to implement methods for depositing, withdrawing, and transferring funds between accounts, ensuring encapsulation and data integrity principles are adhered to.

b. Mini Project:

i. Encourage students to design and implement classes for books, patrons, and library inventory,incorporating principles of inheritance, polymorphism, and encapsulation.

ii. Assess the project based on the completeness of functionalities, adherence to object-orienteddesign principles, and code quality.

CO3. Execution and time taken by instructions in a pipelined processor.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understanding Interfaces and Inheritance **SO3.2** Proficiency in Polymorphism **SO3.3** Utilizing Abstract Classes and Interfaces **SO3.4** Object Equality and Comparison: **SO3.5** Understanding Object Cloning and Immutability		**Module-3.0 Advance feature of OOPs** 3.1 Introduction to Unit Testing: Discuss the importance of unit testing and basic principles of test-driven development. 3.2 JUnit Framework Basics: Introduce JUnit framework and demonstrate its usage for writing unit tests. 3.3 Writing Test Cases: Guide students through writing comprehensive test cases for Java classes and methods. 3.4 Advanced Testing Techniques: 3.5 Explore advanced testing techniques such as parameterized tests and mocking	**SL 3.1** understand the programming Concept.

		frameworks. 3.6 Test Suite Development: 3.7 Discuss strategies for organizing and managing test suites for large-scale projects. 3.8 Test Coverage Analysis: Introducetools for analyzing test coverage and ensuring comprehensive testing. 3.9 Defensive Programming Principles: 3.10 Discussthe importance of defensive programming and error handling techniques. 3.11 Exception Handling Best Practices: Explore best practices for exception handling and error reporting in Java. 3.12 Coding Exercise: Implement exception handling and defensive programming techniques in a sample application.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Present students with a scenario where they need to design and implement a system for managingdifferent types of vehicles (e.g., cars, trucks, motorcycles) and their properties.

ii. Task students with implementing interfaces for vehicles, defining classes for specific vehicletypes, and demonstrating polymorphic behavior for common vehicle operations (e.g., start, stop, accelerate).

b.Mini Project:

i. Develop a simple banking application that supports different types of accounts (e.g., savings,checking, loans) and provides functionalities for account management and transactions.

ii. Encourage students to implement interfaces for account types, define classes for specific accounttypes, and demonstrate inheritance and polymorphism for common banking operations.

CO4. The need for memory hierarchy and efficiency achieved due to the use of cache.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understanding Unit Testing Principles **SO4.2** Proficiency in JUnit/Boost. Test Frameworks **SO4.3** Assertion Methods and Testcase Management **SO4.4** Exception Testing and Handling **SO4.5** Test Suite Development.		**Unit-4.0 Unit Testing** 4.1 : Big-O Notation: Explain the concept of Big-O notation and its significance in analysing algorithmic complexity. 4.2 : Java Collection Framework: Introduce Java Collection Framework and its data structures for handling advanced data. 4.3 Sorting and Searching Algorithms: Discuss various sorting and searching	**SL1.0** Learn about Testing

		algorithms and their implementations. 4.4 Algorithm Efficiency Analysis: Analyze algorithms using Big-O notation and discuss strategies for optimizing performance. 4.5 Hands-on Coding Session: Implement sorting and searching algorithms and analyze their performance. 4.6 Advanced Data Structure Handling: Explore advanced data structure handling techniques using Java Collection Framework. 4.7 Group Project Implementation: 4.8 Guide students through implementing data structures and algorithms in a real-world project. 4.9 Project Progress Review: Review group project progress, 4.10 provide guidance,and address any technical challenges. 4.11 Optimization Techniques: 4.12 Discuss optimization techniques and strategies for improving code efficiency.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Provide students with a set of Java classes representing various data structures (e.g., linked list,stack, queue) and algorithms (e.g., sorting, searching).

ii. Task students with writing comprehensive JUnit test cases to validate the correctness andefficiency of the implemented data structures and algorithms.

b.Mini Project:

i. Extend the library management system developed in Module 2 to include a comprehensive suite of unit tests using JUnit or a similar testing framework.
ii. Require students to write test cases to validate functionalities such as book search, borrowing and returning books, and inventory management.

CO5. How the data is stored and input-output is performed in computers.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
O5.1 Understanding Big-O Notation **SO5.2** Proficiency in Java Collection Framework (or Boost libraries **SO5.3** Sorting and Iterating Objects **SO5.4** Understanding Data Structure Efficiency **SO5.5**. Optimizing Performance		**Unit-5.0 Storage and I/O, Superscalar processors and multicore systems** 5.1 Big-O Notation: Explain the conceptof Big-O notation and its significancein analyzing algorithmic complexity. 5.2 Java Collection Framework: Introduce Java Collection Framework and itsdata structures for handling advanceddata. 5.3 Sorting and Searching Algorithms: Discuss various sorting and searching algorithms and their implementations. 5.4 Algorithm Efficiency Analysis: Analyze algorithms using Big-O notation anddiscuss strategies for optimizing performance. 5.5 Hands-on Coding Session: Implement sorting and searching	

		algorithms and analyze their performance. 5.6 Advanced Data Structure Handling: Explore advanced data structure handling techniques using Java Collection Framework. 5.7 Group Project Implementation: Guide students through implementing data structures and algorithms in a real-world project. 5.8 Project Progress Review: Review group project progress, provide guidance, and address any technical challenges. 5.9 Optimization Techniques: Discuss optimization techniques and strategies for improving code efficiency.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Present students with a set of programming problems that require the use of advanced datastructures and algorithms.

ii. Task students with implementing solutions using language-supported libraries such as the JavaCollection Framework or Boost libraries. interrupt initiated I/O.

b. Mini Project:

i. Develop a web application that utilizes language-supported libraries for handling advanced datastructures and performing common operations.

ii. Encourage students to implement functionalities such as user authentication, data visualization,and interactive user interfaces using appropriate APIs and libraries.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	SessionalWork (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1 Comprehensive Understanding of BuildSystems and Tools	12	2	1	15
CO2 Proficiency in Object-Oriented Programming:	12	2	1	15
CO3 Ability to Abstract and Solve Programming Problems:	12	2	1	15
CO4 Utilization of Language Libraries forBuilding Large Programs	12	2	1	15
CO5 Application of Defensive Programming Techniques	12	2	1	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1.	Introduction: Familiarity with the programming environment	03	04	03	10
CO2.	Basic principles of the object-oriented development process	05	03	02	10
CO3.	Advanced features of OOP	05	02	03	10
CO4.	Unit testing	04	04	02	10
CO5.	Using language APIs	03	05	2	10
Total		20	18	12	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Advanced Programming will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

T1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston. Object-Oriented Analysis and Design with Applications.
T2. M. Scott. Programming Language Pragmatics. 4th edition.

Suggested reference books / Online resources:

R1. R. Sebesta. Concepts of Programming Languages. 10th edition
R2. J. Rumbaugh et al. The Unified Modeling Language Reference Manual.
R3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, and Grady Booch. Design Patterns: Elements of Reusable Object-Oriented Software.
R4. P. Van Roy and S. Haridi. Concepts, Techniques, and Models of Computer Programming.
R5. https://missing.csail.mit.edu/
R6. https://www.baeldung.com/junit
R7. https://www.tutorialspoint.com/junit/index.htm
R8. For UML tools, open-source tools may be used (e.g. www.starUML.io, argouml.tigris.org/)

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: PCC CS-402

Course Title: *Advanced Programming*

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO 1: Understandingthe build system: IDE, tools for testing, debugging, profiling, and source code management.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Students can demonstrate proficiency in object-oriented programming.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Identify and abstract the programming task involved for a given programming problem.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Learning and using language libraries for building large programs.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: How the data is stored and input-output is performed in	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
computers.																	

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understanding the build system: IDE, tools for testing, debugging, profiling, and source code management.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1	Unit-1 **Introduction**: 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Students can demonstrate proficiency in object-oriented programming.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	0	Unit-2 **Principal of Object-Oriented Programing** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Identify and abstract the programming task involved for a given programming problem.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	0	Unit-3 **Principal of Object-Oriented Programing** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Learning and using language libraries for building large programs.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	0	Unit-4 **Unit Testing** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: How the data is stored and input-output is performed in computers.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	0	Unit-5 **Storage and I/O, Superscalar processors and multicore systems** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of BTech (CSE) Program

FOURTH SEMESTER

Course Code: HSMC-401A

Course Title: Organizational Behavior

Pre- requisite: Student will be able to learn and understands the concept of Organizational Behavior and interpersonal behavior in an organization.

Rationale: The students will study about the framework of organizational behavior, individual behavior, leadership and stress management which help the student to understand the application of OB principles, which makes the managers and employees more conscious, realistic, thoughtful, justifiable, reasonable and free from personal biasness. The decisions taken on the basis of organizational behavior is the subject of evaluation and objective assessment. Through this student will learn about logical thinking, sensibility.

Course Outcomes:

CO.1: Understand the effect of interpersonal behavior in an organizational work life.

CO.2: Understand Perspective in Diverse cultural Environment.

CO.3: Understand the principles of organizational human behavior with relevance to the Indian business context.

CO.4 Student understand Stress Management.

CO.5: Understand the organizational structure and personnel management.

Scheme of Studies:

Board of Study	CourseCode	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
HSMC	HSMC-401A	Organizational Behavior	3	0	1	1	5	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
HSMC	HSMC-401A	Organizational Behavior	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	0
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 To Discuss the Nature and importance of organizational behavior.	.	**Unit-1.0 Concept of Organizational Behavior** 1.1 Concept and	1. Nature and Characteristics of organizational behavior.

SO1.2 To analyze the framework of organizational behavior. . **SO1.3** To Understand the contribution of organizational behavior. **SO1.4** Understand the evolution of organizational behavior. . **SO1.5** To create the understanding of Challenges and Opportunities in OB.		nature ofOB 1.2 Need of OB 1.3Importance of OB 1.4Evolution of OB 1.5Contributing Disciplines to OB. 1.6Framework of OB 1.7 Need of the Frameworkof OB 1.8Challenges of OB 1.9Opportunities of OB 1.10Key element of OB	2. Importance of organizational behavior. .

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   Describe in detail about Evolution of OB.
b. Mini Project:
   Framework of Organizational Behavior.
c. Other Activities (Specify):
   Case study, presentation

Approximate Hours

Item	AppX Hrs
Cl	16
LI	0
SW	1
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 Understand about Individual Behavior. **SO2.2** To analyze the different aspect of Personality and perception.		**Unit-2: Individual Behavior** 2.1 Individual Behavior 2.2Personality Development 2.3Concept of Perception	1. Importance of Individual Behavior.

SO2.3 Analyze impression Management. **SO2.4** To create awareness about values and attitude. **SO2.5** To apply the learning of Organizational behavior.		2.4 Perceptual Perception 2.5 Social Perception 2.6 Impression Management 2.7 Attitude 2.8 Characteristics of Attitude 2.9 Component of Attitude 2.10 Formation 2.11 Measurement 2.12 Values. 2.13 Learning. 2.14 Types of Learning. 2.15 Re- enforcement. 2.16 Importance of learning	

SW-2 Suggested Sessional Work (SW):

a. **Assignments:**

(1) Define Individual Behavior and importance of it in an organization.

b. Mini Project: Explain about perception and its process.

c. Other Activities (Specify): case analysis, presentation

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)

O3.1 To Discuss the Nature and importance of Leadership.. **SO3.2** To Understand the conceptand nature of Group Dynamics. **SO3.3** Student will analyze thereason of joining groups.. **SO3.4** To learn about Causing Factors of Individual and group Differences. **SO3.5** To understand the importance of group memberresources.	.	**Unit-3 Leadership** 3.1 Concept of Leadership 3.2 Theories of Leadership 3.3 Qualities of a Good Leader 3.4 Group Dynamics 3.5 Group Formation 3.6 Nature of groups 3.7 Types of Group 3.8 Group member resources 3.9 Reasons of joining groups 3.10 Importance of joining groups 3.11 Functions of group within organization 3.12 Need of Group Members	1. Leadership andits importance

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**

(i) Define Leadership and its types.

b. **Mini Project**: Define the functions of group within organization.

c. **Other Activities** (Specify): case analysis and presentation.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	0
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Student will Understand the concept, nature and process of Stress Management SO4.2 To analyze the strategies of stress management SO4.3 Student will understand	.	Unit-4 –Stress Management 4.1 Concept of Stress Management 4.2 Meaning of stress management	1. Student will learn how to handle

the importance of Stress Management. SO4.4 Student will analyze the concept of work stress management. SO4.5 To know the importance of Motivation in an Organizational.		4.3 Causes of stress management 4.4 effect of stress management 4.5 Coping strategies for stress management 4.6Meaning of work stress 4.7 Concept of Motivation 4.8Importance of motivation 4.9 Need of motivation 4.10 Theories of Motivation	stress in different situation .

SW-4 Suggested Sessional Work (SW):

a. Assignments:

(1) What is perception? Explain about major influence of the perception process.

b. Mini Project:

(1) Describe about Theories of Learning

C. Other Activities (Specify): case analysis and presentation

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Student will Learn about the concept of Organizational change. **SO5.2** Student will understand different forces of change. **SO5.3** Student will be Able to understand Conflict management in an organization. **SO5.4 To** analyzes different		**Unit 5: Organizational Change, conflict and peer.** 5.1 Concept of organizational Change. 5.2 Concept of Conflict. 5.3 Meaning of Peer 5.4 Forces of change 5.5 Planned changes 5.6 Resistance approaches 5.7 Conflict Management 5.8 Need of Conflict Management 5.9 importance of conflict management	1. How to handle conflict management in an organization.

Negotiation techniques in work place. **SO5.5** Student will understand different types of Organizational Structure.		5.10 Negotiation techniques 5.11 Organizational Structure 5.12 Personnel management	

SW-5 Suggested Sessional Work (SW):

a. **Assignments (1)** Explain about Conflict management and its importance in an organization.

b. Mini Project: **(1**) Define organizational structure and its type

c. **Other Activities (Specify): case analysis and presentation**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
Unit-1 Concept of Organizational	10	1	1	12
Unit-2.Individual Behavior	16	1	1	18
Unit-3 Leadership	12	1	1	14
Unit-4 Stress Management	10	1	1	12
Unit-5 Organizational Change, conflict and peer.	12	1	1	14
Total Hours	**60**	**05**	**05**	**70**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Concept of Organizational	03	04	03	10
CO-2	Individual Behavior	05	03	02	10
CO-3	Leadership	05	02	03	10
CO-4	Stress Management	04	04	02	10
CO-5	Organizational Change, conflict and peer.	03	05	02	10
Total		20	18	12	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	"Organizational Behavior",	Luthans Fred.,	McGraw Hill.	Latest edition
2	Organizational Behavior	Robbins S. P	New Delhi, PHI	7th edition,1996
3	Understanding Organizational Behavior	Udai Pareek	Oxford University Press	2011 Third Edition
4	Organizational Behavior	Shekcharam Uma	New Delhi THM, 1989.	1989
5	Dr P. Subba Rao	Organizational Behavior	Himalaya Publishing House	First Edition 2009
6	Lecture note provided by Faculty of Management, AKS University, Satna.			

Cos and POs Mapping

Course: B. Tech. (CSE)
Course Code: HSMC-401A
Course Title: Organizational Behavior

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased systems of various complexity.	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO 1: Understand the effect of interpersonal behavior in an organizational work life.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Understand Perspective in Diverse cultural Environment.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Understand the principles of organizational human behavior with relevance to the Indian business context.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Student understand Stress Management.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Understand the organizational structure and personnel management.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand the effect of interpersonal behavior in an organizational work life.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-1 Concept of Organizational 1.1,1.2,1.3,1.4,1.5,1.6,1.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understand Perspective in Diverse cultural Environment.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7		Unit-2 Individual Behavior 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Understand the principles of organizational human behavior with relevance to the Indian business context.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		Unit-3 Leadership 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Student understand Stress Management.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Stress Management 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Understand the organizational structure and personnel management.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7		Unit-5 Organizational Change, conflict and peer. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

FOURTH SEMESTER

Course Code: **HCMC-401B**

Course Title: **Management 1 (Organizational Behavior/Finance & Accounting)**

Pre-requisite: Student should have basic knowledge of transaction in business

Rationale: This syllabus is designed to provide students with a comprehensive understanding of accounting principles and practical skills in accounting software. The progression from basic accounting concepts to advanced tools like Tally and ERP-9 ensures a gradual and thorough learning experience. By covering topics such as the golden rule, trial balances, GST, and alternative tools, students will be equipped to handle both manual and computerized accounting systems. Practical exercises in Tally and ERP-9 enhance their proficiency, preparing them for real-world accounting tasks and ensuring adaptbility in diverse professional settings.

Course Outcome

CO 1 "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."

CO 2 "Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets, addressing outstanding transactions."

CO 3 "Student will operate Tally software, from introduction to voucher entries, and effectively manage accounting tasks such as purchase/sales orders and receipts, bills, and journals."

CO 4 "Student will be able to use GST tasks like creating masters, handling return of goods, managing exempt transactions, and generating reports for registered and composite dealers."

CO 5 "Student will be able to operate, covering Tally Vault, security controls, data import-export, audit procedures, and utilizing online support and help for advanced accounting functions.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core	HCMC-401	Management 1 (Organizational Behavior/Finance & Accounting)	3	0	2	1	6	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture(L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:
Theory

Board of Study	Course Code	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks (PRA+ ESA)**
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
	HSMC - 401	Financial management	15	20	5	5	5	50	50	100

CO 1 "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."

Approximate Hours

Item	Approx Hrs.
Cl	15
LI	0
SW	2
SL	1

Total	18

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
1. Mastering Basic AccountingPrinciples 2. Proficiencyin Manual Accounting Techniques 3. Understanding the Significance of the GoldenRule 4. Competencein Crafting Effective Journal Entries 5. Capability toMaintain andAnalyze Ledger Accounts		1. Basics of Accounting 2. Introduction to Manual Accounting 3. Comparison: Manual vs. Computerized Accounting 4. Understanding the Golden Rule in Accounting 5. Accounting Equation Essentials 6. Importance of Journal Entries 7. Ledger Account Structure 8. Types of Ledger Accounts 9. Financial Transactions Recording 10. Principles of Double-Entry Accounting 11. Closing Entries in Journal 12. Significance of Accounting Concepts 13. Application of the Golden Rule 14. Accounting Equation in Practice 15. Journal Entry Formatting	1. Entry in account in g system. 2. Explore modern comput erized

SW- Suggested Sessional Work (SW):

Assignment: Create a comprehensive journal entry for a complex business transaction.

Mini Project: Prepare a comparative analysis of manual and computerized accounting systems.

Other Activity: Organize a group discussion on the evolving role of technology in accounting practices.

CO 2 "Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets, addressing outstanding transactions."

Approximate Hours

Item	Approx Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)

1. Proficiency in Creating a Comprehensive Balance Sheet 2. Competence in Generating and Analyzing Trial Balances 3. Mastery of Final Account Preparation 4. Skill in Crafting Trading and 5. Profit & Loss Accounts		1. Trial Balance Formats 2. Importance of Trial Balance 3. Final Accounts Overview 4. Ledger-Wise Trial Balance 5. Essential Elements of Profit and Loss Account 6. Composition of a Balance Sheet 7. Key Sections of the Trading Account 8. Presentation of the Balance Sheet 9. Trading Account Calculations 10. Structure of Trading Account 11. Comprehensive Profit and Loss Statements 12. Components of a Balance Sheet	1. Learn advanced techniquesfor analyzing a balance sheet. 2. Explore methods to reconcile trial balances effectively .

SW- Suggested Sessional Work (SW):

Assignment: Prepare a trading account, profit and loss account, and balance sheet for a fictional company.

Mini Project: Conduct a financial health check for a real-world business using trial balance and final accounts.

Other Activity: Organize a group workshop on the interpretation of balance sheets for diverse industries.

CO 3 "Student will operate Tally software, from introduction to voucher entries, and effectively manage accounting tasks such as purchase/sales orders and receipts, bills, and journals."

Approximate Hours

Item	Approx Hrs.
Cl	14
LI	0
SW	2
SL	1
Total	17

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
1. Proficiency in Navigating Tally's Interface 2. Competence in Creating and Managing Companies 3. Mastery of Configuring Accounting Features 4. Skill in Setting Up Account Heads 5. Understanding the Voucher Entry Process		1. Overview of Tally Software 2. Gateway of Tally Functionality 3. Creating a Company in Tally 4. Company Information Menu Exploration 5. Accounting Master Features 6. Configuration in Tally 7. Setting Up Account Heads 8. Voucher Entry Process 9. Purchase and Sales Order Management 10. Handling Receipt Notes 11. Processing Purchase and Sales Bills 12. Debit and Credit Note Entries 13. Journal Voucher Utilization 14. Comprehensive Voucher Understanding	1. Explore advanced voucher entry techniquesin Tally. 2. Learn howto customize Tally based on specific business needs.

SW- Suggested Sessional Work (SW):

Assignment: Prepare a trading account, profit and loss account, and balance sheet for a fictional company.

Mini Project: Conduct a financial health check for a real-world business using trial balance and final accounts.

Other Activity: Organize a group workshop on the interpretation of balance sheets for diverse industries.

CO 4 "Student will be able to use GST tasks like creating masters, handling return of goods, managing exempt transactions, and generating reports for registered and composite dealers."

Approximate Hours

Item	Approx Hrs.
Cl	12

LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
1. Mastery in GST Master Creation 2. Proficiency in Managing Returns of Goods 3. Competence in Exempt Transaction Handling 4. Ability to Process Sales for Registered Dealers 5. Skill in Processing Sales for Composite Dealers		1. Creation of GST Masters 2. Management of Exempt Transactions 3. Sales Process for Registered Dealers 4. Sales Process for Composite Dealers 5. Generation of GST Reports 6. Features of GST in Tally 7. Configuration for GST 8. Setting Up Account Heads for GST 9. Voucher Entries for GST 10. Purchase Bills for GST 11. Sales Bills for GST 12. Debit/Credit Note Journal for GST	1. Configuration of GST 2. Sale voucher with GST

SW- Suggested Sessional Work (SW):

Assignment: Prepare a detailed report on the impact of GST on a specific industry and its accounting implications**.**

Mini Project: Implement GST in Tally for a mock business, ensuring compliance with various GST scenarios.

Other Activity: Conduct a workshop on GST filing procedures using Tally, emphasizing common challenges and solutions.

CO 5 "Student will be able to operate, covering Tally Vault, security controls, data import-export, audit procedures, and utilizing online support and help for advanced accounting functions

Approximate Hours

Item	Approx Hrs.
Cl	7
LI	0
SW	2
SL	1
Total	10

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
1. Proficiency in Utilizing Tally Vault 2. Mastery of Tally Security Controls 3. Competence in Data Import and Export 4. Skillful Tally Audit Implementation 5. Efficient Logging and Control Center Management		1. Introduction to Tally Vault 2. Tally Security Control Features 3. Data Import and Export in Tally ERP-9 4. Tally Audit Procedures 5. Logging in Tally 6. Managing Control Center in ERP-9 7. Online Support and Help Features	1. Advanced features and functionalities. 2. Tally's Control Center. .

SW- Suggested Sessional Work (SW):

Assignment: Conduct a security audit in Tally ERP-9 for a simulated business and propose improvements.

Mini Project: Implement data import/export procedures for a real-world scenario using Tally ERP-9.

Other Activity: Organize a training session on advanced features of Tally ERP-9, focusing on control center management and troubleshooting.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO 1 "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."	15	2	1	18
CO 2 "Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets, addressing outstanding transactions."	12	2	1	15
CO 3 "Student will operate Tally software, from introduction to voucher entries, and effectively manage accounting tasks such as purchase/sales orders and receipts, bills, and journals."	14	2	1	17
CO 4 "Student will be able to use GST tasks like creating masters, handling return of goods, managing exempt transactions, and generating reports for registered and	12	2	1	15
CO 5 "Student will be able to operate, covering Tally Vault, security controls, data import-export, audit procedures, and utilizing online support and help for advanced accounting	7	2	1	10
Total Hours	60	10	05	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	**CO 1** "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."	01	01	03	05
CO-2	**CO 2 "**Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets, addressing outstanding transactions."	01	01	03	05
CO-3	**CO 3** "Student will operate Tally software, from introduction to voucher entries, and effectively manage accounting tasks such as purchase/sales orders and receipts, bills, and journals."	-	03	10	13
CO-4	**CO 4** "Student will be able to use GST tasks like creating masters, handling return of goods, managing exempt transactions, and generating reports for registered and composite dealers."	-	03	10	13

CO-5	**CO 5** "Student will be able to operate, covering Tally Vault, security controls, data import-export, audit procedures, and utilizing online support and help for advanced accounting functions	01	03	10	14
Total		03	11	36	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Financial Accounting will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional / Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition&Year
1	Official Guide to Financial Accounting using Tally.Erp 9 with GST	-	Tally Education Pvt.Ltd	
2	Tally Essential Level	-	TALLY EDUCATION PVT LTD	
3	Lecture note provided by Dept. of Commerce AKS University, Satna.			

COS, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering
Course Code: HCMC-401
Course Title: Management 1 (Organizational Behavior/Finance & Accounting)

Course Outcomes	Program Outcomes										Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO	PO1	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Co mm erce and busi ness	Solv ing the pro ble ms	Prof essi on rela ted scen	Star t- ups and entr epre	Lea ders hip qual ities	Com muni catio n thro ugh	Adv ance rese arch in the	Dec isio n ma kin	Pat hw ays pro gra ms	Envi ron men t and sust	Parap hrase the field of E Comm	Articula te in the area of corpora te sectors	Enhanc e the skills of Entrepr eneurial attitude and	Demons trate knowled ge in setting up e- commer	Design the system and processe s
CO 1 "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."	3	2	3	1	1	1	3	1	1	**1**	**3**	**3**	**1**	**2**	**1**
CO 2 "Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets.	3	2	**3**	**1**	**1**	**1**	3	1	**1**	**1**	**2**	**3**	**1**	**1**	**1**
CO 3 "Student will operate Tally software, from introduction to	3	2	**1**	**2**	**1**	**1**	3	1	**2**	**1**	**3**	**3**	**2**	**1**	**1**

voucher entries, and effectively manage accounting.															
CO 4 "Student will be able to use GST tasks like creating masters, handling return of goods.	3	3	**1**	**3**	**1**	**1**	3	1	**1**	**1**	**3**	**3**	**2**	**1**	**1**
CO 5 "Student will be able to operate, covering Tally Vault, security controls, data import-export.	3	2	**3**	**1**	**1**	**1**	3	1	**1**	**1**	**1**	**2**	**3**	**1**	**1**

Legend:1–Slight (Low),2–Medium, 3–High

Course Curriculum Map

POs &PSOs No.	COsNo.& Titles	SOs No.	(LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4, 5,6 7,8,9,10, PSO 1,2, 3, 4, 5	**CO 1** "Student will be able to apply fundamental accounting concepts, distinguish manual and computerized systems, and apply the golden rule effectively."	SO1.1SO1.2SO1.3 SO1.4 SO1.5		Unit 1. Introduction Accounting 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.81.9,1.10,1.11,1.12,1.13 ,1.14,1.15	As mentioned in page number 3 to 7
PO1,2,3,4, 5,6 7,8,9,10, PSO 1,2, 3, 4, 5	**CO 2 "**Student will be able to prepare financial statements, including trial balances, trading, profit and loss accounts, and balance sheets, addressing outstanding transactions."	SO2.1SO2.2SO2.3 SO2.4 SO2.5		Unit-2 Ledger Trial balance, Final Account 2.1,2.2,2.3,2.4,2.5,2.6, 2.7, 2.8,2.9,2.10,2.11,2.12	
PO1,2,3,4, 5,6 7,8,9,10, PSO 1,2, 3, 4, 5	**CO 3** "Student will operate Tally software, from introduction to voucher entries, and effectively manage accounting tasks such as purchase/sales orders and receipts, bills, and journals."	SO3.1SO3.2 SO3.3 SO3.4 SO3.5		Unit-3: Intro tally 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8, 3.9,3.10,3.11,13.12,3.13,3.14	

PO1,2,3,4, 5,6 7,8,9,10, PSO 1,2, 3, 4, 5	**CO 4** "Student will be able to use GST tasks like creating masters, handling return of goods, managing exempt transactions, and generating reports for registered and composite dealers."	SO4.1SO4.2SO4.3 SO4.4 SO4.5		Unit-4 GST Vouching 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8, 4.9,4.10,4.11,4.12	
PO1,2,3,4, 5,6 7,8,9,10, PSO 1,2, 3, 4, 5	**CO 5** "Student will be able to operate, covering Tally Vault, security controls, data import-export, audit procedures, and utilizing online support and help for advanced accounting functions	SO5.1SO5.2SO5.3 SO5.4 SO5.5		Unit 5: Tally Control 5.1,5.2,5.3,5.4,5.5,5.6,5.7	

Course Curriculum Map

FOURTH SEMESTER

Course Code: MC

Course Title: Environmental Sciences

Pre- requisite: To study this course, the student must have a knowledge about the environmental components, pollution, biodiversity, and ecosystem at senior secondary, **Class** 12th level.

Rationale: The students studying Environmental Science should possess foundational understanding about environment and its components. They should also know the importance of ecosystems in our surroundings.

Course Outcomes:

CO1: To understand various aspects of life forms, ecological, processes, and the impacts on them by the human during Anthropocene era.

CO2: To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.

CO3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
AUC	MC	Environmental Science	2	0	1	1	5	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) andTutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science& Engineering) Program

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT +AT)	(ESA)	(PRA+ ESA)
AUC	MC	Environmental Science	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: To understand various aspects of life forms, ecological,processes, and the impacts on them by the human during Anthropocene era.

Approximate Hours

Item	AppX Hrs.
Cl	11
LI	0
SW	1
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO1.1 Know multidisciplinary nature of environmental science. SO1.2 Learn about the natural resources. SO1.3 Know the problems associated with land resource. SO1.4 Learn the conservation of resources. SO1.5 Know alternative energy resources.	.	**Unit-1 Environment and Natural Resources:** 1.1 The Multidisciplinary nature of environmental studies. 1.2 Scope and Importance of Environmental studies 1.3 Components of Environment: Atmosphere, 1.4 Hydrosphere, 1.5 Lithosphere, 1.6 and Biosphere. 1.7 Brief account of Natural Resources and associated problems 1.8 Land Resource 1.9 Water Resource 1.10 Energy Resource 1.11 Concept of Sustainability and Sustainable Development	i. What is environmental Science? ii. What are resources?

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Write the definition and causes of soil erosion.
   ii. Define desertification and write its causes.
   iii. Describe structure of atmosphere.
   iv. Explain lithosphere.

CO2: To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.

Approximate Hours

Item	AppX Hrs
Cl	11
LI	0
SW	2

SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of ecosystem. **SO2.2** Learn the structure of ecosystem. **SO2.3** Know the function of ecosystem. **SO2.4** Describe the structure of forest ecosystem. **SO2.**5 Learn about biodiversity and its conservation.		Unit-2 Biomes, **Ecosystem and Biodiversity** 2.1 Major Biomes: Tropical 2.2 Temperate 2.3 Forest 2.4 Grassland 2.5 Desert 2.6 Tundra 2.7 Wetland 2.8 Estuarine and Marine 2.9 Ecosystem: Structure 2.10 Function and types their Preservation & Restoration 2.11 Biodiversity and its conservation practices.	i. What is biotic and abiotic components of environment? ii. What are interactions?

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. What do you mean by ecosystem? Describe the structure of ecosystem.
ii. Give a brief classification of ecosystem.
iii. Write the function of an ecosystem.
iv. Define biodiversity write strategies of biodiversity conservation.

b. Mini Project:

Visit to various ecosystem and study biotic and abiotic ecosystem.

CO3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.

Approximate Hours

Item	AppX Hrs
Cl	8
LI	0
SW	02
SL	2

Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1. Learn about pollution and its sources. **SO3.2** Know the sources of different pollutant. **SO3.3** Understand the law & legislation related to environment. **SO3.4** Learn the control of pollution. **SO3.**5 Describe the role of information technology in environment and human health.		**Unit-3: Environmental Pollution, Management and** Social **Issues:** 3.1 Pollution: Types, Control measures, 3.2 Management and associated problems. 3.3 Environmental Law and Legislation: Protection and conservation Acts. 3.4 International Agreement & **Program** 3.5 Environmental Movements 3.6 communication and public awareness Program. 3.7 National and International organizations related to environment conservation and monitoring. 3.8 Role of information technology in environment and human health.	i. What is pollution basic introduction? ii. What is pollutant?

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Write an essay on air pollution.
ii. What do you mean by acid rain write its causes and effects.
iii. Describe the effects of water pollution.
iv. How soil pollution can be control?
v. Describe the role of information technology in environment and human health.
vi. Mention some national and international organizations related to environment conservation and monitoring.

b. Other Activities (Specify):

Visit to different polluted sites and study the source of pollution and their effects.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)

CO1: To understand various aspects of life forms, ecological processes, and the impacts on them by thehuman during Anthropocene era.	08	1	2	11
CO2: To build capabilities to identify relevant environmental issues, analyze the variousunderlying causes, evaluate the practices and policies, and develop framework to make inform decisions.	05	2	2	09
CO3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	07	2	2	11
Total Hours	20	05	06	31

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Environment and Natural Resources:**	03	08	05	16
CO-2	Biomes, **Ecosystem and Biodiversity**	05	08	05	18
CO-3	**Environmental Pollution, Management and** Social **Issues**	03	08	05	16
	Total	11	24	15	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Fundamental of Environmental Science will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, WhatsApp, Mobile, Online sources)

9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Ecology; Environment Science and Conservation	Singh; J.S., Singh S.P. and Gupta, S. R	S. Chand publishing, New Delhi.	2018
2	Perspectives in Environmental Studies	Kaushik, Anubha, Kaushik, C.P.	New age International Publishers	2018
3	A Textbook of Environmental Studies	Asthana, D. K Asthana Meera	S. C1iand.Publishing, New Delhi	2007
4	Environmental Law and Policy in India: Cases, Material & Status	Divan, S. and Rosenkranz, A	Oxford University Press, India	2002

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

Program: B. Tec **COs, POs and PSOs Mapping**

BTech Computer Science & Engineering

Course Code: MC

Course Title: Environmental Sciences

Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO1 1**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
	Engineering knowledge	**Problem Analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computerbased	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings.	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent software innovations in the fields of engineering and computer science.	Recognize and examine issues in real life, then offer creative software solutions
CO1	1	3	1	3	3	1	3	3	1	1	1	3	2	2	3	3	
CO2	2	3	1	3	2	2	3	2	1	1	1	3	2	3	2	3	
CO3	1	1	2	3	1	2	3	2	1	1	1	3	2	2	2	3	

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: To understand various aspects of life forms, ecological, processes, and the impacts on them by the human during Anthropocene era.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1	Unit-1 **Environment and Natural Resources:** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10 1.11	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	3	Unit-2 **Biomes, Ecosystem and Biodiversity** 2.1, 2.2, 2.3, 2.4, 2.5,2.6,2.7,2.8,2.9, 2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	2	Unit-3 **Environmental Pollution, Management and** Social **Issues:** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,2.8	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering Program

(Revisedason01August2023)

SEMESTER-IV

Course Code: PROJ CS-601

Course Title: Project-I: Minor Project

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

The details of COs and LOs are as follows: -

CO.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
CO.2: - The student will be able to implement the project plan and manage the project.
CO.3: - The student will be able to present the complete project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	PROJ CS-601	Minor Project	0	6	0	0	6	3

INTRODUCTION TO PROJECT WORK/INTERNSHIP

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

1. To learn skills and abilities which are otherwise not possible either in classroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints and circumstances,
   - Skill to learn in self-directed way to pursue the specific

professional projects (Self Directed Learning)
- Skill to learn from real life self- experiences (lifelong learning)
- Skill to manage the real-life engineering / professional projects
- Skill to plan and organize the self / group professional work
- skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self-real-life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	60Hrs
3	Implementing the detailed project plan	
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Internship/Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
    - **The work on the topic should be theoretically and practically feasible.**
    - **The project work on the topic should be completed within approx. Three and half months.**
    - **Availability of required resources should be certain. Cost of project work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1

  to 2 students).

- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: PROJ CS-601

Course Title: Minor Project

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.				As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.				
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.				

Semester - V

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-V

Course Code: ESC-501

Course Title : **Signals and Systems**

Pre-requisite: Student should have basic knowledge of Engineering mathematics, Engineering physics and Electronic Devices.

Rationale: This course aims to introduce the basic concepts of signals and systems its properties and analyzing the concepts of continuous time and discrete time systems with the transformation techniques

Course Outcomes:

CO1: Understanding the concept and properties of different types of Signals and Systems
CO2: Understanding the behavior of continuous and discrete time LTI systems
CO3: Analyzing the different signals and systems using Fourier series and Fourier Transform.
CO4: Understanding the significance of signals and system using Laplace transform and Z-Transform
CO5: Analyzing the signals by applying Sampling and Reconstruction theorems,Applications of signals and systems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	**ESC-501**	Signals and Systems	3	0	2	2	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	ESC-501	Signals and Systems	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understanding of the concept and properties of different types of Signals and Systems

.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	3
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of signals and its types **SO1.2** Understand the characteristics of systems and its types **SO1.3** Understand the significance of different properties of signals and systems **SO1.4** Discuss Continuous and discrete time signals. **SO1.5** Explain linearity, additivity and homogeneity, shift invariance		**Unit-1: Signal and system properties** 1.1 Definition of signal and signal properties 1.2 periodicity, absolute integer ability, determinism and stochastic character 1.3 the unit step, the unit impulse, the sinusoid, the complex exponential 1.4 Continuous and discrete time signals, continuous and discrete amplitude signal 1.5 Definition of systems and systems properties 1.6 linearity: additivity and homogeneity, shift invariance 1.7 Causality, stability realizability. 1.8 Causality, stability realizability.	1. Difference Mathematical accepts of different signals 2. Types of different signals and their representation

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Theoretical Assignments of different types of Signals and Systems.
2. Numerical Problems Related to properties of signal and system.
3. Explain System properties.

b. Other Activities (Specify):

Seminar and Tutorial

CO2 Understanding of behavior of continuous and discrete time LTI systems

Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	0
SW	3
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understanding of LTI systems. **SO2.2** Analyzing the different Responses **SO2.3** Understand the different characteristics of LTI system **SO2.4** Use of impulse response and step response **SO2.5** Explain causality and stability		**Unit-2 Behavior of continuous and discrete-time LTI systems** 2.1 Explanation of LTI systems 2.2 Impulse response and step response, convolution, 2.3 Input-output behavior with aperiodic convergent inputs, cascade interconnections. 2.4 Characterization of causality and stability of LTI systems. 2.5 System representation through differential equations and difference equation 2.6 State-space Representation of systems. State-Space Analysis, 2.7 Multi-input, multi-	1. Concept of the system and its properties. 2. Convolution Time domain and frequency domain signals

		output representation. State Transition Matrix and its Role. 2.8 Periodic inputs to an LTI system, 2.9 The notion of a frequency response and its relation to the impulse response.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Theoretical Assignment related to impulse response and step response of LTI Systems.
2. Numerical Problems related to LTI systems.
3. Explain frequency response.

b. Other Activities(Specify):

Seminar and Tutorial

CO3: Analyzing the different signals and systems using Fourier series and FourierTransform.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	2
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO3.1 To discuss role of Fourier series and Fourier transform **SO3.2** To study the differentproperties of Fourier series and Fourier transform **SO3.3** To understand the significance of DTFT **SO3.4.** Explain Fourier domain duality **SO3.5.** Discuss Parseval's Theoram		**Unit-3 : Flow Networks** 3.1 Introduction to Fourier series and types of Fourier series 3.2 Fourier series representation of periodic signals, Waveform and Symmetries 3.3 Calculation of FourierCoefficients 3.4 Introduction to Fourier transform and types of Fourier transform 3.5 Fourier Transform Convolution 3.6 Fourier Transform multiplication and their effect in the frequency domain, magnitude and phase response 3.7 Fourier domain duality 3.8 Introduction to discreteFourier transform 3.9 Properties of DTFT 3.10 Parseval's Theorem	1. Basics of Fourier series 2. Basics of Fourier transform

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Written Assignments related to Fourier series and Fourier transform.
2. Numerical Problems related to different properties of Fourier series and Fourier transform
3. Explain Parseval's Theoram.

b. Other Activities(Specify):

Seminar and Tutorial

CO4: Understanding the significance of signals and system using Laplace transform and Z-Transform

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	3
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Discuss the role of Laplace transform for continuous time signals and systems **SO4.2** Understand the significance of poles and zeros for signals and systems **SO4.3** Analyze the Z-transform of discrete time signals and systems **SO4.4** Study the significance of poles and zeros for signals and systems		**Unit-4 : Laplace and z-Transforms** 1 4.1 Review of the Laplace Transform for continuous time signals. 4.2 Review of the Laplace Transform for continuous time systems. 4.3 Poles and zeros of signals 4.4 Poles and zeros of system functions. 4.5 Laplace domain analysis 4.6 Solution to differential equations and system behavior. 4.7 Introduction to the z-Transform for discrete-time signals and systems 4.8 Introduction to the z-Transform for discrete time	1. Basics of Laplace transform 2. Basics of Z-transform 3. Continuous-time signals and discrete time signals
		systems 4.9 poles and zeros of systems and sequences 4.10Z- Transform domain analysis.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Numerical Problems related to Laplace transform
2. Numerical Problems Based on Z-transform

3. Discuss the poles and zeros of system.

b. Other Activities (Specify):

Seminar and Tutorial

CO5: Analyzing the signals by applying Sampling and Reconstruction theorems,applications of signals and systems.

Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	0
SW	3
SL	2
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Discussion about sampling theorem **SO5.2** Understand the Reconstruction **SO5.3** Application of sampling and reconstruction. **SO5.4** Study of different types of application of signals and systems		**Unit 5: Sampling and Reconstruction** 5.1 Introduction to the Sampling Theorem and its implications 5.2 Derivation of sampling theorem. 5.3 Characteristics and significance of sampling theorem 5.4 Reconstruction:	1. Analog and Digital converters. 2. Sampling and its Types
SO5.5 Explain continuous and discrete time system		ideal interpolator zero-order hold and first-order hold 5.5 Aliasing and its effects 5.6 Relation between continuous and discrete-time systems. 5.7 Introduction to the applications of signal and system theory	

		5.8modulation techniques for communication and filters 5.9feedback control Systems.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Theoretical Assignment based on reconstruction and Hold
2. Numerical Problem based on sampling theorem.
3. Discuss feedback control system.

b. Other Activities (Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understanding the concept and properties of different types of Signals and Systems	8	3	2	13
CO2: Understanding the behavior of	09	3	2	14
continuous and discrete time LTI systems				
CO3: Analyzingthe different signals and systems using Fourier series and Fourier transform.	10	3	2	15

CO4: Understanding the significance of signals and system using Laplace transform and Z- transform	10	3	3	16
CO5: Analyzingthe signals by applying Sampling and Reconstruction theorems, applications of signals and systems.	09	3	2	14
Total Hours	46	15	11	72

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO1	Signal and system properties	02	05	03	10
CO2	Behavior of continuous and discrete-time LTI systems	04	04	02	10
CO3	Flow Networks	02	06	02	10
CO4	Laplace and z- Transforms	03	04	03	10
CO5	Sampling and Reconstruction	03	05	02	10
Total		14	24	12	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Signals & Systems will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Signals and systems	A. V. Oppenheim, A. S. Willsky and S. H. Nawab,	Prentice Hall India,	1997
2	Signals and systems	H. P. Hsu	McGraw Hill Education	2010.
3	Signals and Systems	S. Haykin and B. V. Veen	John Wiley and Sons,	2007
4	Linear Systems and Signals	B. P. Lathi	Oxford University Press	2009

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: ESC-501
Course Title: Signals and Systems

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Understanding the concept and properties of different types of Signals and Systems	1	1	2	2	3	2	3	1	2	1	3	2	2	3	1	2	2
CO2: Understandingthe behavior of continuousand discrete time LTI systems	2	1	2	2	1	2	3	1	1	1	2	2	2	2	2	2	2
CO3: Analyzing the different signals and systems using Fourier series and Fourier transform	2	2	1	1	1	2	2	1	1	2	3	3	1	1	2	2	2
CO4: Understanding the significance of signals and system using Laplace transform and transform	3	2	2	2	3	2	3	1	2	1	3	3	2	3	1	2	2
CO5: Analyzing the signals by applying Samplingand Reconstruction theorems, applications of signals and systems.	2	2	2	1	1	3	3	1	1	1	2	2	2	3	1	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1: Understanding the concept and properties of different types of Signals and Systems**	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Signal and system properties 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2: Understanding the behavior of continuous and discrete time LTI systems**	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Behavior of continuous and discrete-time LTI systems 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3: Analyzing the different signals and systems using Fourier series and Fourier transform**	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 : Flow Networks 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4: Understanding the significance of signals and system using Laplace transform and transform**	SO4.1 SO4.2 SO4.3 SO4.4	Unit-4: Laplace and z- Transforms 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5: Analyzing the signals by applying Sampling and Reconstruction theorems, applications of signals and systems.**	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5: Sampling and Reconstruction 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester-V

Course Code: PCC CS-505

Course Title: Introduction to Database Systems

Pre-requisite: Student should have a basic xunderstanding of fundamental computer knowledge that includes concepts of computer architecture, storage and hardware.

Rationale: The aim of learning Database Management System is to gain the knowledge and skills needed to leverage Database services and technologies for various purposes. Database systems help users share data quickly, effectively, and securely across an organization.

Course Outcomes:

CO1: Explain the features of database management systems and relational database.

CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.

CO3: Create and Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL

CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.

CO5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	(LI+T)	SW	SL	Total Study Hours (CI+T+LI+SW+SL)	
Program Core (PCC)	PCC CS-505	Introduction to Database Systems	3+1	2	2	1	9	5

Legend: **CI:** Classroom Instruction(Includesdifferentinstructionalstrategiesi.e.,Lecture(L)andTutorial (T)and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work(includes assignment, seminar, mini projected.),

SL: Self-Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PCC CS-505	Introduction to Database Systems	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PCC CS-	Introduction to Database Systems	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Explain the features of database management systems and relational database.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	6
SW	1
SL	1
Total	21

ession Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Define DBMS Discuss about the Characteristics. **SO1.2** Explain Architecture and Modeling **SO1.3** Explain Entity Relationship (ER) Model **SO1.4** Enhanced Entity Relationshi (EER) Model **SO1.**5 Explain Generalization	1.1 draw ER Model and Relational Model for a given database 1.2 Show ER to Relational Model reduction 1.3 Create a table using select command	**Unit-1. Introduction to DBMS:** **(13 Lectures)** 1.1 Why database? Characteristics of data in database Functional Units. 1.2 What are database advantages of DBMS? 1.3 Conceptual, physical and logical database models . 1.4 Role of DBA, Database design 1.5 Components of ER-model, ER modeling symbols . 1.6 Relationships. 1.7 An introduction,	1. Why we are using database . And how much its importa nt .

		Superclass and subclass entity types. 1.8 Specialization, Generalization. 1.9 Attribute inheritance, Categorization& Aggregation. 1.10 DBMS, DBA, Entity Relationship (ER) 1.11 S EER, Superclass 1.12 Subclass,	
		Specialization Floating-Point Representatio n 1.13 Generalization, Categorization & Aggregation.	

SW-1Suggested Sessional Work (SW):

a. Assignments:

(i) Explain Components of ER-model and ER modeling symbols.

b. Presentation

c. Pictorial representation of ER-Model

CO2: Design Conceptual Models of a Database Using ER Modelling For Real LifeApplications And Construct Queries In Relational Algebra.

Approximate Hours

Item	Appx. Hrs.
Cl	15
LI	6
SW	1
SL	1
Total	23

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Fundamental Concepts. **SO2.2** To learn Normalization Process **SO2.3**To understand Transforming a Conceptual Model to a Relational Model. **SO2.4** Transforming Relationships. **SO2.**5 Aggregated Object Sets.	1) Creation of Database with proper constraints (Pk, Fk etc). 2) Insert into database using different types of insert statements. 3) To display the table after	Unit-2 **The Relational Data Model** **(11 Lectures)** **2.1** Relations, Null Values, **2.2** Keys, Foreign Keys. **2.3** Integrity Constraints Entity Integrity & Relational Integrity . **2.4** First Normal Form, Functional Dependencies, **2.5** Second Normal Form, Third Normal Form.	1. Solve Recursive Relationship.
	creation and insertion we use the following syntax: select *front <table nanze>	**2.6** Boyce-Codd Normal Form (BCNF), **2.7** Fourth Normal Form **2.8** Other Normal Forms Fifth Normal Form & Domain/Key Normal Form. **2.9** Transforming Objects Sets and Attributes **2.10** Transforming Models without External Keys. **2.11** Transforming Specialization and Generalization Object Sets. **2.12** One-One Relationships **2.13** One-Many Relationships, Many-Many	

		Relationships **2.14** Transforming Aggregated Object Sets **2.15** Transforming Recursive Relationships	

SW-2 Suggested Sessional Work(SW):

a. Assignments:
1. Design BCNF.

b. Presentation

c. Pictorial representation of different type of Keys

CO3: Create and Populate A RDBMS for A Real-Life Application, With Constraints and Keys,Using SQL

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	4
SW	1
SL	1
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 Relational Algebra and Calculus Relational Algebra. SO3.2 to understand Relational Calculus . SO3.3 to understand the The Existential Quantifier	1. Applying different constraints check, not null, etc. 2. Alter table: add column, remove column, add constraint, remove constraint	**Unit-3: Relational database implementation:** 3.1 Union, Intersection 3.2 Product, Select, 3.3 Project, Join Natural, 3.4 Theta & Outer Join 3.5 Divide, Assignment. 3.6 Target list & Qualifying Statement 3.7 The Existential Quantifier 3.8 Existential Quantifier examples 3.9 The Universal Quantifier 3.10 Universal Quantifier	i. Explain Target list, Existential Quantifier,

		example	

SW-3 Suggested Sessional Work(SW):

a. Assignments:

1. Explain Join Natural, Theta & Outer Join

b. Presentation

c. Pictorial representation of different Relational Calculus

CO4: Retrieve Any Type of Information from a Database by Formulating Complex QueriesIn SQL.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Explain Relational Implementation with SQL,Relational Implementations. SO4.2 To An Overview. Schema and Table Definition. SO4.3 Explain Data Manipulation SO4.4 Explain Relational Algebra Operations SO4.5 Explain Using SQL with Data Processing Languages	1. Selection of rows and columns, renaming columns, use of distinct keyword 2. Select clause is used to list the attributes desired in the result of a query. It corresponds to the projection operation of the relational algebra: Eg. select EMPLOYEE 3. SQL provides a case construct which we can use to perform both the update with a single update statement avoiding the problem with the order of	**Unit-4 : SQL** 4.1 Schema definition, 4.2 Data types & domains, Defining Tables . 4.3 Simple Queries (SELECT, FROM, WHERE), 4.4 Multiple-Table Queries, Subqueries, Correlated Subqueries. 4.5 EXISTS and NOT EXISTS operators.	i. Define Data Manipulation

	updates.	4.6 Built-ln Functions (SUM, AVG, COUNT, MAX, and MIN).	
		4.7 GROUP BY and HAVING clause 4.8 Built-In Functions 4.9 UNION, INTERSECT, EXCEPT, JOIN.Database Change Operations. 4.10 INSERT, UPDATE, DELETE. 4.11 View Definition, Restrictions on View Queries and Updates 4.12 Practice SQL Queries	

SW-4 Suggested Sessional Work(SW):

a. Assignments:

1. Database Change Operation

b. Presentation : Pictorial representation of different Built-ln Functions.

CO5: Analyses The Existing Design of a Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	6
SW	1

SL	2
Total	19

ession Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand Physical Access of the Database.Physical Storage Media **SO5.2** Explain Disk Performance Factors **SO5.3** Explain Data Storage Formats on Disk **SO5.4** Discuss Input/output Management.File Organizing and Addressing Methods **.** **SO5.5** Discuss Hashing	1) JOINS: SQL joins are used to query data from two or more tables, based on a relationship between certain columns in these tables. 2) Create a personalized collection of relation that is better user's intuition than is logical model Creation of Views 3) To define a view we must give the view a better name and must state the query that computes the view. Syntax: create vieu'<view najne> as <query expression>	**Unit5: INPUT-OUTPUT:** 5.1 Secondary Storage 5.2 Physical Storage Blocks 5.3 Access Motion Time 5.4 Head Activation Time 5.5 Rotational Delay, Data Transfer Rate, Data Transfer Time 5.6 Track Format, Record Format Fixed-Length Records & Variable-Length Records 5.7 Sequential File Organization, Indexed Sequential File Organization 5.8 Direct File Organization. 5.9 Static Hash Functions and Dynamic Hash Functions Synchronization 5.10 Static Hash Functions and Dynamic Hash Functions Synchronization problems	1. Disk Performance Factors 2. Sequential File Organization

SW-5 Suggested Sessional Work (SW):

a. Assignments:
Indexed Sequential File Organization .

b. Mini Project:
Data base management of any fields by using file handling.

c. Other Activities(Specify):
NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
CO1: Explain the features of database managementsystems and relational database.	13	6	1	1	21
CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	15	6	1	1	23
CO3: Create and Populate A RDBMS For A Real- Life Application, With Constraints And Keys, Using SQL	10	4	1	1	16
CO4: Retrieve Any Type Of Information From ADatabase By Formulating Complex Queries In SQL.	12	6	1	1	20
CO5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	10	6	1	2	19
Total Hours	60	28	05	05	98

Suggestion for End Semester Assessment

Suggested Specification Table(ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction to DBMS	03	02	03	08
CO-2	The Relational Data Model	03	01	05	09
CO-3	Relational database implementation	03	07	02	12
CO-4	SQL	03	05	05	13
CO-5	INPUT-OUTPUT	03	02	03	08
Total		15	17	18	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Introduction to Database Systems will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

Books:

S. No.	Title	Author	Publisher	Edition & Year
1	SQL, PL/SQL – The Programming Language of Oracle	Ivan Bayross	Prentice Hall	1 Dec 2010
2	SQL & PL / SQL for Oracle 11g Black Book	P.S. Deshpande	Pearson Education	7 Jul 2011
3	Mastering Oracle SQL	Sanjay Mishra	Morgan Kauffmann Publishers	17 Apr 2002

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Madhvi Soni, Teaching Associate, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PCC CS-505
Course Title: Introduction to Database Systems

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Explain the features of database management systems and relational database.	3	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	3	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Create and Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL	3	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	3	2	2	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand the basic concept of Programming languages, software, algorithm and flowchart.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI.1.1,LI1.2, LI1.3	Unit-1 Introduction to DBMS: 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.1 1,1.12,1.13	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI.2.1,LI2.2,LI 2.3	Unit-2 The Relational Data Model. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11, 2.12, 2.13, 2.14, 2.15	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Create and Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL	SO3.1 SO3.2 SO3.3	LI3.1,LI3.2	Unit-3 Relational database implementation. 3.1,3.2,3.3,3.4,3.5,3.6,3.7, 3.8, 3.9, 3.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1,LI4.2, LI4.3	Unit-4 SQL 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11, 4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI.5.1,LI5.2,LI5 .3	Unit-5 INPUT-OUTPUT 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-V

Course Code: **PCC CS-603**

Course Title: Machine Learning

Pre-requisite: Student should have basic knowledge of Matrix Operations, differential equation, Integration.

Rationale: The study of this subject will develop understanding of students in various classification models of Machine learning like Support vector machine, Random Forest and many other models of Machine learning. In addition, types of learning models like supervised, unsupervised and semi supervised. Learning of these models will develop new techniques and skills according to the industry need. And students will be industry ready.

Course Outcomes:

CO1: Have awareness about the importance of core CS principles such as algorithmic thinking and systems design in ML.
CO2: Understanding popular ML algorithms with their associated mathematicalfoundations.
CO3: Appreciate the mathematical background behind the popular ML algorithms.
CO4: Helping them connect/map real-world problems to the appropriate ML algorithm(s) to solvethem.
CO5: Make aware of the role of data in the future of computing and solving real-world problems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
Program Core (PCC)	**PCC CS-603**	Machine Learning	3	0+1	2	2	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PCC CS-603	Machine Learning	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Have awareness about the importance of core CS principles such as algorithmic thinkingand systems design in ML.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Understand the role of Machine Learning **SO1.2.** Understand the role of Machine Learning in problem solving **SO1.3.** Understand the role of data **SO1.4.** Learn about linear transformations **SO1.5.** Learn about matrix vector operations **SO1.6.** Understand from examples from industry **SO1.7.** Understand about Problem formulations (classification and regression) **SO1.8.** Practice problems **SO1.9.** Learn about probability distribution **SO1.10.** Learn about prior probabilities **SO1.11.** Learn about Bayes Rule **SO1.12.** Understand about		**Unit-1 Introduction to ML** 1.1 Motivation and role of machine learning in computer science 1.2 Role of machine learning in and problem-solving 1.3 Representation (features) 1.4 Linear transformations, Appreciate linear transformations in the context of data and representation 1.5 Matrix vector operations in the context of data and representation 1.6 Discuss examples from industry 1.7 Problem formulations (classification and regression) 1.8 Practice problems 1.9 Appreciate the probability distributions in the context of data 1.10 Prior probabilities 1.11 Bayes Rule 1.12 Introduce paradigms of Learning (primarily supervised and unsupervised. Also, a brief overview of others)	1. Learn about mathematical operations or transformations that manipulate the data. 2. Plot/visualize the data distributions (say in 2D).

paradigms of Learning			

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   1. What are Eigen values, Eigen vectors, rank of matrices?
   2. Elaborate the importance and role of Machine Learning in the field of Computer Science.
   3. Explain Bays Rule.

b. **Other Activities (Specify):**
   Seminar and Tutorial

CO2: Understanding popular ML algorithms with their associated mathematical foundations.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Understand about PCA **SO2.2.** Understand about Dimensionality Reduction. **SO2.3.** About Nearest Neighbors **SO2.4.** KNN. **SO2.5.** About Linear Regression. **SO2.6.** Understand about Decision Tree Classifiers **SO2.7.** Analysis of Generalization **SO2.8.** Problem of Over		**Unit-2 Fundamentals of ML** 2.1 PCA 2.2 Dimensionality Reduction 2.3 Nearest Neighbors 2.4 KNN. 2.5 Linear Regression 2.6 Decision Tree Classifiers 2.7 Notion of Generalization	1. Learn about Dimensionality Reduction using PCA and its applications in removing irrelevant features 2. Compression /compaction.

fitting **SO2.9.** Understand Training **SO2.10.** Understand Validation **SO2.11.** Understand Testing **SO2.12.** Relate to generalization and over fitting		2.8 Concern of Over fitting 2.9 Notion of Training, 2.10 Notion of Validation 2.11 Notion of Testing 2.12 Connect to generalization and over fitting	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Describe the role of hyper parameter K and the role of validation data in choice of hyper parameters.
2. Explain how the over fitting can be controlled by seeing validation performance.
3. Explain KNN.

b. Other Activities (Specify):

Seminar and Tutorial

CO3: Appreciate the mathematical background behind the popular ML algorithms.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	3
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. Learn about ensemble **SO3.2.** Learn about RF. **SO3.3.** Understand about the role of Optimization **SO3.4.** Learn about the challenges in Optimization **SO3.5.** Understand about Linear SVM.		**Unit-3: Selected Algorithms** 3.1 Ensemble 3.2 RF 3.3 Role of Optimization 3.4 Challenges in Optimization 3.5 Linear SVM 3.6 Practice problems 3.7 K Means	1. Learn how SVM can yield a solution better than a simple linear separating solution. 2.Learn

SO3.6. Practice problems **SO3.7.** Understand about K Means. **SO3.8.** Real world implementation from industry **SO3.9.** Practice problems **SO3.10.** Understand about Logistic Regression. **SO3.11.** Practice problems **SO3.12.** Learn about Naïve Bayes. **SO3.13.** Practice problems		3.8 Real world implementation from industry 3.9 Practice problems 3.103.10 ogistic Regression 3.11 ractice problems 3.12 aïve Bayes 3.13 Practice problems	about the role of support vectors and how SVMs extend to problems even if data is not linearly separable.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Describe the role of optimization in machine learning and Challenges in optimization?
2. Why we are sometimes happy with sub-optimal solutions? How assumptions make the algorithms simple/ tractable?
3. Practice problems

b. Other Activities (Specify):

Seminar and Tutorial

CO4: Helping them connect/map real-world problems to the appropriate ML algorithm(s) tosolve them.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O4.1. Understand about Loss functions and optimization **SO4.2.** Understand about optimization **SO4.3.** Learn about GD **SO4.4.** Learn about BP **SO4.5.** Understand about		**Unit-4: Neural Network Learning** 4.1 Role of Loss Functions 4.2 Role of Optimization 4.3 Gradient Descent 4.4 Perception/ Delta Learning	1. Study different types of CNN architectures

MLP **SO4.6.** Learn about Back propagation. **SO4.7.** Learn about MLP for classification **SO4.8.** Learn about MLP for regression **SO4.9.** Understand Regularization **SO4.10.** Understand Early Stopping **SO4.11.** Introduction to Deep Learning **SO4.12.** Understand CNNs		4.5 MLP 4.6 Back propagation 4.7 MLP for Classification 4.8 MLP for Regression 4.9 Regularization 4.10 Early Stopping 4.11 Introduction to Deep Learning 4.12 CNNs	

a. Assignments:

1. Explain Gradient Descent and BP. Also, with the help of graph show learning process and performances.
2. Describe CNN architecture.
3. Explain Regularization.

b. Other Activities (Specify):

Seminar and Tutorial

CO5: **Make aware of the role of data in the future of computing and solving real-world problems.**

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	3
SL	2
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO5.1. Introduction to some popular CNN Architectures. **SO5.2.** Understand LeNet-5 **SO5.3.** Understand AlexNNet **SO5.4.** Understand GoogleNet **SO5.5.** Understand ResNet (Residual Network) **SO5.6.** Understand DenseNet **SO5.7.** Learn from examples from industry **SO5.8.** Understand about RNNs **SO5.9.** Learn about GANs. **SO5.10.** Learn from examples from industry **SO5.11.** Understand about Generative Models		**Unit 5: Deep Learning Architectures** 5.1 Popular CNN Architectures 5.2 LeNet-5 5.3 AlexNNet 5.4 GoogleNet 5.5 ResNet (Residual Network) 5.6 DenseNet 5.7 Discuss examples from industry 5.8 RNNs 5.9 GANs 5.10 Discuss examples from industry 5.11 Generative Models	1. Study various popular architectures used for Deep Learning

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Write short note on two popular CNN architectures.
2. Describe with examples GANs.
3. Discuss RNN.

b. Other Activities (Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Have awareness about the importance of core CS principles such as algorithmic thinking and systems design in ML.	12	3	2	17

CO2: Understanding popular ML algorithms with their associated mathematical foundations.	12	3	2	17
CO3: Appreciatethe mathematical background behind the popular ML algorithms.	13	3	2	18
CO4: Helping them connect/map real-world problems to the appropriate ML algorithm(s) to solve them.	12	3	2	17
CO5: Make aware of the role of	11	3	2	16
data in the future of computing and solving real-world problems.				
Total Hours	60	15	10	85

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction to ML	05	02	02	09
CO2	Fundamentals of ML	02	03	05	10
CO3	Selected Algorithms	02	03	06	11
CO4	Neural Network Learning	2	03	05	10
CO5	Deep Learning Architectures	-	05	05	10

Total	11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end-of-semester assessment for Machine Learning will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong	Cambridge University Press	2020
2	Machine Learning	Tom M. Mitchell	McGraw Hill Education	International Edition
3	Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow	Aurélien Géron	O'Reilly Media, Inc.	2nd Edition
4	Deep Learning	Ian Goodfellow, Yoshoua Bengio and Aaron Courville	MIT Press Ltd	Illustrated edition
5	Pattern Recognition and Machine Learning-Springer	Christopher M.Bishop		2nd edition

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering
9. Mr. Prasoon Thakur, Teaching Associate, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PCC CS-603
Course Title: Machine Learning

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Have awareness about the importance of core CS principles such as algorithmic thinking and systems design in ML.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO 2: Understanding popular ML algorithms with their associated mathematical foundations.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO 3: Appreciate the mathematical background behind the popular ML algorithms.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO 4: Helping them connect/map real-world problems to the appropriate ML algorithm(s) to solve them.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO 5: Make aware of the role of data in the future of computing and solving real-world problems.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Have awareness about the importance of core CS principles such as algorithmic thinking and systems design in ML.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5, SO1.6, SO1.7, SO1.8, SO1.9, SO1.10, SO1.11, SO1.12	Unit-1: Introduction to ML 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understanding popular ML algorithms with their associated mathematical foundations.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5, SO2.6, SO2.7, SO2.8, SO2.9, SO2.10, SO2.11, SO2.12	Unit-2: Fundamentals of ML 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Appreciate the mathematical background behind the popular ML algorithms.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5, SO3.6, SO3.7, SO3.8, SO3.9, SO3.10, SO3.11,SO3.12, SO3.13	Unit-3: Selected Algorithms 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9, 3.10,3.11,3.12,3.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Helping them connect/map real-world problems to the appropriate ML algorithm(s) to solve them.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5, SO4.6, SO4.7, SO4.8, SO4.9, SO4.10, SO4.11, SO4.12	Unit-4: Neural Network Learning 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Make aware of the role of data in the future of computing and solving real-world problems.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5, SO5.6, SO5.7, SO5.8, SO5.9, SO5.10, SO5.11	Unit-5: Deep Learning Architectures 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester - V

Course Code: PCC CS-403

Course Title: Operating Systems

Pre- requisite: Student should have basic knowledge of Computer Architecture, Computer fundamentals.

Rationale: Study of this subject will develop understanding of operating system. Students will learn System calls, Multithreading, Process Synchronization, and Memory Management and file system. By learning these concepts students will learn goals and functions of OS. Students will also develop understanding and use of other operating systems too.

Course Outcome:

CONO	Course Outcomes	Bloom's Level
CO1	At the end of this chapter, the student will recognize the structure and services of OS	Understand
CO2	At the end of this chapter, the student will use the concept of process	Apply
CO3	At the end of this chapter, the student will differentiate various threads and deadlocks	Analize
CO4	At the end of this chapter, the student will compare memory systems	Analize
CO5	At the end of this chapter, the student will select the appropriate storage system	Evaluate

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			Cl	(LI+T)	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PCC	PCC CS-403	Operating Systems	3	2+1	1	1	8	5

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PCC CS-403	Operating Systems	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	Pcc cs 403	Operating Systems	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom

Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Learning Outcomes of the course (i.e. statements on students' understanding and skills at the end ofthe course the student shall have):

Essential:

1. To understand the role, functionality, and layering of the system's software components
2. To understand the design and usage of the OS API and OS mechanisms
3. To understand the details of the abstractions and interfaces provided by the OS for programexecution and execution requirements --- processes, threads, memory management, and files.
4. To understand problems arising due to concurrency and related synchronization-based solutions.
5. Hands-on and practical experience with usage of the OS API and basics of OS mechanisms

Desirable/Advanced:

1. To gain an in-depth understanding of the design and implementation of OS internalsvia a teaching OS
2. To be able to implement incremental changes to the functionality of a teaching OS

PCC CS-403.1: At the end of this chapter, the student will explain the core concept of OS

Item	AppX Hrs
Cl	10
LI	4
SW	3
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO1.1 Understand about Operating Systems. **SO1.2** Understand about use of Systems stack **SO1.3** Use of Components Of OS.	LI01.1Discuss how OS distributions can impact system performance. LI01.2Provide a comprehensive overview of the internal components of operating systems	**Unit-1.0 Introduction to Operating Systems** 1.1 Application requirements 1.2 The systems stack 1.3 role of OS, 1.4 resources, abstractions 1.5 interfaces 1.6 Components overview of an OS 1.7 Examples of different types of OSes 1.8 (RTOS vs. desktop vs. mobile etc.), 1.9 OS 1.10 OS distributions.	1. Use of OS. 2. Architecture of os.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. To comprehend the essential requirements and components of an operating system.
   ii. To examine examples of different operating systems and distributions.

b. Mini Project.

c. Other Activities(Specify):
   i. Seminar and Tutorial

PCC CS-403.2: At the end of this chapter the student will use Application requirements.

Item	AppX Hrs
Cl	17
LI	4
SW	2
SL	2
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand systems stack. **SO2.2** Types of OS	LI02.1 Discuss the von Neumann architecture and its significance in computer organization. LI02.2 How the OS interacts with hardware components to facilitate various tasks and optimize system performance.	**Unit-2.0** **Computer organization of hardware components** 2.1. Role of OS relative to hardware 2.2. Functionality withexamples. 2.3. the vonNeumann architecture 2.4. Process view: System callsfor file handling. 2.5. Roles and responsibilities of file system. 2.6. File system design details---file and file system 2.7. Metadata, directory structure. 2.8. Caching optimizations. 2.9. Condition variables.	**1.** Use of Application requirements**.** 2. Use of Components
		2.10. semaphores 2.11. Introduction to the threadsynchronization. 2.12. API 2.13 Case studies --- producer-consumer. 2.14 reader-writers,barriers 2.15 Discussion on issues with concurrency. 2.16 race conditions. 2.17 deadlocks, order	

		violation.	

Suggested Sessional Work (SW):

a) *Assignments:*
   i. Investigate the von Neumann architecture and its implications on file system design.
   ii. Explain the concept of system calls for file handling and provide examples of commonly

b) MiniProject:

PCC CS-403.3: At the end of this chapter, the student will describe the Process.

Approximated Hours

Item	AppX Hrs
Cl	10
LI	4
SW	2
SL	2
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand program vs. Process. **SO3.2** declaration of basic OS **SO3.3** Use of system calls	LI03.1 Experiment with system calls such as fork and wait to understand their functionality and usage. LI03.2 Investigate their role in process creation, termination, and synchronization.	**Unit-3.0 Process and System call** 3.1 Process abstraction 3.2 Program vs. process. 3.3 Process Control Block (PCB) 3.4 Design of system calls. 3.5 Invocation and basic OS handling. 3.6 Process control system calls 3.7 Fork, wait. 3.8 Exec. 3.9 getpid, getppid and variants 3.10 The limited direct execution model	1. Use of process. 2. Life cycle of process

Suggested Sessional Work (SW):

a) *Assignments:*

i. Discuss the limited direct execution model and its advantages in process management.

ii. Provide examples illustrating the usage of process control system calls in real-world scenarios.

b) MiniProject:

c) other Activities(Specify):

PCC CS-403.4: At the end of this chapter the student will design macro and programs

Approximated Hours

Item	AppX Hrs
Cl	14
LI	4
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand about Address bus. **SO4.2** address space **SO4.3** Address translation	LI04.1 Explore the mechanisms used by operating systems for memory bookkeeping and management. LI04.2 Discuss the steps involved in program execution and process creation	**Unit-4.0** **Address bus and memory access** 4.1 Memory view of a process - 4.2 --- heap, stack, code, data 4.3 Process memory usage requirements 4.4 The address space 4.5 Abstraction using virtual memory. 4.6 system calls (mmap, munmap, sbrk, mprotect) 4.7 Address translation mechanisms --- static mapping, segmentation, paging 4.8 Page faults, page sharing. 4.9 Read/write permissions. 4.10 swapping, process vs. OS memory 4.11 Memory bookkeeping	1. Use of memory access.

		and management. 4.12 motivation and mechanisms (process and OS) 4.13 Case studies --- malloc 4.14 Role of OS for program to process.	

Suggested Sessional Work (SW):

a) Assignments:
   i. Analyze the role of the operating system in managing process and OS memory, including memory allocation and deallocation.
   ii. Explore case studies focusing on memory allocation strategies, with a particular emphasis on the malloc function.
b) Mini Project:
c) other Activities(Specify):

PCC CS-403.5: Comprehend the functions of the process lifecycle.

Approximated Hours

Item	AppX Hrs
Cl	9
LI	4
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand about The process lifecycle **SO5.2** Understand about The OS mode **SO5.3** Use of system calls	LI05.1 Investigate the different modes of execution in which the operating system operates. LI05.2 Discuss how the PCB state is saved and	**Unit-5.0** **The process lifecycle---** 5.1. source code to execution 5.2. The OS mode of execution - 5.3. Limited direct execution recap. 5.4. interrupts, system calls 5.5. The process context. 5.6. switch mechanism and PCB state	1. Use of process lifecycle.

	restored during context switches, ensuring seamless process execution.	5.7. Scheduling policies. 5.8. Set of scheduling metrics. 5.9. goals and examples (interactive vs. real-time, priority)	

Suggested Sessional Work (SW):

a) Assignments:
b) MiniProject:
c) other Activities(Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PCC CS-403.1: At the end of this chapter, the student will explain the core concept of OS	10	4	3	2	19
PCC CS-403.2: At the end of this chapter the student will use Array and Function in programs.	17	4	2	2	25
PCC CS-403.3: At the end of this chapter, the student will describe the Process.	10	4	2	2	18

PCC CS-403.4: At the end of this chapter the student will design macro and programs	14	4	1	1	20
PCC CS-403.5: Comprehend the functions of the process lifecycle.	9	4	1	1	15
Total Hours	60	20	09	8	97

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PCC-CS 403.1	Introduction to Operating Systems	02	05	03	10
PCC-CS-403.2	Computer organization of hardware components	04	04	02	10
PCC-CS-403.3	Process and System call	02	06	02	10
PCC-CS-403.4	Address bus and memory access	03	04	03	10
PCC-CS-403.5	The process lifecycle	03	05	02	10
Total		14	24	12	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Operating Systems will be held with written examination of 50 marks.

Suggested text books / Online lectures or tutorials:

S. No.	Title	Author	Publisher	Edition &Year
1	Operating Systems: Three Easy Pieces	Remzi H. Arpaci-Dusseau and Andrea C.	Arpaci-Dusseau Books	2014
2	Design of the UNIX Operating System	Maurice J. BAC	Pearson Education India	First edition
3	Advanced Programming in the UNIX® Environment	W. Richard Stevens, Stephen A. Rago	Pearson Education India	Third Edition

Suggested Online content:

1. The Linux Documentation Project, www.tldp.org

Suggested reference books / Online resources:

R1. Modern Operating Systems, Andrew S. Tannenbaum and Herbert Bos, Pearson EducationIndia; 4th edition

R2. Operating System Concepts, Avi Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley India;9th, edition

R3. Operating System courses offered on NPTEL, https://nptel.ac.in/

R4. Think OS, A Brief Introduction to Operating Systems. Allen B. Downey https://www.greenteapress.com/thinkos/index.html

R5. Linux Kernel Development, Robert Love, Pearson Education India; 3rd edition

R6. Operating Systems: Principles and Practice, Thomas Anderson, Michael Dahlin, RecursiveBooks; 2nd Edition, https://ospp.cs.washington.edu/index.htm

R7. Computer Systems: A Programmer's Perspective, Randall E. Bryant, David R.O' Hallaron,Pearson Education India; 3rd edition.

R8. The C Programming Language, Brian Kernighan, Dennis Ritchie, Pearson EducationIndia; 2nd edition

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Mr. Anurag Tiwari, Assistant Professor, Department of Computer Science and Engineering

COs, POs and PSOs Mapping

Program: B.Tech (Computer Science & Engineering)

Course Code: PCC-CS- 403

Course Title: Operating Systems

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: At the end of this chapter, the student will explain the core concept of OS	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2: At the end of this chapter the student will use Array and Function in programs.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: At the end of this chapter, the student will describe the Process.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4: At the end of this chapter the student will design macro and programs	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5: Comprehend the functions of the process lifecycle.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	LI	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: At the end of this chapter, the student will explain the core concept of OS	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI01.1,LI01.2	**Unit-I** **Introduction to Operating Systems** 1.1,1.2,1.3, 1.4,1.5,1.6, 1.7,1.8,1.9,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: At the end of this chapter the student will use Array and Function in programs.	SO2.1 SO2.2	LI02.1,LI02.2	**Unit-2 Application requirements** 2.1, 2.2, 2.3, 2.4, 2.5,2.6, 2.7, 2.8, 2.9, 2.10, 2.11,2.12, 2.13, 2.14, 2.15, 2.16, 2.17	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: At the end of this chapter, the student will describe the Process.	SO3.1 SO3.2 SO3.3	LI03.1,LI03.2	**Unit-3 Process** 3.1,3.2,3.3,3.4,3.5, 3.6,3.7,3.8,3.,3.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: At the end of this chapter the student will design macro and programs	SO4.1 SO4.2 SO4.3	LI04.1,LI04.2	**Unit-4: Address bus and memory access** 4.1,4.2,4.3,4.4, 4.5,4.6,4.7,4.8, 4.9,4.10,4.11,4.12,4.13,4.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Comprehend the functions of the process lifecycle.	SO5.1 SO5.2 SO5.3	LI05.1,LI05.2	**Unit 5- The process lifecycle** 5.1,5.2,5.3,5.4,5.5,5.6,5.6,5. 7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester - V

Course Code: PEC- Elective-I-A

Course Title : Web Engineering

Pre- requisite: Student should have basic knowledge of Signal, Circuit, Computer fundamentals.

Rationale: Study of this subject will develop different skills in students to create and manage the websites. Concepts like Html, CSS and JavaScript will helpful to develop front end design of website. And knowledge of PHP will help students to develop back-end design. Advance concepts like Angular and React will help students to make website dynamic.

Course Outcomes:

On successful completion of this course, the students will be able to:

CO1 Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links toExternal Documents and different sections of a HTML page.

CO2 Develop skills to generate HTML and CSS page and have knowledge of JavaScript assisted style sheets (JSSS).

CO3 Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants,Embedding PHP in HTML pre-defined and used defined.

CO4 Have knowledge of Angular JS, XML Fundamentals, J Query

CO5 Develop skills to generate Static and dynamic application designing, Google formdesigning, Django

Scheme of Studies:

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C:Credits.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PEC	PEC-Elective-I-A	Web Engineering	3	2	2	2	9	4

Legend: **CI:**Class room Instruction(Includesdifferentinstructionalstrategiesi.e.,Lecture(L)andTutorial (T)and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work(includes assignment, seminar, mini projected.),
SL: Self-Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PE	PEC-Elective-I-A	Web Engineering	15	20	5	5	5	50	50	100

Practical

B	C o u	Course Title	Scheme of Assessment (Marks)

			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PE	PEC-Elective-I-A	Web Engineering	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Have knowledge of HTML, its essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	6
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand basics of HTML	LI1.1 Design web pages for your college	**Unit-1.0 Topics Basics of**	1. Learning various

SO1.2 Understanding various tags used with HTML SO1.3 Understanding types of List in Html. SO1.4 Understanding different input types SO1.5 Understand client server architecture. .	containing a description of the courses, departments, faculties, library, etc, use href, list tags. LI1.2 Create your class timetable using the table tag. LI1.3 Create user Student feedback form (use textbox, text area, checkbox, radio button, select box, etc.)	**Internet and Web** 1.1 Introduction to HTML 1.2 Essential Tags 1.3 Tags and Attributes 1.4 Text Styles and Text An-arguments, Text, Effects Events 1.5 coupling tools, Form elements 1.6 Table layout and presentation 1.7 Use of different input types. 1.8 List types 1. 9 various tags: Canvas, DIV and SPAN 1.10 Introduction to basic client-side technologies	concepts related with internet.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain basic terminologies used with HTML.

ii. Explain various types of tags.

b. Mini Project:

CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).

Approximate Hours

Item	AppX Hrs
Cl	8
LI	8
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO2.1 To Understand the concept of web server. **SO2.2** To learn about Cascading Style Sheet. **SO2.3** To implement VB Script and Java Script. **SO2.4** To understand Document Object Model. **SO2.**5 To learn about JRE (JavaScript Runtime Environment).	LI2.1 Create a web page using the frame. Divide the page into two parts with LI2.2 Create your resume using HTML tags also experiment with colors, text, links, size, and also other tags you studied. LI2.3 Create a web page by making use of the following tags: Head, Body, Bgcolor. LI2.4 Write a HTML program to implement different types of CSS.	Unit-2 **Web Client and Web Sever** 2.1 Cascading Style Sheet-Introduction 2.2 types of CSS and its static and dynamic applications 2.3 JavaScript- Basics of JavaScript technology 2.4 Control statements. 2.5 Document Object Model. 2.6 Events, functions, Array. 2.7 JRE (JavaScript Runtime Environment) and its applications. 2.8 Embedding JavaScript in HTML and CSS run time data communications	1. Try to Implement VB Script and Java Script

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explain client-side scripting VBScript and JavaScript.
ii. Explain web database connectivity using DBC and ODBC.

b. Mini Project:

Create an image mapping.

CO3: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	14
SW	2
SL	2
Total	28

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Learning server-side scripting language PHP. **SO3.2** Will learn PHP Syntax, Comments Tags and Attributes. **SO3.3** Learn CSS and JavaScript run time data communications. **SO3.4** Creating forms using HTML. **SO3.**5 Implement front end to back end any data base	LI3.1 Acquaintance with elements, tags and basic structure of HTML files. LI3.2.Practicing basic and advanced text for formatting. LI3.3 Practice use of image, video and sound in HTML documents. LI3.4 Designing of web pages- Document layout, list, tables. LI3.5 Practicing Hyperlink of web pages, working with frames.	**Unit-3 : PHP** 3.1 Introduction to server-side scripting language PHP. 3.2 Data types in PHP 3.3 PHP Syntax, Comments Tags and Attributes 3.4 Variables and Constants 3.5 Embedding PHP in HTML 3.6 CSS and JavaScript run time data communications 3.7 pre-defined and used defined Functions 3.8 Strings functions and Array	1. Learning various attributes of HTML tags. 2. Learning online HTML editors.
communication.	LI3.6 Working with forms and controls. LI3.7 Working with background, text, font, list properties.	3.9 CRUD 3.10 Front end to back end any data base communication	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Explain basic PHP tags and their properties.

ii. Create an HTML page that contains a CSS.

b. Mini Project:

iii. Create an admission form using HTML tags & CSS.

c. Other Activities (Specify):

Use of latest editors for web development like. VS Code, Notepad++ etc.

CO4: Have knowledge of Angular JS, XML Fundamentals, J Query

Approximate Hours

Item	AppX Hrs
Cl	9
LI	8
SW	2
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding Angular JS **SO4.2** Learn XML Fundamentals **SO4.3** Learn J Query	LI4.1 Create a web form using php for login page LI4.2 Create a simple xml document with following	**Unit-4 : Angular JS** 4.1 Introduction to Angular JS	i. Differentiate between HTML and DHTML.
SO4.4 Learn Accessing Data from XML Documents **SO4** Understand working of JSON.	details: Rollno, Sname, Contact, Email & Address. LI4.3 Write a simple PHP script to perform crud operations. LI4.4 Create a web form using php for enquiry details.	4.2 MVC Architecture and Angular JS applications 4.3 XML: -Introduction, 4.4 XML Fundamentals 4.5 XML Syntax, Accessing Data from XML Documents 4.6 J Query Introduction, 4.7 J Query Syntax 4.8 J query selectors, Events 4.9 working with JSON.	ii. Learn CSS and JSSS.

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:

i. Write down the features of Angular JS.

ii. Explain XML.

b. Mini Project:

i. Design a page and use Angular JS.

c. Other Activities (Specify):

Implementing CSS in your previously created web page.

CO5: Develop skills to generate Static and dynamic application designing, Google form designing, Django

Approximate Hours

Item	AppX Hrs
Cl	8
LI	8
SW	2
SL	2
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Learn Static and dynamic application designing. **SO5.2** Implementing Google forms. **SO5.3** Learn Django **SO5.4** Implementing template customization and develop dynamic applications **SO5.**5 Learn MVT (Model View Template) with Django.	LI5.1 Customize a template using Django LI5.2 Create a MySQL data base and connect with PHP. LI5.3 Write PHP script for storing and retrieving user information from my SQL table. a. Write a HTML page which takes Name, Address, Email and Mobile number from user (register PHP). b. Store this data in MySQL data base. Next page displays all user in HTML table using PHP (display PHP).	**Unit-5** 4.1 Static dynamic application designing 4.2 dynamic application designing 4.3 Google form designing. 4.4 customer review panel 4.5 Introduction to Django 4.6 MVT (Model View Template) with Django 4.7 template customization 4.8 develop dynamic applications	1. Learn PHP as server side scripting. 2. Use PHP to connect any database.

	LI5.4 Write a PHP program to print first ten Fibonacci numbers.		

SW-5 Suggested Sessional Work (SW):

a. **Assignments**
   i. Write a PHP program to print first ten Fibonacci numbers.
   ii. Create HTML page with java script which takes integer number as a input and tells whether the number is divisible by 4 or not.
b. **Mini Project:**
   i. Using HTML, CSS, Java script, PHP, MySQL, design and authentication module of a web page.
c. **Other Activities (Specify):**
   Create form validation using PHP.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	10	6	2	1	19
CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	8	8	2	1	19
CO3: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.	10	14	2	2	28
CO4: Have knowledge of Angular JS, XML Fundamentals, J Query.	9	8	2	2	21

CO5 : Develop skills to generate Static and dynamic application designing, Google form designing, Django	8	8	2	2	22
Total Hours	45	44	10	08	107

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Topics Basics of Internet and Web	04	02	02	08
CO-2	Web Client and Web Sever	02	06	02	10
CO-3	PHP	02	05	05	12
CO-4	Angular JS, XML Fundamentals, J Query	02	05	05	12
CO-5	Google form designing, Django	-	04	04	08
Total		10	22	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Web Engineering will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Industrial visit

7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Beginning PHP5, Apache, and MySQL Web Development	Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz	Glass Wrox Publication	2005
2	Beginning HTML, XHTML, CSS, and JavaScript 2010	Jon Duckett	Wiley Publishing	2010
3	Web Technologies, Black Book, Dream Tech Press 2010	Kogent	Learning Solutions Inc Dream Tech Press	2010
4	HTML, XHTML and CSS Bible	Bryan Pfaffenberger, Steven M. Schafer, Chuck White	John Wiley & Sons	2004

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B.Tech (Computer Science & Engineering)

Course Code: PEC- Elective-I-A
Course Title: Web Engineering

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4 : Have knowledge of Angular JS, XML Fundamentals, J Query	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5 : Develop skills to generate Static and dynamic application designing, Google form designing, Django	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	LI	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI01.1,LI01.2, LI01.3	Unit-1 Topics Basics of Internet and Web 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI02.1,LI02.2, LI02.3, LI02.4	Unit-2 Web Client and Web Sever 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI03.1,LI03.2, LI03.3, LI03.4, LI03.5, LI03.6, LI03.7	Unit-3 **:** pHp 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10	

PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4 : Have knowledge of Angular JS, XML Fundamentals, J Query	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI04.1,LI04.2, LI04.3, LI04.4	Unit-4: Angular JS, XML Fundamentals, J Query 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5 : Develop skills to generate Static and dynamic application designing, Google form designing, Django	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI05.1,LI05.2, LI05.3, LI05.4	Unit-5 Google form designing, Django 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

Semester-V

Course Code: PEC- Elective-I-B

Course Title: Project Management

Pre- requisite: Software Engineering

Rationale: The study of this subject will develop understanding in students to create project, work with project front end and back end deign.By this subject student will use skill set of their learning in different ways to make new projects. Projects will be industry oriented as well as real life problem solving.

Course Outcomes:

CO.1. Understanding the evolution and improvement of software economics.

CO.2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.

CO.3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process.

CO.4. Organize Project schedule.

CO.5. Analyse Project Monitoring and Control.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	PEC-Elective-I-B	Project Management	3	2	1	1	7	4

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self-Learning,
C: Credits.
Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment number 3 markseach	Class Test2 (2 best out of 3) 10 markseach	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PEC	PEC-	Project Management	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC- Elective-I-B	Project Management	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO.1. Understanding the evolution and improvement of software economics.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	8
SW	1

SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand Software Economics. **SO1.2** Understand Software Processes **SO1.3** Apply Team Effectiveness	LI1.1. Write down the problem statement for a suggested system of relevance.	**Unit-1.0 Conventional Software Management** 1.1 Evolution of software economics	1. Explain the importance of a project charter in software project management. 2. List and describe the key elements that should be included in a project initiation document.
	LI1.2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system. LI1.3. To perform the function-oriented diagram: Data Flow Diagram (DFD) and Structured chart. LI1.4. To perform the user 's view analysis for the suggested system: Use case diagram.	1.2 Improving software economics 1.3 Reducing product size 1.4 Software processes 1.5 Team effectiveness 1.6 Automation through software environments 1.7 Principles of modern software management	

SW-1 Suggested Sessional Work (SW):

Assignments:

- Discuss the challenges associated with requirements elicitation in software projects.
- Explain the role of a requirements traceability matrix in project management.

CO.2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.

Approximate Hours

Item	Appx Hrs

Cl	13
LI	8
SW	1
SL	1
Total	23

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand software management life cycle and framework **SO2.2** Use various types of artifacts **SO2.3** Demonstrate the checkpoints of process.	1. To draw the structural view diagram for the system: Class diagram, object diagram. 2. To draw the behavioral view diagram: State-chart diagram, Activity diagram 3. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram 4. To perform the implementation view diagram: Component diagram for the system.	**Unit-2.0 Software Management Process** 2.1. Framework 2.2. Life cycle phases 2.3. Inception 2.4. Elaboration 2.5. construction and training phase 2.6. Artifacts of the process 2.7. the artifact sets 2.8. management artifacts 2.9. engineering artifacts 2.10. pragmatics artifacts 2.11. Model based software architectures 2.12. Workflows of the process 2.13. Checkpoints of the process	2. Explain the importance of effective communication in software project management. 3. Discuss strategies for managing and resolving conflicts within a project team.

SW-1 Suggested Sessional Work (SW):

Assignments:

- Describe the change control process in software project management.
- Discuss the challenges associated with implementing changes in the middle of a project.

CO.3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	8
SW	1
SL	1
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of graph and search tree **SO3.2** Use various search algorithms **SO3.3** Apply various search algorithms	LI3.1. To perform the environmental view diagram: Deployment diagram for the system. LI3.2. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system LI3.3. Perform Estimation of effort using FP Estimation for chosen system. LI3.4. To Prepare time line chart/Gantt Chart/PERT Chart for selected software project.	**Unit-3.0 Software Management Disciplines** 3.1. Iterative process planning 3.2. Project organizations and responsibilities 3.3. Process automation 3.4. Project control 3.5. process instrumentation 3.6. core metrics 3.7. management indicators 3.8. life cycle expectations 3.9. Process discriminants 3.10. Fundamentals of Software Project Management.[SPM] 3.11. Project Management Cycle 3.12. SPM objectives, management spectrum	1. Describe the key considerations when allocating resources for a software project. 2 Discuss the impact of resource constraints on project timelines and deliverables.

SW-1 Suggested Sessional Work (SW):

Assignments:

- Explain the role of quality assurance in software development projects.
- Discuss the different types of testing and their importance in ensuring software quality.

CO.4. Organize project schedule.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	2
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
	1. Prepare Project Schedule based on project plan which having following details: • Define project calendar • Define project resources • Specify resource type and resource rates • Assign resources against each task • Baseline the project • Create GANTT chart on your project schedule	**Unit-4: Project Organization and Scheduling Elements** 1.1. WBS and its type 1.2. Project and product life cycle 1.3. Project Schedule, scheduling objectives 1.4. Network Diagrams: PERT, CPM 1.5. Bar charts: Milestone, Gantt 1.6. Interpretation of Earned value Indicators, 1.7. Error tracking 1.8. Software Revies and its type	1 Compare and contrast different project scheduling techniques (e.g., Gantt charts, PERT charts). 2 Discuss the significance of risk management in project planning and provide examples of potential software project risks.

	of your software project		

SW-1 Suggested Sessional Work (SW):

Assignments:

- Discuss the significance of project monitoring and control in software project management.
- Describe key performance indicators (KPIs) that can be used to track project progress.

CO.5. Analyse Project Monitoring and Control

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	4
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Describe Dimensions of project monitoring & control **SO5.2** Discuss SV Schedule Variance **SO5.3** Explain CPI Cost Performance	1. To study project planning and project management tolls 2. To prepare project plan for your software project which having following details. • Specify project name and start (or finish) date. • Identify and define project task. • Define	**Unit-5: Project Monitoring and Control** 5.1. Dimensions of Project Monitoring & Control 5.2. Earned Value Analysis 5.3. Earned Value Indicators: BCWS Budgeted Cost for Work Schedule, 5.4. CV Cost Variance 5.5. SV Schedule Variance 5.6. CPI Cost Performance Index 5.7. SPI Schedule Performance Index	1. Compare traditional project management methodologies with Agile methodologies. 2. Discuss the benefits and challenges of implementing Agile in a software development environment.

	duration for each project task • Define milestone in the plan • Define dependency between tasks		

SW-1 Suggested Sessional Work (SW):

Assignments:

- Outline the steps involved in closing a software project.
- Discuss the importance of conducting a post-project review for continuous improvement.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1. Understanding the evolution and improvement of software economics.	07	08	01	01	17
CO.2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.	13	08	01	01	23
CO.3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process.	12	08	01	01	22

CO.4. Organize Project schedule.	08	02	01	01	12
CO.5. Analyse Project Monitoring and Control.	07	04	01	01	13
Total Hours	47	30	05	05	87

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Conventional Software Management	03	02	03	08
CO-2	Software Management Process	03	01	05	09
CO-3	Software Management Disciplines	03	07	02	12
CO-4	Project Organization and Scheduling Elements	03	05	05	13
CO-5	Project Monitoring and Control	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Project Management will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video

Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)

9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Artificial Intelligence: Structures and strategies forComplex Problem Solving	Luger G.F. and Stubblefield W.A.	Addison Wesley	6th edition 2008
2	Artificial Intelligence: A Modern Approach	Russell S. and Norvig P	Prentice-Hall	3rd Edition 2009
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Artificial Intelligence	Prof. Bhushan Trivedi	GLS University
2.	Artificial Intelligence: Search Methods for Problem Solving	Prof. Deepak Khemani	IIT Madras
3.	Fuzzy Logic and Neural Networks	Prof. Dilip Kumar Parihar	IIT Kharagpur

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
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CO, PO and PSO Mapping

Course Title: B. Tech. (Computer Science & Engineering)
Course Code: PEC- Elective-I-B
Course Title: Project Management

Course Outcomes	Program Outcomes												Program Specific Outcomes				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
	Engineering knowledge	**Problem Analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**					
CO1. Understanding the evolution and improvement of software economics.	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3	3
CO2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3	2
CO3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process.	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3	2
CO4. Organize Project schedule.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2	2
CO5. Analyse Project Monitoring and Control.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO1. Understanding the evolution and improvement of software economics.	SO1.1 SO1.2 SO1.3	LI1.1,LI1.2,LI1.3,LI1.4	**Unit-1.0 Conventional Software Management** 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As Mentioned in Page no. ____to ______
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.	SO2.1 SO2.2 SO2.3	LI2.1,LI2.2,LI2.3,LI2.4	**Unit-2.0 Software Management Process** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process.	SO3.1 SO3.2 SO3.3	LI3.1,LI3.2,LI3.3,LI3.4	**Unit-3.0 Software Management Disciplines** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO4. Organize Project schedule.	SO4.1 SO4.2 SO4.3	LI4.1	**Unit-4: Project Organization and Scheduling Elements** 4.1,4.2,4.3,4.4,4.5,4.6,4.7	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO5. Analyse Project Monitoring and Control.	SO5.1 SO5.2 SO5.3	LI5.11,LI5.2	**Unit-5: Project Monitoring and Control** 5.1,5.2,5.3,5.4,5.5,5.6	

Semester - VI

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VI

Course Code: PCC CS-601

Course Title: Computer Networks

Pre- requisite: Fundamentals of Computer

Rationale: Problem solving skills can help people develop more skills and build Computer Network.

Course Outcome:

CO1. Understand the architecture principles that have enabled the orders of magnitude expansion of the Internet

CO2. Understand networked applications and their protocols, their installation, operation, and performance tuning

CO3. Understand layering as a means of tackling complexity, layering applied to the Internet

CO4. Understand protocols as a structured means of reliable communications

CO5. Be familiar with tools for configuring, monitoring, and tuning the Internet and Hosts.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL)	
ProgramCore (PCC)	PCC CS-601	Computer Networks	3	2+1	2	2	10	5

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL must be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
(PCC)	PCC CS-601	Computer Networks	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PCC CS 601	Computer Networks	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1. Understand the architecture principles that have enabled the orders of magnitude expansion of the Internet

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	2
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding Internet Operations: Gain insights into how the Internet functions, including browsing mechanisms and key terminologies like browsers, web servers, URLs, and IP Addresses. **SO1.2** Grasping Internet Design Principles: Learn about packet switching, store-and-forward networks, and layering for modularity, providing a foundational understanding of Internet architecture. **SO1.3** Exploring Performance Metrics: Familiarize with key performance metrics such as throughput, delay, jitter, and drop rates, crucial for evaluating network efficiency.	LI01.1 Basic fundamental of IP address. How to view IP address using CMD. LI01.2. Different commands to configure IP in other operating systems.	**Unit 1.0: Introduction** 1.1 Introduction to Internet Operations: • Begin by explaining the basic concept of the Internet and its significance in modern communication. • Provide examples to illustrate how data flows from a user's device to a web server when accessing a website. 1.2 Overview of Key Terminologies: • Define essential terms such as browsers, web servers, URLs, domain names, and IP addresses. • Use visual aids or interactive demonstrations to enhance understanding. 1.3 Discussion on Internet Design Principles: • Present the principles of	SL1.0 learn Basics of Computer Fundamental

SO1.4 Mastering DNS and Internet Names: Understand the Domain Name System (DNS) and its role in translating domain names to IP addresses, essential for accessing web resources.		packet switching, circuit switching, and store-and-forward networks. • Discuss the concept of layering and its importance in modularizing network functionality.	
SO1.5 Introduction to Data Link and Wireless Networking: Learn about error detection, medium access protocols, and wireless network fundamentals, including physical layer characteristics and 802.11 architecture. **SO1.4** Understanding Routing Protocols and Internet Architecture: Explore routing protocols, differentiate between intra-domain and inter-domain routing, and gain insights into OSPF and BGP protocols, providing a deeper understanding of Internet infrastructure.. **SO1.5** Utilize lists effectively to store and manipulate collections of data, including performing operations such as appending, extending, slicing, sorting, and reversing. **SO1.6** Explain the characteristics and usage of tuples, including indexing, slicing, and tuple packing/unpacking. **SO1.7** Utilize dictionaries for efficient data storage and		1.4 Interactive Activity on Performance Metrics: • Engage students in a discussion about performance metrics such as throughput, delay, jitter, and drop rates. • Encourage students to brainstorm real-world scenarios where these metrics play a crucial role. 1.5 Hands-On Exercise: DNS and Internet Names: • Introduce the Domain Name System (DNS) and its role in translating domain names to IP addresses. • Guide students through practical exercises to perform DNS lookups and understand the process. 1.6 Group Presentation on Data Link and Wireless Networking: • Divide students into groups and assign each group a topic related to the data link layer or wireless networking. • Encourage groups to research and present their findings, fostering peer learning.	

retrieval, including accessing, adding, modifying, and deleting key-value pairs.		1.7 Case Study Analysis: Routing Protocols and Internet Architecture:	
		• Provide case studies illustrating real-world routing scenarios and challenges. • Facilitate discussions on the role of routing protocols such as OSPF and BGP in maintaining Internet connectivity. 1.8 Practical Demonstration: Internet Traffic Analysis: • Use network monitoring tools to analyze internet traffic flow and packet transmission. • Allow students to observe and interpret the data to gain insights into network performance. 1.9 Role-Play Activity: Simulating Packet Switching vs. Circuit Switching: • Divide the class into groups representing different nodes in a network. • Have students simulate packet switching and circuit switching scenarios to understand the differences in data transmission. 1.10 Quiz on Key Concepts: • Conduct a short quiz to assess students' understanding of fundamental concepts covered in the unit. • Provide immediate feedback	

		to reinforce learning.	
		1.11 Guest Speaker Session: Industry Insights: • Invite a guest speaker from the networking industry to share practical experiences and insights. • Encourage students to ask questions and engage in discussions with the speaker. 1.12 Review and Reflection: • Conclude the unit with a review session, summarizing key concepts and reinforcing learning objectives. • Encourage students to reflect on their learning and identify areas for further exploration.	

SW-1 Suggested Sessional Work (SW):
Assignments:
a. Define and explain the following performance metrics in the context of computer networking: end-to-end throughput, delay, jitter, and drop rates.
b. Discuss the practical implications of each metric on the user experience and network efficiency.

Mini Project:
Network Performance Analysis of Popular Websites

CO2. Understand networked applications and their protocols, their installation, operation, and performance tuning.

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	2
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 Understanding Internet Names and DNS **SO2.2** Application Layer Protocols **SO2.3** Web Applications and their Architecture **SO2.4** Peer-to-Peer Applications and P2P File Distribution **SO2.5** Audio and Video Streaming Challenges	LI02.1 How to Configure static DNS. LI02.2 How to stablish peer to peer connection using CMD.	**Module- 2.0 Application Layer Protocols & Web Applications, P2P, and Streaming Challenges.** 2.1 Emphasize the importance of domain names and URLs. 2.2 Explain DNS and its role in translating domain names to IP addresses. 2.3 Discuss the hierarchical structure of DNS. 2.4 Conduct a hands-on DNS resolution simulation. 2.5 HTTP, SMTP, and SNMP 2.6 HTTP, discussing the request-response model and methods. 2.7 SMTP in email communication. 2.8 SNMP and its role in network management. 2.9 Practical activity analyzing HTTP request.	SL1.0 Enhance the understanding of Internet Protocol (IP) versions, IPv4 and IPv6, and their significance in modern networking.

		2.10 Discussion on HTTPS and its importance in securing web communication. 2.11 Comparison of HTTP/1.1 and HTTP/2 protocols, highlighting differences in performance and efficiency. 2.12 Case study analysis of email server configurations and troubleshooting common SMTP issues.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Identify and explain at least three types of HTTP requests (e.g., GET, POST) and their purposesin the context of the chosen website.

ii. Explain the role of Simple Mail Transfer Protocol (SMTP) in the process of sending andreceiving emails.

b. Mini Project:

i. Web Application Performance Analysis.

CO3. Understand layering as a means of tackling complexity, layering applied to theInternet

Item	AppX Hrs
Cl	13
LI	4
SW	2
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding of Socket Programming **SO3.2** Building a Simple Client-	LI03.1 Socket programming using cisco	**Unit 3 - T Socket Programming &**	**SL 3.1** Proficiency in Linux network

Server Application **SO3.3** Understanding UDP Sockets **SO3.4** Hands-On Linux Network Programming **SO3.5** Discussion on Practical Applications **SO3.**6 Q&A and Problem-Solving Session	socket programming LI03.2 Configure Linux based machine for network testing	**Building a Simple Client-Server Application** 3.1 Socket programming and its role in network communication. 3.2 The fundamental concepts of sockets, including client and server roles. 3.3 The types of sockets and their applications. multi-cycle processor. 3.4 Brief demonstration of a simple socket programming scenario. 3.5 The steps involved in establishing a connection between a client and server. Explanation of TCP and UDP socket programming and their respective use cases.	programming, specifically focusing on socket programming

		3.7 Discussion on the importance of error handling and exception management in socket programming. 3.8 Hands-on lab session on building a multi-threaded server using socket programming. 3.9 Case study analysis of real-world applications using socket programming for network communication. 3.10 Exploration of socket programming libraries in various programming languages such as Python, Java, and C++. 3.11 Practical demonstration of socket programming for peer-to-peer communication. 3.12 Explanation of socket options and configurations for optimizing	

		network performance. 3.13 Group project on developing a collaborative chat application using socket programming.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. The fundamental differences between TCP (Transmission Control Protocol) and UDP (UserDatagram Protocol) in the context of socket programming.

ii. TCP would be more appropriate than UDP and vice versa, considering factors like reliability,connection-oriented nature, and overhead.

b. Mini Project:

Secure Chat Application using Sockets

CO4. Understand protocols as a structured means of reliable communications.

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	2
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
4.1 Understanding of Transport Layer Protocols **SO4.2** Process-to-Process Delivery and Multiplexing **SO4.3** Port Numbers and Header Structure **SO4.4** Reliable Transmission Mechanisms **SO4.5** TCP Connection Setup and Teardown **SO4.6**. Hands-On Exercise:	LI04.1 How to manually configure port numbers using CMD LI04.2 Steps to configure file transfer	**Unit - 4 Transport Layer & Process-to-Process Delivery and Multiplexing.** 4.1 Differentiate between TCP (Transmission Control Protocol) and UDP (User Datagram Protocol).	**SL1.0** Enhance your understanding of the Transport Layer protocols, TCP and UDP, byengaging in self- directed learning activities.

Implementing a Basic TCP Application	protocols.	4.2 The concept of process-to-process delivery facilitated by the transport layer. 4.3 Multiple processes on a host can communicate over a network. 4.4 The concept of multiplexing and its role in transport layer communication. 4.5 Emphasize the role of port numbers in distinguishing different applications. 4.6 The mechanisms used by TCP for reliable communication, including sequence numbers, acknowledgments (ACKs), timeout, and retransmissions. 4.7 Break down the three-way handshake process for TCP connection establishment. 4.8 Address any uncertainties and clarify concepts. 4.9 Ask where students investigate and present a comparison between TCP and UDP in a specific application or use case. 4.10 Discussion on the concept of port forwarding and its	

		implications for network security and application accessibility. 4.11 Exploration of the differences between TCP congestion control and UDP congestion avoidance mechanisms. 4.12 Hands-on lab session on packet sniffing and analysis to understand TCP and UDP packet structures and behaviors	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Packet analyzer tool (e.g., Wireshark) to capture network traffic during a file download, andidentify instances of TCP and UDP packets.

ii. The implications of using TCP or UDP in this specific scenario and how the choice of protocol might impact the overall performance of the file transfer.

b. Mini Project:

Reliable File Transfer Application

CO5. How the data is stored, and input-output is performed in computers.

Item	AppX Hrs
Cl	14
LI	4
SW	2
SL	2
Total	22

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**

SO5.1 Understand about Memory. **SO5.2** Use of flash memory. **SO5.3** learn about I/O and memory mapping. **SO5.4** learn about data transfer techniques. **SO5.5**. learn Limitation of ILP. **SO5.**6 use of SMT processor. **SO5.7** Learn about multicore systems and cache coherence issues	LI05.1 Demonstrate RAID System in different Storage System. LI05.2 Configure Network Drive, Using Linux Bases base system.	**Unit-5.0 Data Link and Wireless Networks** 5.1 Introduction to Storage Technologies: 5.2 Begin by introducing different storage technologies, including magnetic disks and flash memory. 5.3 Explain the fundamental concepts such as tracks, sectors, and the differences between magnetic and flash storage. 5.4 Exploration of I/O Mapping Techniques:	1.Computer Memory
		5.5 Discuss I/O mapped and memory mapped I/O, highlighting their respective advantages and applications. 5.6 Provide examples to illustrate how devices communicate with the CPU using these mapping techniques. 5.7 Understanding I/O Data Transfer Methods: 5.8 Introduce programmed I/O, Interrupt-driven I/O, and Direct Memory Access (DMA) as data transfer techniques.	

		5.9 Explain the mechanisms and trade-offs associated with each method. 5.10 Discussion on Instruction-Level Parallelism (ILP) Limits: 5.11 Explore the limitations of ILP in enhancing processor performance. 5.12 Discuss factors such as dependencies, branch prediction, and instruction scheduling affecting ILP effectiveness. 5.12 Explain RAID configurations and their role	
		in improving data storage performance and reliability. 5.13 Discuss different RAID levels and their characteristics. 5.14 Discuss popular algorithms such as FCFS, SSTF, and SCAN. Use visual aids or simulation tools to enhance understanding.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Write the difference between memory mapped I/O and Isolated I/O.

Ii What is the drawback of programmed I/O method and how it can be resolved by interrupt initiated I/O.

b. Mini Project:

i. Explain asynchronous serial transmission.

c. Other Activities (Specify):

Explain booth multiplication algorithm with the help of example.

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1. Understand the architecture principles that have enabledthe orders of magnitude expansion of the Internet	12	4	2	2	20
CO2. Understand networked applications and their protocols, their installation, operation, and performance tuning	12	4	2	2	20
CO3. Understand layering as ameans of tackling complexity, layering applied to the Internet	13	4	2	2	21
CO4. Understand protocols as astructured means of reliable communications	12	4	2	2	20
CO5. Be familiar with tools for configuring, monitoring and tuning the Internet and hosts	14	4	2	2	22
Total Hours	63	20	10	10	103

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction	03	04	03	10
CO2	Application Layer Protocols & Web Applications, P2P, and Streaming Challenges.	05	03	02	10
CO3	T Socket Programming & Building a Simple Client-Server Application	05	02	03	10
CO4	Transport Layer & Process-to-Process Delivery and Multiplexing.	04	04	02	10
CO5	Data Link and Wireless Networks	03	05	2	10
Total		20	15	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Computer Networks will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,

Twitter, WhatsApp, Mobile, Online sources)

9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	The art of computer systems performance analysis	R. Jain	Wiley India	1991
2	Computer Network	A.S. Tanenbaum and D.J. Wetherall	Pearson	5th edition,2013
3	An Introduction to Queueing Systems	S.K. Bose	Springer Science + Business Media New York	2012

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COs, POs and PSOs Mapping

Program: B. Tech. (Computer Science & Engineering)
Course Code: PCC CS-601
Course Title: Computer Networks

Course Outcomes	**Program Outcomes**												**Program Specific Outcome**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PS0 5**
	Engineering knowledge	**Problem analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-longlearning**	**Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity**	**Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings**	**Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.**	**Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science**	**Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.**
CO1:Understand the architecture principles that have enabled the orders of magnitude expansion of the Internet	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2:Understand networked applications and their protocols, their installation, operation, and performance tuning	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3:Understand layering as a means of tackling complexity, layering applied to the Internet	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4:Understand protocols as a structured means of reliable communications	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5:Be familiar with tools for configuring, monitoring, and tuning the Internet and Hosts.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Understand the architecture principles that have enabled the orders of magnitude expansion of the Internet	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.1 1,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2:Understand networked applications and their protocols, their installation, operation, and performance tuning	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2: Application Layer Protocols & Web Applications, P2P, and Streaming Challenges. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Understand layering as a means of tackling complexity, layering applied to the Internet	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** T Socket Programming & Building a Simple Client-Server Application 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12,3.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Understand protocols as a structured means of reliable communications	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Transport Layer & Process-to-Process Delivery and Multiplexing. 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.1 1,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Be familiar with tools for configuring, monitoring, and tuning the Internet and Hosts.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Data Link and Wireless Networks 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5. 11,5.12,5.13,5.14	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester-VI

Course Code: PCC CS-601

Course Title: Introduction to Cyber Security

Pre-requisite: In order to learn Cyber Security, students must be familiar with the basics of computer science. To understand how to protect information systems from attack, it is necessary to understand how systems work.

Rationale: The objective of this course is to introduce Cyber Security Application of Cyber Security, pattern matching and cluster analysis is included to aware students of broad Cyber Security areas.

Course Outcome:

CO1: Recall the basics of Cyber Security

CO2: Understand the cyber security threat landscape.

CO3: Develop a deeper understanding and familiarity with various types of cyberattacks,Cyber-crimes.

CO4: Analyse and evaluate existing legal framework and laws on cyber security.

CO5: Analyse and evaluate the digital payment system security and remedial measures againstDigital Payment frauds.

Scheme of Studies:

Board of Study	**Course Code**	**Course Title**	**Scheme ofstudies (Hours/Week)**					**Total Credits(C)**
			Cl	**LI**	**SW**	**SL**	**Total Study Hours(CI+LI+SW+SL)**	
Program Core(CS)	PCC CS-601	Introduction to Cyber Security	3	2	2	2	9	4

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.)

SL: Self Learning.

C: Credits.

Note: SW&SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment	Class Test 2 (2 best out of 3)	Seminar one	Class Activity	Class Attendance	Total		
CS	PEC CS-601	Introduction to Cyber Security	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PEC CS 601	Introduction to CyberSecurity	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Recall the basics of Cyber Security

Approximate Hours

Item	AppXHrs
Cl	9
LI	4
SW	2
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Defining Cyberspace and Overview of Computer and Web-technology **SO1.2** Architecture of Cyberspace. **SO1.3** Communication and web technology, Internet, World wide web, **SO1.4** Advent of internet, Internet infrastructure for data transfer and governance **SO1.**5 Internet society, Regulation of cyberspace,	LI 01.1 Checklist for reporting cybercrime at Cyber Crime Police Station. LI 1.2. Checklist for reporting cyber-crime online.	**Module-1.0 Introduction to Cyber security**: 1.1 Defining Cyberspace 1.2 Overview of Computer and Web-technology 1.3 Architecture of cyberspace. 1.4 Communication and web technology 1.5 Internet, World wide web, 1.6 Advent of internet, Internet infrastructure for data transfer and governance 1.7 Internet society, Regulation of cyberspace, 1.8 Concept of cyber security 1.9 Issues and challenges of cyber	1. Learn about Cyber Security.

		security	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Issues and challenges of cyber security

ii. Concept of cyber security

b. Mini Project:

i. Explore common cyber threats such as malware, phishing, ransomware, and DDoS attacks.

c. Other Activities (Specify):

Provide examples and case studies.

CO2: Understand the cyber security threat landscape.

Approximate Hours

Item	AppXHrs
Cl	9
LI	4
SW	2
SL	2
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Classification of cyber crimes, **SO2.2**LearnAbout Common cybercrimes- cyber crime targeting computers and mobiles **SO2.3**UnderstandAbout cyber crime against women and children, financial frauds, **SO2.4** Understand about social engineering attacks, malware and	LI 2.1 Reporting phishing emails. LI 2.2 Demonstration of email phishing attack and preventive measures.	**Module 2.0 Cybercrime and Cyber law** 2.1 Classification of cybercrimes, 2.2 Common cybercrimes- cybercrime targeting computers and mobiles 2.3 cybercrime against women and children, financial frauds, 2.4 social engineering attacks, malware and ransomware	SL1. Students, at the end of this module, should be able to understand the cybercrimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.

ransomware attacks, zero day and zero click attacks, **SO2.5** Cybercriminals modus-operandi , Reporting of cybercrimes, Remedial and mitigation measures, .		attacks, 2.5 zero day and zero click attacks, 2.6 Cybercriminals modus-operandi , Reporting of cybercrimes, 2.7 Remedial and mitigation measures, 2.8 Legal perspective of cybercrime, IT Act 2000 and its amendments. 2.9 Cybercrime and offences, Organizations dealing with Cybercrime and Cyber security in India,	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. define social engineering attacks, malware and ransomware attacks, zero day and zero click attacks.

b. Mini Project:

i. Discuss network security protocols (e.g., SSL/TLS, IPsec).

C .Other Activities (Specify):

Explore firewalls and intrusion detection/prevention systems.

CO3: Develop a deeper understanding and familiarity with various types of cyberattacks,Cyber-crimes.

Approximate Hours

Item	AppXHrs
Cl	9
LI	4
SW	2
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understand about Introduction to Social Networks. **SO3.2** Understand Types of Social media, Social media platforms, **SO3.3**Use of Social media monitoring, Hashtag, Viral content, **SO3.4** Understand about Social media marketing, **SO3.5** Understand about Social media privacy, Challenges, opportunities and pitfalls in online social network	LI 3.1 Basic checklist, privacy and security settings for popular Social media platforms. LI 3.2 Reporting and redressal mechanism for violations and misuse of Social media platforms	**Module-3.0 Social Media Overview and Security** 3.1 Introduction to Social networks. 3.2 Types of Social media, Social media platforms, 3.3 Social media monitoring, Hashtag, Viral content, 3.4 Social media marketing, 3.5 Social media privacy, Challenges, opportunities and pitfalls in online social network **3.6** Security issues related to social media **3.7** Flagging and reporting of inappropriate content, **3.8** Laws regarding posting of inappropriate content, **3.9** Best practices for the use of Social media	SL1. On completion of this module, students should be able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. understand about Flagging and reporting of inappropriate content

b. Mini Project:

i. Explore popular cybersecurity tools (e.g., Wireshark, Nmap, Metasploit).

c. Other Activities (Specify):
Case Study: Provide hands-on examples of tool usage.

CO4: Analyse and evaluate existing legal framework and laws on cyber security. Analyseand evaluate existing legal framework and laws on cyber security.

Approximate hours

Item	AppXHrs
Cl	9
LI	4
SW	2
SL	2
Total	17

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
SO4.1 Understand about R Definition of E-Commerce, Main components of E-Commerce **SO4.2**About Elements of E-Commerce security, E-Commerce threats, **SO4.3**understand about E-Commerce security best practices, **SO4.4**understand to digital payments, Components of digital payment and stake holders,	LI 4.1 Configuring security settings in Mobile Wallets and UPIs. LI 4.2 Checklist for secure net banking.	**Module 4.0 E-Commerce and Digital Payments** 4.1 Definition of E-Commerce, Main components of E-Commerce 4.2 Elements of E-Commerce security, E-Commerce threats, 4.3 E-Commerce security best practices, 4.4 Introduction to digital payments, Components of digital payment and stake holders, 4.5 Modes of digital	1. Understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.

SO4.5 understand about Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments,		payments- Banking Cards, 4.6 Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, 4.7 Digital payments related common frauds and preventive	
		Measures. 4.8 RBI guidelines on digital payments and customer protection in unauthorized banking transactions. 4.9 Relevant provisions of Payment Settlement Act,2007,	

SW-4 Suggested Sessional Work (SW):

a. **Assignments:**

i. Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments,

b. **Mini Project:**

i. Analyze real-world cybersecurity incidents.

c. **Other Activities (Specify):**

Case Study: Explore regulations and compliance requirements.

CO5: Analyse and evaluate the digital payment system security and remedial measuresagainst Digital Payment frauds.

Approximate hours

Item	AppXHrs
Cl	9
LI	14
SW	2
SL	2
Total	27

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O5.1 Understand about End Point device and Mobile phone security, Password policy, **SO5.2** Security patch management, Data backup, Downloading and management of third party software, Device security policy, **SO5.3**understand about Cyber Security best practices, **SO5.4**understand to Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, **SO5.5**understand about Wi-Fi security, Configuration of basic security policy and permissions End Point device and Mobile phone security, Password policy,	LI 5.1. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User). LI 5.2. Setting and configuring two factor authentication in the Mobile phone. LI 5.3. Security patch management and updates in Computer and Mobiles. LI 5.4. Managing Application permissions in Mobile phone. LI 5.5. Installation and configuration of computer Anti-	**Module 5.0 Digital Devices Security , Tools and Technologies** 5.1 End Point device and Mobile phone security, Password policy, 5.2 Security patch management, Data backup, Downloading and management of third party software, Device security policy, 5.3 Cyber Security best practices, 5.4 Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, 5.5 Wi-Fi security, Configuration of basic security policy and permissions End Point device and Mobile phone security, Password policy, 5.6 Security patch	1 Students, after completion of this module will be able to understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

	virus. LI 5.6. Installation and configuration of Computer Host Firewall.	management, Data backup, 5.7 Downloading and management of third party software, Device security policy,	
	LI 5.7. Wi-Fi security management in computer and mobile	5.8 Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, 5.9 Configuration of basic security policy and permissions.	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Recall basics of Cyber security	9	4	2	2	17
CO2: Understand the cyber security Threat landscape.	9	4	2	2	17
CO3: Develop a deeper understanding and familiarity with various types of cyberattacks, cyber-crimes,	9	4	2	2	17

CO4: Analyse and evaluate existing legal framework and laws on cyber Security.	9	4	2	2	17
CO5: Analyse and evaluate	9	14	2	2	27
the digital payment system security and remedial Measures against digital Payment Frauds.					
Total Hours	45	30	10	10	95

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Recall the basics of Cyber Security	05	02	02	09
CO-2	Cybercrime and Cyberlaw	02	03	05	10
CO-3	Social Media Overview and Security.	02	03	06	11
CO-4	E-Commerce and Digital Payments	2	03	05	10
CO-5	Digital Devices Security Tools and Technologies.	-	05	05	10
Total		11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Cyber Security will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

Improved Lecture

1. Tutorial
2. Case Method
3. Group Discussion
4. Role Play
5. Visit to IT Industry.
6. Demonstration
7. ICTBased Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Cyber Crime Impact in the New Millennium,	R. C Mishra	Auther Press. Edition	2010
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Sumit Belapure and Nina Godbole,	Wiley India Pvt. Ltd.	2011
3	Security in the Digital Age: Social Media Security Threats and Vulnerabilities	Henry A. Oliver	Create Space Independent Publishing Platform	2011
4	Cyber Laws: Intellectual Property & E-Commerce Security	Kumar K, Dominant Publishers		
5	Network Security Bible	Eric Cole, Ronald Krutz, James W. Conley	2nd Edition, Wiley India Pvt. Ltd	

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering

Course Code: - PEC CS - 601

Course Title: Introduction to Cyber Security

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Introduction to Cyber security	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO 2: Understand the cyber security threat landscape	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO 3: Develop a deeper understanding and familiarity with various types of cyberattacks ,cyber-crimes,	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO 4: Analyse and evaluate existing legal framework and laws on cyber Security.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**

CO 5: Analyse and evaluate the digital payment system security and remedial measures against digital Payment frauds	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Introduction to Cyber security	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Cyber security 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Cybercrime and Cyber law	SO2.1 SO2.2 SO2.3	Unit-2 : Cybercrime and Cyber law 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
		SO2.4 SO2.5		
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Social Media Overview and Security.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Social Media Overview and Security 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: E-Commerce and Digital Payments	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: E-Commerce and Digital Payments 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5:Digital Devices Security Tools and Technologies.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Digital Devices Security Tools and Technologies 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester-VI

Course Code: RC602

Course Title : Research Methodology and IPR

Pre-requisite: Student should have basic knowledge of research and Statistics.

Rationale: This course will help them to select an appropriate research design. With the help of this course, students will be able to take up and implement a research project/ study. The course will also enable them to collect the data, edit it properly and analyze it accordingly.

Course Outcomes:

RC602.1: Understand research problem formulation.

RC602.2: Analyze research related information and Follow research ethics

RC602.3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

RC602.4: Understanding that when IPR would take such important place in growth of Individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering In particular.

RC602.5: IPR protection incentivizes inventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
RC	RC602	Research Methodology and IPR	3	0	2	1	6	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA + ESA)
PCC	RC602	Research Methodology and IPR	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand research problem formulation.

Approximate Hours

Item	Appx Hrs
Cl	8
LI	0
SW	2
SL	1
Total	11

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Define a research problem **SO1.2** Explain Characteristics of a good research problem **SO1.3** Explain Scope and objectives of research problem **SO1.4** Discuss data collection **SO1.5** Explain analysis, interpretation .	.	**Unit-1 Introduction to Research** 1.1 Meaning of research problem, Sources of research problem 1.2 Criteria Characteristics of a good research 1.3 problem, Errors in selecting a research problem 1.4 Scope and objectives of research problem. 1.5 Approaches of investigation of solutions for research problem 1.6 data collection, 1.7 analysis, interpretation, 1.8 Necessary instrumentations	1. Write a Process of research problem identification

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss about Errors in selecting a research problem

b. Presentation

c. Pictorial representation of different components of computer

CO2: Analyze research related information and Follow research ethics

Approximate Hours

Item	Appx Hrs
Cl	5
LI	0
SW	2
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To Understand Effective literature studies. SO2.2 To learn different approaches. SO2.3 Explain Plagiarism. SO2.4 Explain research ethics.	.	**Unit-2 : Literature Review** 2.1 Effective literature studies 2.2 Approaches, 2.3 analysis 2.4 Plagiarism, 2.5 Research ethics,	1.Write a Review

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) **Write the different approaches of analysis?**
b. **Presentation**
c. **Pictorial representation of different components of research design?**

CO3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3. 1 To understand Effective technical writing, SO3.2 know the Format of research proposal SO3.3 Develop a Research Proposal SO3.4 know about presentation of research proposal SO3.5 To understand the assessment of research		Unit-3: **Research Proposal** 3.1 Effective technical writing, 3.2 How to write report, Paper. 3.3 Developing a Research Proposal, 3.4 Format of research proposal 3.5 presentation 3.6 assessment by a	**i. Design a research proposal**

proposal.		review committee	

SW-2 Suggested Seasonal Work (SW):

a. Assignments:
   (i) Explain writing a project proposal?
b. Presentation
c. Pictorial representation of different components of computer

CO4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand Nature of Intellectual Property **SO4.2** To understand Patents, Designs, Trade and Copyright **SO4.3** Explain the process of patenting **SO4.4** To understand the development of technological research **SO4.5** To Understand Procedure for grants of patents, Patenting under PCT.	.	**Unit-4 : Intellectual Property** 4.1 Nature of Intellectual Property. 4.2 Patents, Designs, Trade and Copyright 4.3 Process of Patenting and Development technological research 4.4 innovation, patenting, development. 4.5 International cooperation on Intellectual Property 4.6 Procedure for grants of patents, Patenting under PC	i. Prepare a intellectual property proposal ii. Draw a classification diagram of RAID

SW-4 Suggested Seasonal Work (SW):

a. Assignments:
b. (i) Write the process of patent design

c. **Presentation**
d. **Pictorial representation of different steps of patent design.**

CO5: IPR protection incentivizes inventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.

Approximate Hours

Item	Appx Hrs
Cl	5
LI	0
SW	2
SL	1
Total	8

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Explain Patent Rights **SO5.2** Discuss Licensing and transfer of technology **SO5.3**Discuss about Patent information and databases **SO5.4** Understand Geographical Indications		**Unit5: IPR protection** 5.1 Patent Rights: 5.2 Scope of Patent Rights 5.3 Licensing and transfer of technology 5.4 Patent information and databases 5.5 Geographical Indications	i. Learn about scope of patent rights

SW-5Suggested Seasonal Work (SW):

a. **Assignments:**
(i) Explain in detail about geographical indications.
b. **Presentation:**
c. **Other Activities (Specify):**
(i) Group discussion of important topics.

CO5: To better products, and in turn brings about, economic growth and social benefits

Approximate Hours

Item	AppXHrs
Cl	7
LI	0
SW	2

SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO6.1 Understand Administration of Patent System **SO6.2** Explain new developments in IPR **SO6.3**Discuss about IPR of Biological Systems, Computer Software etc. **SO6.4** Understand Traditional knowledge Case Studies, IPR and IITs.		**Unit6: New Developments in IPR** 6.1 Administration of Patent System. 6.2 New developments in IPR; 6.3 IPR of Biological Systems, Computer Software etc. 6.4 Traditional knowledge 6.5 Case Studies, IPR and IITs	ii. Learn about IPR

SW-5Suggested Seasonal Work (SW):

a. **Assignments:**
   Write a case study on Patents.
b. **Presentation:**
c. **Other Activities (Specify): Group discussion**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1 Understand research problem formulation	8	2	1	11
CO2 Analyze research related information and Follow research ethics	5	2	1	8
CO3 Understand that today's world is controlled by Computer, Information Technology, but	6	2	1	9

tomorrow world will be ruled by ideas, concept, and creativity.				
CO4 Understanding that when IPR would take such important place in growth of Individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering In particular.	6	2	1	9
CO5 IPR protection incentivizes inventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.	5	2	1	8
Total Hours	30	10	5	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5 and Unit-6	03	02	03	08
Total		15	17	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Research Methodology & IPR will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Data center
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Research Methodology	C R Kothari ,Gaurav Garg	New Age International	2023
2	Research Methodology: Concepts And Cases	Deepak Chawla (Author), Neena Sondhi (Author)	Vikas Publishing House	May 2016

B. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

C. Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science & Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science & Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B.Tech (Computer Science & Engineering)
Course Code: RC602
Course Title: Research Methodology and IPR

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
RC602.1 At the end of this chapter the student will Understand research problem formulation.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
RC602.2 At the end of this chapter the student will Analyze research related information and Follow research ethics	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
RC602.3 At the end of this chapter the student will Understand that today's world	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
RC602.4 At the end of this chapter the student will know about Intellectual Property Right	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
RC602.5 at the end of this chapter the student will Understand that IPR protection	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1** At the end of this chapter the student will Understand research problem formulation.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2** At the end of this chapter the student will Analyze research related information and Follow research ethics	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3** At the end of this chapter the student will Understand that today's world	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4** At the end of this chapter the student will know about Intellectual Property Right	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5** at the end of this chapter the student will Understand that IPR protection	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 5.1,5.2,5.3,5.4,5.5	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

SEMESTER - VI

Course Code:	**PEC- Elective-II-A**
Course Title:	Big Data Analytics
Pre- requisite:	Student should have a basic understanding of data mining, statistics, data visualization and a degree of programming knowledge.
Rationale:	Big data analytics is important because it helps organizations use data to identify new opportunities.

Course Outcome:

CO.1: Understand and apply big data flow to actual projects as well as apply data Analytics life cycle to big data projects.

CO.2: Apply appropriate techniques and tools to solve big data problems.

CO.3: Describe big data and use cases from selected business domains.

CO.4: Explain NoSQL big data management.

CO.5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big dataAnalytics.

Scheme of Studies:

Board of Study	**Course Code**	**Course Title**	**Scheme of studies (Hours/Week)**					**Total Credits (C)**
			Cl	**LI**	**SW**	**SL**	**Total Study Hours (CI+LI+SW+SL)**	
PE	**PEC-Elective-II-A**	**Big Data Analytics**	3	2	1	1	7	4

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

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Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
PC	PEC-Elective-II-A	Big Data Analytics	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PEC-Electi ve-II	Big Data Analytics	35	5	5	5	50	50	100

Course-Curriculum Detailing: This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO.1: Understand and apply big data flow to actual projects as well as apply dataanalytics life cycle to big data projects.

Approximate Hours

Item	AppX Hrs

Cl	9
LI	4
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand about concept of Bigdata **SO1.2** Understand about Traits of Big data **SO1.3** Understand about Challenges of Conventional Systems **SO1.4** Web Data, Evolution of Analytic, Scalability. **SO1.5** Understand about Analysis vs Reporting **SO1.**6 use of Statistical Concepts **SO1.7** Learn about Re-Sampling, Statistical Inference, Prediction Error	LI 1.0 Describe big data and use cases from selected business domains. LI 2.0 Installation of Hadoop Framework, it's components and study the HADOOP Ecosystem.	**Module 1: Introduction to big data** 1.1 Introduction to Bigdata Platform 1.2 Traits of Big data 1.3 Challenges of Conventional Systems 1.4 Web Data, Evolution of Analytic, 1.5 Scalability 1.6 Analysis vs Reporting 1.7 Statistical Concepts: Sampling Distributions 1.8 Re-Sampling, Statistical Inference 1.9 Prediction Error.	1. Learn about different source of data.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. What is difference between structure, unstructured and semi structure data?

ii Explain various challenge associated with big data.

b. Mini Project:

i. N/A

c. Other Activities (Specify):

Quiz, Class Test.

CO.2. Apply appropriate techniques and tools to solve big data problems.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	8
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand about Regression Modelling. **SO2.2** About Multivariate Analysis, Bayesian Modelling. **SO2.3** About Inference and Bayesian Networks **SO2.4** Understand about Vector and Kernel Methods **SO2.5** Analysis of Time Series. **SO2.**6 understand Neural Networks **SO2.7** understand Fuzzy Logic **SO2.**8 about Introduction to R.	LI 2.1 Explain NoSQL big data management. LI 2.1 Installation of R-Studio on windows. LI2.3Perform data visualization using any data. LI.2.4 Perform any two statical operations Using R Programming.	**Module 2: Basic data analysis and data analytic methods using R** 2.1 Regression Modelling 2.2 Multivariate Analysis, Bayesian Modelling 2.3 Inference and Bayesian Networks 2.4 Support Vector and Kernel Methods 2.5 Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics 2.6 Rule Induction 2.7 Neural Networks:	SL1. Learn about basics of data analysis

		Learning and Generalization, Competitive Learning 2.8 Principal Component Analysis and Neural Networks 2.9 Fuzzy Logic: Extracting Fuzzy Models from Data Fuzzy Decision Trees, Stochastic Search Methods. 2.10 Introduction to R, Statistics for Model Building and Evaluation.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Bayesian Networks.

ii Explain challenges of Neural Networks

b. Mini Project:

i. Read Dataset with Pandas.

c. Other Activities (Specify):

Oral Presentation

CO.3. Describe big data and use cases from selected business domains

Approximate Hours

Item	AppX Hrs
Cl	8
LI	8
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Mining Frequent item sets: Market Based Model **SO3.2** Understand about Apriori Algorithm. **SO3.3** Understand about Handling Large Data Sets in Main Memory **SO3.4** Understand about Limited Pass Algorithm **SO3.5** Learn about Counting Frequent item sets in a Stream **SO3.6** understand about different Clustering Techniques	LI 3.1 Install, configure, and run Hadoop and HDFS. LI 3.2 Explain Any two-clustering method with program using any dataset. LI 3.3 Explain Regression method with program using any dataset. LI 3.4 Write a program to implement K-means Clustering algorithm using MapReduce.	**Module-3.0 Frequent item sets and clustering** 3.1 Mining Frequent item sets: Market Based Model 3.2 Apriori Algorithm 3.3 Handling Large Data Sets in Main Memory 3.4 Limited Pass Algorithm 3.5 Counting Frequent item sets in a Stream 3.6 Clustering Techniques: Hierarchical 3.7 K-Means 3.8 Frequent Pattern based Clustering Methods	1. About Clustering 2.Diffrent Types of clustering

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. What are the Requirements of Clustering Data Mining Techniques?
ii. Explain application of clustering.

b. Mini Project:

i. Write a program to implement clustering in R programming.

c. Other Activities (Specify):

Class Test, Quiz

CO.4. Explain NoSQL big data management

Approximate Hours

Item	AppX Hrs
Cl	9
LI	2
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand about Stream Data **SO4.2** About Stream Computing **SO4.3** understand about Sampling Data in a Stream: Filtering Streams, Counting Distinct Elements in a Stream **SO4.4** learn about Estimating Moments, Counting Oneness in a Window **SO4.5** learn about Decaying Window, Real time Analytics Platform (RTAP) Applications **SO4.6** Analysis and case studies	LI.1. Pre-Processes Techniques on Data Set	**Module-4.0 Mining data streams** 4.1 Introduction to Streams Concepts: Stream Data Model and Architecture 4.2 Stream Computing 4.3 Sampling Data in a Stream: Filtering Streams 4.4 Counting Distinct Elements in a Stream. 4.5 Estimating Moments, Counting Oneness in a Window	1. Source of data

		4.6 Decaying Window, Real time Analytics Platform (RTAP) Applications 4.7 Case Studies, 4.8 Real Time Sentiment Analysis, 4.9 Stock Market Predictions	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Explain the real-time analytics platform (RTAP) application.
ii. Case studies - real-time sentiment analysis, stock market predictions.

b. Mini Project:

i. Why the rapid growth of unstructured data is putting greater pressure on businesses. Explain it.

c. Other Activities (Specify):
PowerPoint Presentation

CO.5: Design a database scenario for handling big data.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	8
SW	2
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand about Hadoop **SO5.2** Understand about MapR **SO5.3** Learn about NoSQL Database and Hadoop Distributes File System **SO5.4** Understand about Visual Data Analysis. **SO5.5** Learn about Interaction Techniques **SO5.6** Use of Statistical packages **SO5.7** Understand about Application of Analytics	LI5.1 Perform map-reduce analytics using Hadoop. LI5.2 Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day. LI5.3Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year. LI5.4 Develop a MapReduce program to find the grades of students.	**Module -5.0 Framework, technologies, tools and visualization** 5.1 Map Reduce: Hadoop 5.2 Hive 5.3 MapR, Sharding 5.4 NoSQL Databases: S3, 5.5 Hadoop Distributed File Systems 5.6 Visualizations: Visual Data Analysis Techniques, 5.7 Interaction Techniques; Systems and Analytics Applications. 5.8 Analytics using Statistical packages 5.9 Industry challenges and application of Analytics	1.Big Data

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create Word Count Map Reduce program to understand Map Reduce Paradigm

ii. Implementing Matrix Multiplication with Hadoop Map Reduce.

b. Mini Project:

i. To setup Hadoop.

Other Activities (Specify):

Class Test, Quiz

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand and apply big data flow to actual projects as well as apply data analytics life cycle to big data projects.	9	4	2	1	16
CO2: Apply appropriate techniques and tools to solve big data problems	10	8	2	1	21
CO3: Describe big data and use cases from selected business domains	8	8	2	1	21
CO4: Explain NoSQL big data management	9	2	2	1	14
CO5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics	9	8	2	1	20
Total Hours	45	30	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO.1	Introduction to big data	03	04	03	10
CO.2	Basic data analysis and data analytic methods using R	05	03	02	10
CO.3	Frequent item sets and clustering	05	03	02	10
CO.4	Mining data streams	04	05	01	10
CO.5	Framework, technologies, tools and visualization	03	05	2	10
Total		20	17	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Big Data Analytics will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
1	Analytics in a Big Data World: The Essential Guide to data Science and its Applications	Bart Baesens,	Wiley publications	2014
2	Big Data & Hadoop	V.K. Jain	Khanna Book Publishing Co., Delhi (ISBN 978-93-82609-131)	2005
3	Intelligent Data Analysis",	Michael Berthold, David J. Hand	Springer	2003
4	Mining of Massive Datasets	Anand Rajaraman and Jeffrey David Ullman	Cambridge University Press, 2020.	2020
5	Beginner's Guide for Data Analysis using R Programming	Jeeva Jose	Khanna Book Publishing House, 2019	2019

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Mr. Chandra Shekhar Gautam Assistant Professor, Department of Computer Science and Engineering.
3. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
5. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
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8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: PEC- Elective-II-A

Course Title: Big Data Analytics

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Understand and apply big data flow to actual projects as well as apply data analytics life cycle to big data projects.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	3	1	2
CO 2: Apply appropriate techniques and tools to solve big data problems.	1	1	2	2	1	2	3	1	1	1	2	2	2	2	2	2	3
CO 3: Describe big data and use cases from selected business domains.	2	2	1	1	1	2	2	1	1	1	1	2	2	3	2	2	2
CO 4: Explain NoSQL big data management.	3	2	2	2	3	2	3	1	2	1	2	3	3	3	3	2	2
CO 5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	2	2	3	2	2	3	3	1	1	1	2	2	3	3	1	3	3

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand and apply big data flow to actual projects as well as apply data analytics life cycle to big data projects.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7	LI01.1,LI01.2,LI01.3	Unit-1 Introduction to big data 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Apply appropriate techniques and tools to solve big data problems.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7 SO2.8	LI02.1,LI02.2,LI02.3,LI02.4	Unit-2 : Basic data analysis and data analytic methods using R 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Describe big data and use cases from selected business domains.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	LI03.1,LI03.2,LI03.3,LI03.4	Unit-3 Frequent item sets and clustering 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	

PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Explain NoSQL big data management.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6	LI04.1	Unit-4 Mining data streams 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7	LI05.1,LI05.2,LI05.3,LI05.4	Unit-5 Framework, technologies, tools and visualization 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

Semester-VI

Course Code: **PEC- Elective-II-B**

Course Title: Pattern Recognition & Visual Recognition

Pre-requisite: Basic understanding of Business concepts and Online technologies.

Rationale: This syllabus aims to equip students with a robust foundation in e-commerce, integrating historical context, technological advancements, and critical security considerations for a comprehensive understanding of this dynamic field.

Course Outcomes: After completion of course, students would be able to:

CO1	Understand basic mathematical and statistical techniques commonly used in pattern recognition.
CO2	Apply a variety of pattern recognition algorithms.
CO3	Understand and apply various pre-processing algorithms.
CO4	Apply various algorithms for image classification.
CO5	Assess the use of FCM and soft-computing techniques in pattern recognition

Scheme of Studies:

Board of Study	**Course Code**	**Course Title**	**Scheme of studies (Hours/Week)**					**Total Credits (C)**
			Cl	**LI**	**SW**	**SL**	**Total Study Hours (CI+LI+SW+SL)**	
Program Core (PCC)	PEC-Elective-II-B	Pattern Recognition & Visual Recognition	3	2	2	1	8	4

Legend: **CI**: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PEC- e – II-B	Pattern Recognition & Visual Recognition	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
ES	PEC elective	Electiv Pattern Recognition& Visual Recognition	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand basic mathematical and statistical techniques commonly use-din pattern recognition.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	4
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the basic mathematical concepts to pattern recognition problems. **SO1.2** Analyze the uses and mathematical foundations of pattern recognition, including classification and Bayesian rules. **SO1.3** Differentiate between clustering and classification in the context of pattern recognition. **SO1.4** Apply linear algebra concepts to understand vector spaces in pattern recognition. **SO1.5** Apply eigenvalues and eigenvectors for feature extraction in pattern recognition.	1. Apply mathematical preliminaries and principles of pattern recognition to design and implement a classification algorithm in Python or MATLAB. 2. Use principles of linear algebra and vector spaces to compute eigenvalues and eigenvectors of image datasets, demonstrating their significance in feature extraction and pattern representation.	**Unit-1.0 Introduction and mathematical Preliminaries** 1.1 Basics of mathematical Preliminaries 1.2 Principles of pattern recognition 1.3 Uses, mathematics 1.4 Classification and Bayesian rules 1.5 Clustering vs classification Basics of linear algebra and vector spaces 1.6 Eigen values and eigen vectors 1.7 Rank of matrix and SVD.	1. Explore online resources to deepen understanding of linear algebra concepts relevant to pattern recognition. 2. Investigate real-world applications of pattern recognition, focusing on recent advancements and case studies.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
1. Analyze and implement Bayesian rules for classification in pattern recognition systems.

b. Mini Project:
1. Develop a visual recognition system using clustering techniques, incorporating linear algebra principles.

c. Other Activities (Specify):
1. Participate in group discussions on ethical considerations and societal impacts of pattern recognition technologies.

CO2: Apply a variety of pattern recognition algorithms.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	4
SW	2

SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Define the basics of pattern recognition, including pattern recognition basics and decision theory. **SO2.2** Explain classifiers, discriminant functions, and decision surfaces. **SO2.3** Apply parameter estimation methods and Hidden Markov models in pattern recognition. **SO2.4** Analyze dimension reduction methods, including Fisher discriminant analysis and Principal Component Analysis. **SO2.5** Implement algorithms for clustering, such as K-means and hierarchical methods, in unsupervised learning scenarios.	1. Implement a K-Means Clustering Algorithm for Unsupervised Learning in Pattern Recognition 2. Apply Fisher Discriminant Analysis and Principal Component Analysis for Dimension Reduction in Pattern Recognition.	**Unit-2.0 Pattern Recognition basics** 2.1 Bayesi and Decision theory 2.2 Classifiers and Discriminant functions 2.3 Decision surfaces 2.4 Parameter estimation methods 2.5 Hidden Markov models 2.6 dimension reduction methods 2.7 Fisher discriminant analysis 2.8 Principal component analysis 2.9 non-parametric techniques for density estimation 2.10 non-metric methods for pattern classification 2.11 unsupervised learning 2.12 Algorithms for clustering: K-means, Hierarchical and other methods.	1. Explore fundamental concepts of pattern recognition, including Bayesian and decision theory.

SW-2 Suggested Sessional Work (SW):

a. Assignments:
1. Apply classifiers, discriminant functions, and decision surfaces in practical pattern recognition scenarios.

b. Mini Project:
1. Implement Hidden Markov Models for sequence analysis in a visual recognition project.

c. Other Activities (Specify):
1. Engage in discussions and explore dimension reduction techniques, such as Fisher discriminant analysis and Principal Component Analysis.

CO3: Understand and apply various pre-processing algorithms

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	4
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Recall the importance of feature selection and extraction in addressing real-world problems. **SO3.**2. Comprehend the problem statement and diverse applications of feature selection. **SO3.**3. Implement the Branch and Bound algorithm for efficient feature selection. **SO3.**4. Evaluate the Sequential Forward and Backward Selection methods and the Cauchy Schwartz inequality. **SO3.**5. Assess feature selection criteria functions, focusing on Probabilistic Separability and Interclass Distance.	1. Implement basic pattern recognition concepts, including feature selection, extraction, and problem statement analysis. 2. Apply and compare feature selection methods like Branch and Bound, Sequential Forward and Backward Selection, utilizing Cauchy Schwartz inequality and Feature Selection Criteria functions for Probabilistic Separability and Interclass Distance.	**Unit-3: Basics of Feature Selection** 3.1. Feature Selection 3.2. Extraction 3.3. Problem statement and uses 3.4. Branch and bound algorithm 3.5. Sequential forward 3.6. Backward selection 3.7. Cauchy Schwartz inequality 3.8. Feature selection criteria function: Probabilistic separability based 3.9. Interclass distance based 3.10. Feature Extraction: principles.	1. Investigate the relevance and practical uses of Cauchy-Schwarz inequality in the context of Feature Selection and Extraction in Pattern Recognition.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Explore the application of Branch and Bound algorithm in feature selection for Pattern Recognition, analyzing its efficiency and limitations.

b. Mini Project:

1. Develop a Sequential Forward and Backward Selection algorithm for optimizing feature subsets in a visual recognition system, assessing its impact on classification accuracy.

c. Other Activities (Specify):

1. Implement a mini-project focusing on the development and evaluation of Feature Selection Criteria functions, emphasizing Probabilistic Separability and Interclass Distance based methods.

CO4: Apply various algorithms for image classification.

Approximate Hours

Item	Appx. Hrs.
CI	10
LI	4
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Identify components of human visual recognition: low-level features, mid-level segmentation, and high-level reasoning. **SO4.**2. Explain detection and segmentation methods in visual recognition. **SO4.**3. Apply concepts of context, scenes, and saliency in visual recognition. **SO4.**4. Analyze the significance of large-scale search and recognition in visual processing. **SO4.**5. Evaluate applications of egocentric vision, human-in-the-loop systems, and 3D scene understanding in interactive visual systems.	1. Implement low-level recognition methods by extracting features from images and assess their impact on pattern recognition accuracy. 2. Explore mid-level abstraction techniques by performing image segmentation, and analyze their role in enhancing scene understanding within the context of pattern	**Unit-4: Basics of Visual Recognition:** 4.1 Visual Recognition, Human visual recognition system 4.2 Recognition methods: Low-level modelling (e.g. features) 4.3 Mid-level abstraction (e.g. Segmentation) 4.4 High-level reasoning (e.g. Scene understanding) 4.5 Detection/Segmentation methods 4.6 Context and scenes 4.7 Importance and saliency 4.8 Large-scale search and recognition 4.9 Egocentric vision systems 4.10 Human-in-the-loop interactive systems, 3D scene understanding.	1. Explore foundational concepts of human visual recognition, from low-level features to high-level reasoning, through online resources and academic papers.

	recognition.		

SW-4 Suggested Sessional Work (SW):

a. **Assignments**:

1. Analyze and compare different detection and segmentation methods in the context of visual recognition, emphasizing the importance of context and scenes.

Mini Project:

2. Develop an egocentric vision system with interactive features, integrating low-level modeling and mid-level abstraction for real-world applications.

b. Other Activities (Specify):

1. Conduct a hands-on exploration of large-scale search and recognition techniques, emphasizing the role of human-in-the-loop interactive systems in enhancing 3D scene understanding.

CO5: Assess the use of FCM and soft-computing techniques in pattern recognition

Approximate hours

Item	Appx. Hrs.
Cl	6
LI	4
SW	2
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O5.1. Recall recent advances in Pattern Recognition. **SO5.**2. Comprehend and compare classifier performance metrics. **SO5.**3. Apply basic statistical concepts, including covariance and its properties. **SO5.**4. Examine data condensation, feature clustering, and probability density estimation. **SO5.**5. Develop skills in data visualization, aggregation, and the application of FCM and soft-computing techniques using real-life datasets.	1. Implement classifiers, analyze classification results, and compare metrics such as accuracy, precision, recall, and F1-score. 2. Visualize datasets, calculate covariance matrices, perform feature clustering using techniques like FCM, and interpret results to understand	**Unit 5: Advancements in Pattern Recognition:** 5.1 Recent advancements in Pattern Recognition 5.2 Comparison between performance of classifiers 5.3 Basics of statistics: covariance and their properties 5.4 Data condensation, feature clustering and Data visualization 5.5 Probability density estimation, Visualization and Aggregation 5.6 FCM and soft-computing techniques with Examples of real-life datasets	1. Explore cutting-edge developments in Pattern Recognition through research papers and online resources.

	data patterns.		

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Analyze and compare the performance of various classifiers on a designated dataset, highlighting strengths and weaknesses.

b. Mini Project:

1. Implement a feature clustering algorithm to enhance pattern recognition in a real-world application, showcasing practical problem-solving skills.

c. Other Activities (Specify):

1. Organize a seminar or workshop on the application of FCM (Fuzzy C-Means) and soft-computing techniques in visual recognition, fostering collaborative learning and skill development.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand basic mathematical and statisticaltechniques commonly used in pattern recognition.	7	**4**	2	1	13
CO2: Apply a variety of pattern recognition algorithms.	12	**4**	2	1	19
CO3: Understand and apply various pre-processingalgorithms.	10	**04**	2	1	17
CO4: Apply various algorithms for image classification.	10	4	2	1	17
CO5: Assess the use of FCM and soft-computingtechniques in pattern recognition.	6	**4**	2	1	13
Total Hours	45	**20**	10	5	80

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Introduction and mathematical Preliminaries	03	01	01	05
CO-2	Pattern Recognition basics	02	06	02	10
CO-3	Basics of Feature Selection	03	07	04	14
CO-4	Basics of Visual Recognition	-	10	05	15
CO-5	Advancements in Pattern Recognition	03	02	01	06
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Pattern Recognition & Visual Recognition will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration /Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brain stoarming

Alternative NPTEL/SWAYAM Course (if any):

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Pattern Recognition and Application	Prof. P.K Biswas	IIT Kharagpur
2.	Pattern Recognition	Prof. C.A. Murthy	IIT Madras

Suggested Learning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Pattern Recognition and Machine Learning	Christopher M.Bishop	Springer	2006
2	Pattern Classification :	Richard O. Duda , Peter E. Hart, David G. Stork, Wiley	John Wiley & Sons	2012
3	https://nptel.ac.in/courses/106/106/106106046/			
4	Lecture note provided by Dept.of Computer Science and Engineering, AKS University, Satna.			

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PEC-Elective-II-B
Course Title: Pattern Recognition & Visual Recognition

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Understand basic mathematical and statistical techniques commonly used in pattern recognition.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Apply a variety ofpattern recognition algorithms.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Understand and apply various pre-processing algorithms.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Apply various algorithms for image classification.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5: Assess the use of FCM and soft-computing techniques in pattern recognition.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand basic mathematical and statistical techniques commonly used in pattern recognition.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI.1.1,LI1.2	Unit-1 Introduction and mathematical Preliminaries 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Apply a variety of pattern recognition algorithms.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI.2.1,LI2.2	Unit-2 Pattern Recognition basics 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Understand and apply various pre-processing algorithms.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI3.1,LI3.2	Unit-3 Basics of Feature Selection 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Apply various algorithms for image classification.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1,LI.4.2	Unit-4 Basics of Visual Recognition 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Assess the use of FCM and soft-computing techniques in pattern recognition.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI.5.1,LI5.2	Unit-5 Basics of Visual Recognition 5.1,5.2,5.3,5.4,5.5,5.6	

Semester-VI

Course Code: PCC CS-504

Course Title : Theory of computation

Pre-requisite: Basic knowledge of set theory and its properties.

Rationale: Students will understand fundamental mathematical and computational Principles that are foundations of computer science. They should learn about abstract models of computation, finite representations for languages and gain formal understanding of algorithms and procedures

Course Outcomes:

CO1: Understand models and abstractions: automata as a basic model of computation.
CO2: Students will acquire to represent regular expression and Finite StateAutomata.
CO3: Students will acquire to represent CFL and Pushdown Automata.
CO4: Students will recall Turing machines and the concept of computability, includingDecidability and un-decidability.
CO5: Students will Link between languages, automata, and decision problems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
Program Core (PCC)	**PCC CS-504**	Theory of Computation	3	0+1	2	2	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback

Teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PCC CS-504	Theory of Computation	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand models and abstractions: automata as a basic model of computation.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	3
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Recall the concepts of alphabet strings and languages **SO1.2.** Recognize the automata and its types **SO1.3.** Identify formal languages **SO1.4.** Derive Inductive proofs **SO1.5.** Differentiate NFA and DFA		**Unit-1** **Introduction to Computational Science** 1.1 Definition of Alphabet, String, Language 1.2 Introduction to formal proof 1.3 Introduction to formal proofs continues 1.4 Additional forms of proof, Inductive proofs 1.5 Chomsky Hierarchy for Formal Languages and Automata 1.6 Finite Automata and its Type 1.7 Deterministic Finite Automata(DFA) 1.8 Deterministic Finite Automata(NFA) 1.9 Epsilon – NFA 1.10 Conversion of NFA to DFA 1.11 Conversion of NFA to DFA practice problems 1.12 Conversion Epsilon NFA to NFA 1.13 Conversion Epsilon	1. Study of Set Theory Basics and properties 2. Practice questions on FA.

		NFA to NFA Examples	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
1. Explain Chomsky Hierarchy with example.
2. Practice question of DFA and NFA.
3. Differentiate among NFA, DFA and epsilon NFA

b. Other Activities (Specify):
Seminar and Tutorial

CO2: Student will acquire to represent regular expression and Finite State Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	00
SW	3
SL	2
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. Discuss minimization of Finite automata **SO2.2.** Acquire knowledge of Regular expression and Identities. **SO2.3.** List closure properties of Regular Languages. **SO2.4.** Convert Regular expression to FA and vice versa **SO2.5**. Use of Pumping Lemma to prove language is not Regular		**Unit-2 Regular Expression** 2.1 Minimization of DFA: Equivalence class 2.2 Myhill Nerode Minimization. 2.3 Myhill Nerode Minimization Practice problem 2.4 Regular Expression: Rules and Identities 2.5 Simplification of Regular Expression Using Identities	1. Study of different minimization techniques. 2. Applications of Finite automata and Regular expression.

		2.6 Regular Expression to FA 2.7 FA to Regular Expression Transformation 2.8 Arden's Theorem 2.9 Closure properties of Regular language 2.10 Pumping Lemma for Regular Language 2.11 Pumping Lemma for Regular Language Practice problem	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Pumping Lemma with an example.
2. Discuss Minimization Techniques.
3. Explain closure properties of Regular languages.

b. Other Activities(Specify):

Seminar and Tutorial

CO3: Students will acquire to represent CFL and Pushdown Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	3
SL	2
Total	19

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO3.1. Design PDA for CFL. **SO3.2.** Differentiate DPDA and NPDA. **SO3.3.** Derive Parse Tress and identify Ambiguity in Grammar. **SO3.4.** Use of Pumping Lemma to prove language is not Context Free. **SO3.5.** Equivalence of CFG to PDA and PDA to CFG.		**Unit-3 : Context free Grammar** 3.1 Introduction Context free Grammar 3.2 Parse Trees: Let Most Derivation and Right Most Derivation 3.3 Ambiguities in Context-Free Grammar 3.4 Examples of Ambiguity of Grammar 3.5 Simplification of Grammars 3.6 Removal of Null Production 3.7 Removal of Unit Productions, Removal of Useless Symbols 3.8 Definition of the Pushdown automata 3.9 Languages accepted by Pushdown Automata 3.10 String/Language Acceptability by PDA 3.11 Comparison between Non- Non-deterministic PDA and Deterministic PDA 3.12 Equivalence of CFG to PDA 3.13 Equivalence of PDA To CFG 3.14 Pumping Lemma for CFL	1. Design PDA for different languages. 2.Applications of Derivation trees.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Design PDA for CFLs.
2. Convert CFG to PDA.
3. Differentiate DPDA and NPDA

b. Other Activities(Specify):

Seminar and Tutorial

CO4: Student will recall Turing machines and the concept of computability, includingdecidability and un-decidability.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Design LBA for the Languages **SO4.2.** Design Turing Machine for Languages **SO4.3.** Discuss Types of Turing Machine **SO4.4.** Recognize Decidability and Undesirability and Halting problem of Turing Machine. **SO4.5.** Recall concept of Universal Turing Machine.		**Unit-4 : Linear Bounded Automata and Turing Machine** 4.1 Normal forms for CFG 4.2 CNF and GNF 4.3 Examples on CNF 4.4 Examples on GNF 4.5 Closure Properties of CFL 4.6 Introduction to Turing Machines 4.7 Examples on Turing Machine 4.8 Universal Turing Machine 4.9 Programming Techniques for TM 4.10 Programming Techniques for TM continues	1. Study different Types of Turing Machine 2. Study of different problems which are undecidable

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss CNF with example
2. Discuss different modifications in Turing machine
3. Explain Universal Turing Machine

b. Other Activities(Specify):

Seminar and Tutorial

CO5: **Students will Link between languages, automata, and decision problems.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Recall Halting problem of Turing Machine. **SO5.2.** Differentiate Recursive and Recursively Enumerable Language. **SO5.3.** Identify P class and NP Class Problem. **SO5.4.** Explain post correspondence problem **SO5.5.** Recognize decidable problems and		**Unit 5: Decidability** 5.1 Halting problem of Turing Machine 5.2 Halting Turing Machine 5.3 Recursive languages 5.4 Recursively enumerable languages 5.5 Differentiate recursive And recursively Enumerable languages 5.6 Decidable problems 5.7 Undecidable Problems	1. Study of P and NP class problems 2. Identify Decidable problems
un- Decidable Problem.		5.8 RE Undecidable problems about Turing Machine 5.9 Post's Correspondence Problem 5.10 P class Problems 5.11 NP class problems 5.12 NP Completeness	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Give some examples to explain P and NP class problems.
2. Identify languages which are Recursive.
3. Explain Halting problem in Turing Machine.

b. Other Activities(Specify):
Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand models and abstractions automata as a basic model of computation.	13	3	2	18
CO2: Student will acquire to represent regular expression and Finite State Automata.	11	3	2	16
CO3: Students will acquire to represent CFL and Pushdown Automata.	14	3	2	19
CO4: Student will recall Turing	10	3	2	15
machines and the concept of computability, including decidability and un-decidability.				
CO5: Students will Link between languages, automata, and decision problems.	12	3	2	17
Total Hours	60	15	10	85

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction to Computational Science	05	02	02	09
CO.2	Regular Expression	02	03	05	10
CO3	Context-free Grammars	02	03	06	11
CO4	Linear Bounded Automata and Turing Machine	2	03	05	10
CO5	Decidability	-	05	05	10
Total		11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end-of-semester assessment for Theory of Computation will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	An Introduction to Formal Languages and Automata	Peter Linz	Jones & Bertlet	Sixth edition
2	Introduction to Automata Theory, Languages and Computation	Hopcroft and Ullman	Pearson	Third Edition
3	Theory of Computer Science: Automata, Languages and Computation	Mishra K.L.P	PHI	Third Edition, 2006

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.

3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
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8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering

Course Code: PCC CS-504

Course Title: Theory of Computation

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Understand models and abstractions: automata as a basic model of computation.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO 2: Student will acquire to represent regular expression and Finite State Automata.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO 3: Student will acquire to represent CFL and Pushdown Automata.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO 4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO 5: Students will Link between languages, automata, and decision problems.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand models and abstractions: automata as a basic model of computation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Computational Science 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Student will acquire to represent regular expression and Finite State Automata.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Regular Expression 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Student will acquire to represent CFL and Pushdown Automata.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Context free Grammar 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12,3.13,3.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Linear Bounded Automata and Turing Machine 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Students will Link between languages, automata, and decision problems.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Decidability 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

SEMESTER-VI

Course Code: EEC601

Course Title: Internship

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

The details of COs and LOs are as follows: -

EEC601.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
EEC601.2: - The student will be able to implement the project plan and manage the project.
EEC601.3: - The student will be able to present the complete project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
EEC	EEC601	Internship	0	24	0	0	12	12

Internship option	
• Within India or Abroad (MITACS/DAAD/Any other aligned with GOI schemes) • To enhance hands-on skills (As per NEP-2020) • Refer below options for some suggested Internships.	

Please note the following points pertaining to internship semester:

1. Internship semester is kept as 6th Semester, there is a reason for it. All **International Internships** (List of few such internships provided below), there is a necessary condition that at least one semester study should be left to complete the degree after undertaking that internship. They want students to come back to India and bring cross culture back.

2. For students opting for industry internships also, 6th Semester is a good option, as most of the industries visit for campus placements in 7th Semester. At PEC 6th Semester for all students of all branches there is compulsory internship, industry OR research. Benefit of these internships in 6th Semester is that our 60% students get Pre-Placement Offers (PPO) to join the companies where theyhave undertaken internships. Then they do not appear for Campus Placement interviews, and it becomes a win-win situation for all stakeholders, because companies also do not waste their time and efforts on students who may not join them. Here I want to mention that all types of companies namely a few: Microsoft, Amazon, Deshaw, JP Morgan, Goldman Sach, Maruti, BCG, PWC, TVS, Simens and many more follow the same procedure.

3. A small list of International Fully Funded Internship Programmes (Few of them are especially for Indian Students), Like with MITACS, AICTE has tie-up, with other Programmes also collaborations can be explored**.**

[**To explore tie-ups/collaborations AICTE/MHRD may explore with Indian Origin Academicians working in foreign universities. AICTE have prepared a database of about 25000 Indian Origin Academicians working in US, UK, Australia and Canada as outcome of an on-going DST research project (available on http://ioa-dst.pec.ac.in/)]**.

It is not an exhaustive list:

- USC Summer Internships
- UNIL Summer Undergraduate Research Program
- World Bank Internship
- Petro Jacyk Visiting Scholars Program
- Charles Wallace India Trust Visiting Fellowship
- Google Summer of Code Internship
- RTC Summer Research Program for Undergraduates
- Mitacs Globalink Research Internship
- Charpak – Research Internship Program
- CNIO Summer Training Programme
- Vienna Biocenter Summer School
- Global Challenges Fellowship Program
- Google Site Reliability Engineering Internship
- Balmoral Residential Fellowships

- Nestle Sales Division Internship In USA
- William J. Clinton Fellowship for Indian Students
- American Foreign Service Association (AFSA) Communication Internship
- IST Summer Internship in Austria – Fully Funded Internship in Europe
- DESY Summer Student Program 2020 in Germany
- Japan Summer Internship 2020 in Kashiwa
- CRG Summer Internship 2020 in Barcelona, Spain
- The World Bank Summer Internship Program
- EPFL Summer Research Program 2020 in Switzerland
- Curatorial Internship Program 2020-2021 | Fully Funded Internship in Canada
- CERN Short Term Internship 2020 in Switzerland
- Taiwan International Internship 2020
- RIPS 2020 Summer Internship in the USA
- Echidna Global Scholars Program 2021 in the USA
- Netherlands Government Scholarship 2021 | Fully Funded | Orange Knowledge Programme
- UNIST Undergraduate Scholarship 2021 in South Korea
- Global Intern Program in South Korea 2021 | Fully Funded
- Max Planck Summer Internship in Germany 2021
- CERN Administrative Student Programme 2021 Switzerland – Fully Funded
- Commonwealth Foundation Internship 2021 in the UK
- WHO Internship Program 2021
- University of Tokyo Summer Internship

Semester - VII

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VII

Course Code: PCC CS-602

Course Title : Compiler Design

Pre- requisite: C/C++/Java programming language. Data structures and algorithms. Automata theory

Rationale: Study of this subject will develop knowledge of compiler design concepts like Parsers, Lexical Analysis, Syntax analysis and Semantic analysis. These concepts will help students to understand design of compiles briefly. Students will develop interest to work in new compilers.

Course Outcome:

CO1: To understand the role, functionality and structure of program translation andInterpretationin Software Development

CO2: To understand the difference between abstractions levels of a high level Language and a Machine language

CO3: To understand the role of a sequence of intermediate representations in Lowering the Level ofabstractions in the process of language translation.

CO4: To get a first-hand experience of a practical application of elegant data structures, Algorithms, and Other core CS concepts such as automata theory

CO5: To make effective use of tools such as LEX and YACC

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
Program Core (PCC)	PCC CS-602	Compiler Design	3	2+1	2	2	10	5

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) And Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PCC CS-602	Compiler Design	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)		
			Progressive Assessment (PRA)	End Semester Assessment	Total Marks (PRA+ ESA)

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PCC CS -	CompilerDesign	35	5	5	5	50	50	100

CO1: To understand the role, functionality and structure of program translation andInterpretationin Software development

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
O1.1 understand the high level language and a low level language **SO1.2** Explain phases of compilation **SO1.3** Discuss cross-compilation **SO1.4** Definition Traversing a DFA for recognizing tokens **SO1.5** Explain Generating a lexical analyzerusing LEX/Flex	1.Write 5 simple test-cases in MMC and then inspect the generated code 2. Write a Program to Scan and Count the number of characters, words, and lines in a file.	**Unit-1 Introduction to Compilers**: 1.1 Comparing abstractions of a high level language and a low level language; 1.2 compilation asa series of steps for lowering 1.3 the abstraction level through stepwise refinement; 1.4 phases of compilation; 1.5 bootstrapping; 1.6 cross-compilation 1.7 The role of lexical analysis; 1.8 Token, lexemes, and token codes; 1.9 Regular Expressions (RE) to represent tokens, 1.10 Deterministic finite automata (DFA), 1.11 Traversing a DFA forrecognizing	1.Token, lexemes, and token codes 2.Deterministic finite automata (DFA),

		tokens; 1.12 Generating a lexical analyzer using LEX/Flex.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
1. Regular Expressions (RE) to represent tokens
2. Deterministic finite automata(DFA),
3. Traversing a DFA forrecognizing tokens;

b. Other Activities (Specify): Seminar

CO2: To understand the difference between abstraction levels of a high-levelLanguage and a Machine Language.

Approximate Hours

Item	AppX Hrs
Cl	18
LI	4
SW	2
SL	1
Total	25

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand the Context Free Grammars **SO2.2** To learn Overview of top-down and bottom-up parsing **SO2.3** To lean about viable prefixes and valid items, Constructing LR(0) sets of items **SO2.4** Explain Top-down parsing, Left factoring **SO2.5** Explain parsing, recursive descent parsing	1. Write a laxer to recognize valid tokens. 2. Write a Program to implement NFAs that recognize identifiers, constants, and operators of the mini language	**Unit 2: Syntax Analysis**: 2.1 : Context Free Grammars (CFG), 2.2 : Concept of parsing, sentences and sentential forms, 2.3 : leftmost and rightmost derivations, parse trees, ambiguous grammar 2.4 : Overview of top-down and bottom-up parsing; 2.5 : Introduction to shift reduce parsing; 2.6 : viable prefixes and	1. Generating a parser using a parser generator such as ANTLR 2. leftmost and rightmost derivations, parse trees, ambiguous grammar

		valid items, Constructing LR(0) sets of items; 2.7 : Constructing SLR parsing tables; 2.8 : Generating a parser using a parser generator such as YACC/Bison. 2.9: Top-down parsing, Left factoring, 2.10 : Elimination of left-recursion 2.11 : Practice problems on left recursion removal 2.12 : predictive parsing 2.13 : Examples on predictive parsing 2.14: recursive descent parsing 2.15 : Examples on recursive descent parsing 2.16 : LL (1) parsing and LL(1) parsing table 2.17: String acceptance using LL(1) parsing 2.18: Generating a parser using a parser generator such as ANTLR, Java CC, etc.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:
   i. viable prefixesand valid items, Constructing LR(0) sets of items;
   ii. Generating a parser using a parser generator such as YACC/Bison
   iii. Generating a parser using a parser generator such as YACC/Bison.

b. Other Activities (Specify):
   Seminar

CO3: To understand the role of a sequence of intermediate representations in lowering theLevel of Abstractions in the process of language translation

.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 To Understand semantic analysis **SO3.2** To learn assignment Statements **SO3.3** To understand the attribute evaluation **SO3.4** Explain Applications of SDTS **SO3.5** learn about declaration processing andtype checking	1. Write a parser to parse the given input MMC program 2. Write a C Program to implement DFAs that recognize identifiers, constants, and operators of the mini language	**Unit3: Semantic Analysis:** 3.1The need of semantic analysis 3.2 abstract syntax treesfor expressions, 3.3 assignment Statements 3.4 Examples on assignment Statements 3.5 control flow statements 3.6 attribute evaluation, 3.7 syntax directed translation schemes (STDS); 3.8 Applications of SDTS 3.9 Examples the SDTS 3.10 declaration processing andtype checking, 3.11 generating three-address Code 3.12 Examples on declaration processing	1. abstract syntax treesfor expressions 2. Assignment Statements and control flow statements;

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Applications of SDTS
2. Declaration processing andtype checking
3. Generating three-addresscode

b. Other Activities (Specify):

Seminar

CO4: To get a first-hand experience of a practical application of elegant data structures, Algorithms, and Other core CS concepts such as automata theory

Approximate Hours

Item	AppX Hrs
Cl	10
LI	4
SW	2
SL	1
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Evaluation Parameter passing by value **SO4.2** Understanding the stack and static allocation of activation records **SO4.3** To learn translating a functioncall **SO4.4** To lean about function epilogue **SO4.**5 Discuss call sequence, and return sequence	1. Write a type-checker for a syntactically correct input MMC program 2. Implement the lexical analyzer using Lex, flex or other lexical analyzer-generating tools.	**Unit-4 : Run time support**: 4.1 Parameter passing by value, 4.2 reference, and name 4.3 activation records 4.4 stack and static 4.5 allocation of activation records 4.6 translating a functioncall 4.7 allocating offsets to variables, 4.8 generating code forfunction prologue, 4.9 function epilogue, 4.10 call sequence, and return sequence.	1. stack and static allocation of activation records 2. generating code forfunction prologue

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Stack and static allocation of activation records;
2. Generating code forfunction prologue
3. Call sequence, and return sequence

b. Other Activities (Specify):
Seminar

CO5: To make effective use of tools such as LEX and YACC.

Approximate Hours

Item	AppX Hrs
Cl	08
LI	4
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 To Understand Control flow graphs **SO5.2** Explain Local optimizations **SO5.3** learn this subexpression **SO5.4** To understand assembly codefrom **SO5.5** Explain allocation and instruction selection	1. Generate MIPS code. Use the SPIM simulator to run the code. 2. Design Predictive Parser for the given language	**Unit 5: Introduction to Code:** 5.1 Optimization 5.2 Control flow graphs 5.3 Localoptimizations (common subexpression),copy propagation, 5.4 dead code elimination 5.5 Generating assembly 5.6 codefrom three address codes 5.7 using simple register 5.8 allocation and instruction selection.	1. copy propagation 2. dead code elimination

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Localoptimizations (common subexpression, copy propagation, dead code elimination)
2. Generating assembly codefrom three address codes
3. Allocation and instruction selection

b. Other Activities (Specify):
Seminar

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl +LI)
CO1: To understand the role, functionality and structure of program translation and interpretationin software development.	12	4	02	01	19
CO2:To understand the difference between abstraction levels of a high-level language and a machine language	18	4	02	01	25
CO3: To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the process of language translation	12	4	02	01	19
CO4: To get a first-hand experience of a practical application of elegant data structures, algorithms, and other core CS concepts such as automata theory	10	4	02	01	17
CO5: To make effective use of tools such as LEX and YACC.	08	4	02	01	15
Total Hours	60	20	10	05	95

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Introduction to Compilers**	03	02	03	08
CO-2	**Syntax Analysis**	03	01	05	09
CO-3	**Semantic Analysis**	03	07	02	12
CO-4	**Run time support**	03	05	05	13
CO-5	**Introduction to Code**	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Compiler Design will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S.No.	Title	Author	Publisher	Edition & Year
1	Compilers	Aho, Lam, Sethi, and Ullman	Principles, Techniques, and Tools	2/e, Addison-Wesley, 2006
2	Modern Compiler Implementation in Java	Andrew Appel and Jens Palsberg	Pearson Education India	2/e, Cambridge University Press, 2002.

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PCC CS-602
Course Title: Compiler Design

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: To understand the role, functionality, and structure of program translation and interpretation in software development.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2:To understand the difference between abstraction levels of a high-level language and a machine language	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the process of language translation	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4: To get a first-hand experience of a practical application of elegant data structures, algorithms, and other core CS concepts such as automata theory	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5: To make effective use of tools such as LEX and YACC.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: To understand the role, functionality, and structure of program translation and interpretationin software development.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Compilers 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12,13,14,15,16,17,18 PSO 1,2, 3, 4, 5	CO 2:To understand the difference between abstraction levels of a high-level language and a machine language	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Syntax Analysis 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13,2.14,2.15, 2.16,2.17,2.18	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: To understand the role of a sequence of intermediate representations in lowering the level ofabstractions in the process of language translation	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Semantic Analysis 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10 PSO 1,2, 3, 4, 5	CO 4: To get a first-hand experience of a practical application of elegant data structures,algorithms, and other core CS concepts such as automata theory	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Run Time support 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8 PSO 1,2, 3, 4, 5	CO 5: To make effective use of tools such as LEX and YACC.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Introduction to code 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

Semester-VII

Course Code: PEC Elective III - A

Course Title: Computational Intelligence

Pre-requisite: Completion of foundational coursework in mathematics, including calculus, linear algebra, and probability theory. Additionally, a basic understanding of computer programming concepts and algorithms is required. Familiarity with concepts in artificial intelligence or machine learning is recommended but not mandatory.

Rationale: This course equips students with essential skills in computational intelligence, vital for addressing complex real-world problems. Covering techniques like neural networks, genetic algorithms, and swarm intelligence, it prepares students for careers in research and development across diverse industries.

Course Outcomes:

CO1: Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively.

CO2: Strong Problem-Solving Skills: Graduates will develop adept problem-solving skills using computational intelligence methods.

CO3: Enhanced Critical Thinking and Analysis: Students will sharpen their critical thinking and analytical abilities through the study of computational intelligence concepts.

CO4: Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.

CO5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PEC	PEC Elective III - A	Computational Intelligence	3	0	1	1	5	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, and mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC Elective III - A	Computational Intelligence	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learnin g(SL)
SO1.1 Understanding of Computational Intelligence Concepts: Students will grasp the fundamental concepts of computational intelligence, including its various types and components. **SO1.2** Knowledge of Learning/Training Models: Students will gain insight into learning/training models, distinguishing between parametricand nonparametric models. **SO1.3** Comprehension of Multilayer Networks: Students will understand the architecture and functioning of multilayer networks, including feedforward and feedback networks. **SO1.4** Ability to Identify Appropriate Models: Students will develop the ability to identify and select suitable computational intelligence models for different problem scenarios.		**Unit-1.0 Introduction** 1 Introduction Lecture: Begin with an engaging introductionto Computational Intelligence, highlighting its significance and relevance in various fields. 2 Interactive Discussion: Foster an interactive discussion on the different types and components of Computational Intelligence to ensure students understandthe breadth of the field. 3 Visual Aid Presentation: Utilize visual aids such as diagrams and charts to illustrate the concepts of learning/training models, emphasizing the differences between parametric and nonparametric models. 4 Case Study Analysis: Conduct a case study analysis of real-world examples where multilayer networks, both feedforward and feedback, have been successfully applied, encouraging students to identify patterns and correlations. Group Activity: Divide	1. Explore various resources such as online courses, textbooks, tutorials, documentatio n,and forums related to the topic you want to learn. Choose resources thatsuit your learning styleand preferences. 2. Take advantage of the vast array of online resources available for self-learning, including video tutorials, interactive courses, blogs,and forums.

SO1.5 Application of Computational Intelligence Techniques: Students will be able to apply computational intelligence techniques to solve simple problems and analyze their effectiveness.		students into groups and assign eachgroup a specific computational intelligence model. 5 Have them research and prepare a presentation discussingthe model's architecture, working principles, and applications. Hands-on Lab Session: Organize a hands-on 6 lab session where students can experiment with building simple neuralnetworks using software tools or programming languages like Python. 7 Guest Lecture: Invite a guest speaker who is an expert in Computational Intelligence to share their insights and experiences with the class, providing real-world context and industry perspectives. 8 Problem-Solving Exercise: Present students with a set of problem scenarios and challenge them to identify the most appropriate computational intelligence model to solve each problem, promoting critical thinking and decision-making skills. 9 Formative Assessment: Administer a formative assessment at the end of	

		the unit, comprising multiple- choice questions, shortanswer questions, and 10 problem-solving tasks, to evaluate students' understanding and retention of Unit 1 concepts.	

SW-1 Suggested Sessional Work (SW):

1. **Assignments:**

   1.1. Explain the difference between parametric and nonparametric models in Computational Intelligence. Provide an example of each type and discuss their respective advantages and disadvantages.

   1.2. Discuss the practical applications of multilayer networks, specifically feedforward and feedback networks, in real-world scenarios. Provide at least two examples of each type of network and describe how they are utilized to solve specific problems.

2. **Mini Project:**
   Design and Implementation of a Feedforward Neural Network for Pattern Recognition

CO2: Strong Problem-Solving Skills: Graduates will develop adept problem-solving skills using computational intelligence methods.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understanding Fuzzy Set Theory: Students will grasp the fundamental concepts of fuzzy set theory, including fuzzy sets, membership functions, and operations. **SO2.2** Knowledge of Fuzzy Relations: Students will gain insight into fuzzy relations and their composition, understanding how they model uncertainty and imprecision in real-world data. **SO2.3** Comprehension of Fuzzy Logic: Students will understand the principles of fuzzy logic, including fuzzy rules, inferencing, and the application of fuzzy logic in decision-making systems. **SO2.4** Ability to Design Fuzzy Control Systems: Students will developthe ability to design fuzzy control systems, including the selection of membership functions, fuzzyfication, rule-based design,		**Unit-2.0 Fuzzy System** 2.1 Lecture on Fuzzy Set Theory: Start with a comprehensive lecture on fuzzy set theory, covering concepts such as fuzzy sets, membership functions, and operations. 2.2 Interactive Examples: Use interactive examples to illustrate the concept of fuzzy relations and their composition, encouraging students to participate in discussions and solve problems. 2.3 Fuzzy Logic Demonstration: Conduct a demonstration of fuzzy logic using real-world examples, showing how fuzzy rules and inferencing can be applied to decision-making systems. 2.4 Group Work on Fuzzy Control Design: Divide students into groups and assign each group a specific application domain (e.g., temperature control in a	1. Research and understand advanced topics in fuzzy logic, such as fuzzy control systems and fuzzy inference systems, through online resources, and practical experimentation.

inferencing, and defuzzyfication. **SO2.5** Application of Fuzzy Systems: Students will be able to apply fuzzy systems to solve problems involving uncertainty and imprecision, such as in decision-making, pattern recognition, and control systems.		greenhouse). Have them design a fuzzy control system for their domain, considering factors like membership functions, rules, and defuzzification methods. 2.5 Case Studies: Present case studies showcasing the application of fuzzy systems in various fields such as automotive, robotics, and healthcare. Discuss the challenges faced and the benefits obtained from using fuzzy systems. 2.6 Guest Lecture by an Expert: Invite a guest lecturer who is an expert in fuzzy systems to share their experiences and insights with the class, providing real-world examples and practical advice. 2.7 Hands-on Simulation: Provide students with access to simulation software for designing and simulating fuzzy systems. Guide them through hands-on exercises to create and analyze fuzzy control systems. 2.8 Problem-Solving Scenarios: Present	

		students with problem-solving scenarios involving uncertainty and imprecision, and ask them to devise solutions using fuzzy logic principles. 2.9 Formative Assessment: Administer a formative assessment at the end of the unit, comprising short-answer questions and problem-solving tasks related to fuzzy systems, to evaluate students' understanding and application of fuzzy logic.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1: Design a fuzzy control system for an autonomous vehicle navigating through varying weather conditions. Consider factors such as visibility, road surface conditions, and traffic density. Describe the membership functions, fuzzy rules, and defuzzification method you would use, and explain how your system adapts to different scenarios.

2: You are tasked with developing a fuzzy inference system to assist in medical diagnosis. Choose a specific medical condition (e.g., diabetes, heart disease) and outline the variables and rules needed for the fuzzy inference system. Describe how the system will interpret patient data (e.g., blood sugar levels, cholesterol levels) to provide diagnostic recommendations.

Mini Project Title: "Development of a Fuzzy Logic-Based Smart Thermostat for Energy-Efficient Heating and Cooling"

b. Other Activities (Specify):
NA

CO3: Enhanced Critical Thinking and Analysis: Students will sharpen their critical thinking and analytical abilities through the study of computational intelligence concepts.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding of Basic Genetic Concepts: Students will comprehend the fundamental concepts underlying genetic algorithms, including genes, chromosomes, and populations. **SO3.2** Knowledge of Working Principles: Students will gain insight into the working principles of genetic algorithms, including the process of selection, crossover, and mutation. **SO3.3** Ability to Create		**Unit-3.0 Genetic Algorithms** 3.1 Introduction Lecture on Genetic Algorithms: Start with an introductory lecture covering the basic concepts and working principles of genetic algorithms, including genes, chromosomes, populations, and fitness functions. 3.2 Interactive Example Demonstration: Conduct a demonstration of genetic algorithm operations such as selection, crossover, and mutation using interactive examples or simulations, allowing students to observe how solutions evolve over generations.	1. User definee function and built in function 2. Multiple types of varibales

Offsprings: Students will develop the ability to create offspring solutions through genetic operators such as crossover and mutation, understanding how these operations contribute to the evolution of solutions. **SO3.4** Understanding of Encoding Methods: Students will understand different encoding methods used in genetic algorithms to represent solutions, such as binary encoding, real-valued encoding, and permutation encoding. **SO3.5** Application of Genetic Algorithms: Students will be able to apply genetic algorithms to solve optimization problems in various domains, such as scheduling, routing, and parameter optimization.		3.3 Group Problem-Solving Activity: Divide students into groups and assign each group a different optimization problem to solve using genetic algorithms. Encourage collaboration and discussion among group members to devise effective solution strategies. 3.4 Hands-on Coding Session: Organize a hands-on coding session where students can implement genetic algorithms in a programming language of their choice (e.g., Python, Java). Provide guidance and support as they develop their algorithms to solve predefined optimization problems. 3.5 Guest Lecture by a Practitioner: Invite a guest lecturer who is a practitioner in the field of genetic algorithms to share their insights and experiences with the class, providing real-world examples and practical advice. 3.6 Case Study Analysis: Present case studies showcasing the application of genetic algorithms in various industries, such as	

		engineering, finance, and logistics. Discuss the challenges faced and the benefits obtained from using genetic algorithms in these contexts. 3.7 Critical Evaluation Exercise: Assign students to critically evaluate the effectiveness of genetic algorithms compared to other optimization techniques (e.g., gradient descent, simulated annealing) for solving specific types of problems. Encourage them to consider factors such as solution quality, convergence speed, and computational complexity. 3.8 Mini Project Proposal: Have students propose mini projects where they can apply genetic algorithms to solve optimization problems relevant to their interests or field of study. Provide feedback and guidance to help them refine their project ideas. 3.9 Formative Assessment: Administer a formative assessment at the end of the unit, comprising problem-solving tasks and conceptual questions related to genetic	

		algorithms, to evaluate students' understanding and application of Genetic Algorithms	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

c. Develop a genetic algorithm to solve the Traveling Salesman Problem (TSP). Implement and evaluate its performance in terms of convergence speed and solution quality.

d. Use genetic algorithms to optimize the production schedule of a manufacturing plant. Minimize costs while meeting demand and considering constraints. Evaluate the effectiveness of your approach.

b. Mini Project:

Mini Project Title: "Optimization of Resource Allocation in a Distributed Computing Environment using Genetic Algorithms."

c. Other Activities (Specify):

NA

CO4: Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understanding of Rough Set Theory: Students will comprehend the fundamental concepts of rough set theory,		**Unit-4 Rough Set Theory and Hidden Markov Models** 4.1 Lecture on Rough Set Theory: Begin with a lecture covering the fundamental concepts of	1. Independently research and understand advanced topics in

including set approximation, rough membership, and attribute reduction. **SO4.2** Knowledge of Hidden Markov Models (HMMs): Students will gain insight into the principles of Hidden Markov Models, understanding their structure, states, transitions, and emission probabilities. **SO4.3** Application of Rough Set Theory: Students will be able to apply rough set theory to analyze and process imprecise and uncertain data, such as in feature selection, pattern recognition, and decision-making tasks. **SO4.4** Understanding of HMM Applications: Students will understand the practical applications of Hidden Markov		rough set theory, including set approximation, rough membership, and attribute reduction. 4.2 Interactive Example Demonstration: Conduct an interactive demonstration of rough set theory using practical examples, allowing students to visualize how rough sets are used to handle uncertainty in data. 4.3 Group Activity on Attribute Reduction: Divide students into groups and assign each group a dataset with multiple attributes. Task them with performing attribute reduction using rough set theory and present their findings to the class. 4.4 Hands-on Lab Session on Rough Set Algorithms: Organize a hands-on lab session where students can implement rough set algorithms using software tools or programming languages. Provide guidance as they explore various algorithms and their applications. 4.5 Lecture on Hidden Markov Models (HMMs): Deliver a lecture on the principles of Hidden Markov	rough set theory and Hidden Markov Models by exploring, online resources, and practical examples..

Models in various domains, including speech recognition, bioinformatics, and natural language processing. **SO4.5** Comparison with Other Models: Students will be able to compare and contrast rough set theory and Hidden Markov Models with other computational intelligence techniques, identifying their strengths, weaknesses, and suitable application scenarios.		Models, covering topics such as model structure, states, transitions, and emission probabilities. 4.6 Case Studies on HMM Applications: Present case studies showcasing the practical applications of Hidden Markov Models in speech recognition, bioinformatics, and natural language processing. Discuss the challenges and successes of using HMMs in these domains. 4.7 Group Discussion on HMMs in Real-world Scenarios: Facilitate a group discussion where students analyze real-world scenarios and brainstorm potential applications of Hidden Markov Models. Encourage critical thinking and creativity in exploring novel use cases. 4.8 Guest Lecture by an Expert: Invite a guest lecturer who is an expert in rough set theory or Hidden Markov Models to share their insights and experiences with the class. Provide an opportunity for students to ask questions and engage in discussion. 4.9 Formative Assessment: Administer a formative assessment at the end of	

		the unit, comprising short-answer questions and problem-solving tasks related to rough set theory and Hidden Markov Models, to evaluate students' understanding and application of Unit 4 concepts.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1: Apply rough set theory to analyze a dataset of your choice. Perform attribute reduction and compare the results with the original dataset. Discuss the implications of attribute reduction on data analysis and decision-making processes.

2: Design a Hidden Markov Model (HMM) for a speech recognition system. Define the states, transitions, and emission probabilities based on phonetic features. Implement and evaluate the performance of your HMM using sample speech data. Reflect on the challenges and opportunities of using HMMs in speech recognition applications.

b. Mini Project:

Mini Project Title: "Predictive Maintenance using Hidden Markov Models: An Application in Industrial Equipment Monitoring"

c. Other Activities (Specify):

NA.

CO5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.

Approximate Hour

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding of Swarm Intelligence Concepts: Students will comprehend the fundamental concepts of swarm intelligence, including collective behavior, self-organization, and decentralized control. **SO5.2** Knowledge of Swarm Intelligence Techniques: Students will gain insight into various swarm intelligence techniques, such as Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), and Bee Colony Optimization (BCO). **SO5.3** Application of Swarm Intelligence: Students will be able to apply swarm intelligence techniques to solve optimization problems in diverse domains, including engineering, logistics, and telecommunications. **SO5.4** Analysis of Swarm Intelligence Algorithms: Students will analyze the principles and algorithms behind swarm intelligence techniques, exploring their strengths,		**Unit-5.0 Swarm Intelligence:** 5.1 Lecture on Swarm Intelligence Concepts: Start with a lecture introducing the fundamental concepts of swarm intelligence, including collective behavior, self-organization, and decentralized control. 5.2 Interactive Examples and Demonstrations: Use interactive examples and demonstrations to illustrate swarm intelligence concepts, such as flocking behavior in birds or foraging behavior in ants, fostering engagement and understanding among students. 5.3 Group Activity on Ant Colony Optimization (ACO): Divide students into groups and assign each group a problem to solve using ACO. Encourage them to implement the algorithm and analyze its performance, discussing strategies for parameter tuning and problem-	1. Simple project to demonstrate GUI Bases scripts. **2.** Tkinter module, overview.

weaknesses, and potential applications. **SO5.5** Comparison with Other Optimization Techniques: Students will compare and contrast swarm intelligence techniques with traditional optimization techniques, identifying scenarios where swarm intelligence is particularly effective.		specific adaptations. 5.4 Hands-on Lab Session on Particle Swarm Optimization (PSO): Organize a hands-on lab session where students can implement PSO algorithms using programming languages or simulation tools. Guide them through parameter selection, initialization strategies, and convergence analysis. 5.5 Case Studies on Bee Colony Optimization (BCO): Present case studies showcasing the application of BCO in real-world optimization problems, such as routing optimization in transportation networks or resource allocation in telecommunications systems. Discuss the key insights and lessons learned from these applications. 5.6 Guest Lecture by a Practitioner: Invite a guest lecturer who has practical experience in applying swarm intelligence techniques to share their insights and experiences with the class. Provide opportunities for students to ask questions and engage in	

		discussion. 5.7 Critical Analysis and Discussion: Facilitate a critical analysis and discussion session where students compare and contrast swarm intelligence techniques with traditional optimization methods. Encourage them to evaluate the advantages, disadvantages, and suitability of each approach for different problem domains. 5.8 Problem-Solving Workshop: Organize a problem-solving workshop where students work collaboratively to solve optimization problems using swarm intelligence techniques. Provide guidance and support as they explore different algorithms and solution strategies. 5.9 Formative Assessment: Administer a formative assessment at the end of the unit, comprising problem-solving tasks and conceptual questions related to swarm intelligence, to evaluate students' understanding and application of Unit 5 concepts.	

SW-5 Suggested Sessional Work (SW):
a. Assignments:

1. Design an Ant Colony Optimization (ACO) algorithm to solve the traveling salesman problem (TSP). Implement the algorithm and evaluate its performance in terms of solution quality and convergence speed. Compare your results with other optimization techniques such as genetic algorithms or simulated annealing.

2: Develop a Particle Swarm Optimization (PSO) algorithm to optimize the placement of charging stations for electric vehicles in a city. Consider factors such as population density, traffic flow, and existing infrastructure. Implement the PSO algorithm and analyze the optimal placement of charging stations based on different scenarios and objectives.

b. Mini Project:
"Optimization of Supply Chain Network using Swarm Intelligence Techniques"

1. **Other Activities (Specify):**
NA.

Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1: Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively.	9	0	1	1	11
CO.2: Strong Problem-Solving Skills: Graduates will	9	0	1	1	11

develop adept problem-solving skills using computational intelligence methods.					
CO.3: Enhanced Critical Thinking and Analysis: Students will sharpen their critical thinking and analytical abilities through the study of computational intelligence concepts.	9	0	1	1	11
CO.4: Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.	9	0	1	1	11
CO.5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.	9	0	1	1	11
Total Hours	45	0	5	5	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO.1	Introduction to Computational Intelligence	02	05	01	08
CO.2	Fuzzy Systems	02	03	05	10

CO.3	Genetic Algorithms	02	03	07	12
CO.4	Rough Set Theory and Hidden Markov Models	0	3	7	10
CO.5	Swarm Intelligence	0	05	05	10
Total		06	19	25	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Internet Applications using Java Programming will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	"Computational Intelligence: Concepts to Implementations"	Amit Konar		2014
2	“Computational Intelligence: A Methodological Introduction”	Krzysztof Cios, Witold Pedrycz, and Roman W. Swiniarski		2016
3	"Fundamentals of Computational Intelligence: Neural Networks, Fuzzy Systems, and Evolutionary Computation"	James M. Keller and Derong Liu		2017
4	"Ant Colony Optimization and Swarm Intelligence: 8th International Conference”	Marco Dorigo, Mauro Birattari, and Christian Blum		2012

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Brijesh Kumar Soni, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.
10. Mr. Anurag Garg, Teaching Associate, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: BTech (Computer Science & Engineering)
Course Code: PEC Elective III - A
Course Title: Computational Intelligence

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively. .	2	2	3	3	3	1	1	1	1	1	1	3	2	3	3	1	2
CO 2: Strong Problem-Solving Skills: Graduates will develop adept problem-solving skills using computational intelligence methods.	1	3	2	3	2	2	2	1	1	1	1	3	2	2	2	1	3
CO3: Enhanced Critical Thinking and Analysis: Students will sharpen their critical thinking and analytical abilities through the study of computational intelligence concepts.	2	2	2	3	3	2	1	1	1	1	1	3	1	1	2	2	2
CO 4: Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.	1	2	3	2	3	2	1	1	1	2	1	3	3	3	3	2	2

CO 5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1. Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5.		Unit-1 Introduction to Computational Intelligence 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9.	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Strong Problem-Solving Skills: Graduates will develop adept problem-solving skills using computational intelligence methods.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5.		Unit-2 Fuzzy Systems 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9.	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Enhanced Critical Thinking and Analysis: Students will sharpen their critical thinking and analytical abilities through the study of computational intelligence concepts.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5.		Unit-3 Genetic Algorithms 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9.	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5.		Unit-4 Rough Set Theory and Hidden Markov Models 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9.	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5.		Unit-5 Swarm Intelligence 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9.	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VII

Course Code: PEC Elective – III-B

Course Title : Wireless and Mobile Networks

Pre-requisite: Basic knowledge of Networking is required.

Rationale: Studying this subject will help students develop an understanding of wireless network and MAC layer protocols. Student will also study and understand different wireless protocols, WLANs and different generations of Mobile networks.

Course Outcomes:

CO1: Identify and choose wireless transmission standard, physical layer protocol andMAC layer Protocol on the basis of various network applications. .

CO2: Understand and explain mobile IP and data routing using it. Classify ad hoc networkProtocols

CO3: Understand the TCP protocol for wireless networks and able to do congestion freeTransmission Over wireless networks.

CO4: Understand the major concepts involved in wireless wide-area networks and itsArchitecture.

CO5: Use knowledge of 4G technologies and analyze various smart antenna techniques,Modulation and coding techniques used in 4G technology.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+SW+SL)	
(PEC)	PEC Elective-III-B	Wireless and Mobile Networks	3	0	2	2	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

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SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC Elective-III-B	Wireless and Mobile Networks	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Identify and choose wireless transmission standard, physical layer protocoland MAC layer Protocol on the basis of various network applications.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Remember basics of WLANS **SO1.2** Recall protocall architecture of IEEE802.11 **SO1.3** Differentiate Hiper LAN and Hiper LAN2 **SO1.4** Identify Wireless USB **SO1.5** Discuss use of Zigbee		**Unit-1.0 : WIRELESS LAN:** 1.1 Introduction- WLAN technologies 1.2 IEEE802.11: System architecture 1.3 protocol architecture 1.4 802.11b 1.5 802.11a – Hiper LAN: WATM, BRAN 1.6 HiperLAN2 – Bluetooth Architecture 1.7 WPAN – IEEE 802.15.4 1.8 Wireless USB 1.9 Zigbee, 6LoWPAN 1.10 WirelessHART	1. Study Difference WLAN Technologies 2. Study of WPANs

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Wireless LAN.
2. Discuss WirelessHART.
3. Explain WPAN-IEEE802.15.4

b. Other Activities (Specify):

Seminar and Tutorial

CO2: Understand and explain mobile IP and data routing using it. Classify ad hocnetwork protocols

Approximate Hours

Item	Appx. Hrs.
Cl	08
LI	0
SW	3
SL	2
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Recall mobile IP **SO2.2** Understand agent discovery **SO2.3** Discuss mobile ad-hoc networks **SO2.4** Use of wireless in IOT **SO2.5** Explain mobile IP sessions		**Unit-2: MOBILE NETWORK LAYER:** 2.1 Introduction - Mobile IP: IP packet delivery 2.2 Agent discovery, tunneling and encapsulation 2.3 IPV6-Network layer in the internet 2.4 Mobile IP session initiation protocol 2.5 mobile ad-hoc network 2.6 Routing: Destination Sequence distance vector 2.7 Routing: Destination Sequence distance vector continued 2.8 IoT: CoAP	1. Study of Routing protocols 2.Study of IPV6 Network layer

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Agent Discovery

2. Explain Routing in Wireless Networks
3. Apply Wireless in IOT.

b. Other Activities(Specify):
Seminar and Tutorial

CO3: Understand the TCP protocol for wireless networks and able to docongestion free transmission Over wireless networks.

Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	0
SW	3
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. Recall UTMS Radio access Network **SO3.2.** Explain Core architecture of UTMS **SO3.3.** Discuss Radio Networks **SO3.4.** Explain TD-CDMA **SO3.5.** Explain TD-SCDMA		**Unit-3 : 3G Overview:** 3.1 Overview of UTMS Terrestrial Radio access network 3.2 UMTS Core network Architecture: 3.3 3GPP Architecture 3.4 User equipment 3.5 CDMA2000 overview- Radio and Network components 3.6 Network structure 3.7 Radio Network 3.8 TD-CDMA 3.9 TD – SCDMA	1. Study of user components 2. Study of 3GPP architecture

SW-3 Suggested Sessional Work (SW):

a. Assignments:
1. Give overview of UTMS Radio access Network.
2. Explain TD – CDMA.
3. Explain TD-SCDMA.

b. Other Activities(Specify):

Seminar and Tutorial

CO4: Understand the major concepts involved in wireless wide-area networks andits Architecture.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	3
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Recall Internetworking objectives **SO4.2** Explain session Mobility **SO4.3** Understand GPRS architecture **SO4.4** Understand WLAN architecture **SO4.5** Use of Local Multipoint Distribution Service		**Unit-4: Internetworking between WLANS and WWANS:** 4.1 Internetworking objectives and requirements 4.2 Schemes to connect WLANS and 3G Networks 4.3 Session Mobility 4.4 Internetworking Architecture for WLAN 4.5 Internetworking Architecture for GPRS 4.6 System Description 4.7 Local Multipoint Distribution Service 4.8 Local Multipoint Distribution Service continued 4.9 Multichannel Multipoint Distribution System	1. Study of 3G and GPRS Networks 2. Study of WLANS

SW-4 Suggested Sessional Work (SW):

a. Assignments:
1. Discuss 3G and GPRS Networks.
2. Explain session Mobility.
3. Discuss WLANS.

b. Other Activities (Specify):
Seminar and Tutorial

CO5: Use knowledge of 4G technologies and analyze various smart antennaTechniques, modulation and coding techniques used in 4G technology.

Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	00
SW	3
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Recall the basics of 4G network **SO5.2** Remember features and applications of 4G **SO5.3** Discuss IMS architecture **SO5.4** Explain smart antenna techniques **SO5.5** Explain MVNO		**Unit 5: 4G & BEYOND:** 5.1 Introduction – 4G vision 5.2 4G features and challenges 5.3 Applications of 4G 5.4 4G Technologies: Multicarrier Modulation 5.5 Smart antenna techniques 5.6 IMS Architecture 5.7 LTE 5.8 Advanced Broadband Wireless Access and Services 5.9 MVNO.	1. Study of 4G networks and applications. 2. Explore IMS architecture.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Write features of 4G and LTE.
2. Explain smart antenna technique
3. Explain MVNO.

b. Other Activities (Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Identify and choose wireless transmission standard, physical layer protocol and MAC layer Protocol on the basis of various network applications.	10	3	2	15
CO2: Understand and explain mobile IP and data routing using it. Classify ad hoc network protocols	08	3	2	13
CO3 Understand the TCP protocol for wireless networks and able to do congestion free transmission Over wireless networks.	09	3	2	14
CO4: Understand the major concepts involved in wireless wide-area networks and its architecture.	09	3	2	14
CO5: Use knowledge of 4G technologies and analyze various smart antenna techniques, modulation and coding techniques used in 4G technology.	09	3	2	14
Total Hours	45	15	10	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Wireless Network	4	3	3	10
CO2	Mobile network layer	3	4	3	10
CO3	3G overview	3	3	4	10
CO4	Internetworking between WLANS and WWANS	2	3	5	10
CO5	4G & BEYOND	3	3	4	10
Total		15	16	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for wireless and Mobile Networks will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	"Mobile Communications"	Jochen Schiller	Pearson Education	Second Edition,2012
2	"Wireless Communications and networking"	Vijay Garg	Elsevier	First Edition,2007
3	"Modern Wireless Communications"	Simon Haykin , Michael Moher, David	Pearson Education	First Edition, 2013

		Koilpillai		

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. (Computer Science & Engineering)
Course Code: PEC Elective-III-B
Course Title: Wireless and Mobile Networks

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Identify and choose wireless transmission standard, physical layer protocol and MAC layer Protocol on the basis of various network applications.	3	1	2	2	3	2	3	1	2	1	3	2	2	3	1	2	2
CO2: Understand and explain mobile IP and data routing using it. Classify ad hoc network protocols	2	1	2	2	1	2	3	1	1	1	2	2	2	2	2	2	2
CO3 Understand the TCP protocol for wireless networks and able to do congestion free transmission Over wireless networks.	2	2	1	1	2	2	2	2	1	2	3	3	1	1	2	2	2
CO4: Understand the major concepts involved in wireless wide-area networks and its architecture.	3	2	1	3	3	2	2	1	2	1	3	3	1	3	1	1	2
CO5: Use knowledge of 4G technologies and analyze various smart antenna techniques, modulation and coding techniques used in 4G technology.	2	2	2	1	1	3	3	1	3	1	2	2	2	3	1	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Identify and choose wireless transmission standard, physical layer protocol and MAC layer Protocol on the basis of various network applications.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Wireless Network 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Understand and explain mobile IP and data routing using it. Classify ad hoc network protocols	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Mobile network layer 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Understand the TCP protocol for wireless networks and able to do congestion free transmission Over wireless networks.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 : 3G overview 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Understand the major concepts involved in wireless wide-area networks and its architecture.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Internetworking between WLANS and WWANS 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Use knowledge of 4G technologies and analyze various smart antenna techniques, modulation and coding techniques used in 4G technology.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5: 4G & BEYOND 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

Semester-VII

Course Code: PEC-Elective-IV - A

Course Title: Java Programming

Pre- requisite: Basic knowledge of OOPs and DBMS.

Rationale:

The study of This subject will develop understanding of Java core concepts. Java is an object-oriented language that are being used in many applications. This subject incorporates basic and advanced concepts of JAVA. These all concepts will help students to develop new projects and applications in JAVA

Course Outcomes

CO1: At the end of this chapter the student will explain the core concept of java programming.

CO2: At the end of this chapter the student will use Objects and Classes in programs.

CO3: At the end of this chapter the student will describe the Exception Handling.

CO4: At the end of this chapter the student will know AWT

CO.5: At the end of this chapter the student will know.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
PEC	PEC-Elective IV -A	Java Programming	3	2 + 0	2	2	9	4

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Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number	Class Test 2 (2 best out of 3) 10 marks	Seminar one (SA)	Class Activity any	Class Attendance	Total Marks (CA+CT+S		
PEC	PEC-EIV-A	Java Programming	15	20	5	5	5	50	50	100

Practical

Board of Study	**Couse Code**	**Course Title**	**Scheme of Assessment (Marks)**						
			Progressive Assessment (PRA)					**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	**Viva1 (5)**	**Viva2 (5) (SA)**	**Class Attendance (AT)**	**Total Marks** (CA+CT+SA+ CAT+AT)		

	PEC-EIV-	Java Programming	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: At the end of this chapter the student will explain the core concept of JAVA programming

Item	AppX Hrs
Cl	10
LI	4
SW	3
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand about language and programming paradigm. **SO1.2** Understand about use of Character set **SO1.3** Use of Identifier and keyword **SO1.4** Understand about Data Types **SO1.5** Understand about constant and variable.	LI1.1. Write a program to print the sum and product of digits of an integer. LI 1.2 Write a program to reverse digit of a number. LI1.3 Write a program to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+…… LI 1.4 WAP to compute the sum of the first n terms of the following series S =1-2+3- 4+5…………	**Unit-1.0 Introduction to Java** : 1.1 Introduction 1.2 Features of Object-Oriented Programming (OOP) 1.3 Java Virtual Machine 1.4 Byte Code Data Types 1.5 Variable 1.6 Arrays 1.7 Expressions 1.8 Operators 1.9 Control Statements 1.10 Iteration Statements.	1. Use of algorithms for develop program. 2. Create program in Java use of decision and looping statement.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. Create a program in Java to check the input no is prime or not.
   ii Create a program in Java to print a factorial of given no.

b. Mini Project:
   i. Java Program to Make a Simple Calculator Using switch...case.

c. Other Activities (Specify):
   i. Printing patterns using Java programs

CO2: At the end of this chapter the student will use Array and Function in programs.

Item	AppX Hrs.
Cl	10
LI	3
SW	3
SL	2
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Objects and Classes. **SO2.2** Types of Constructor **SO2.3** Use of function **SO2.4** Understand about call by value and call by reference .	LI02.1 Write a function that checks whether a givenstring is Palindromeor not. Use this function to find whether the string entered by user isPalindrome or not. LI02.2 Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments. LI02.3 Write a program to compute the factors of a given number.	**Unit-2.0 Objects and Classes**: 2.1 Objects and Classes 2.2 Access Control 2.3 Constructor 2.4 Constructor Overloading 2.5 Finalize 2.6 Method Overriding 2.7 Inheritance 2.8 Abstract Class 2.9 Package 2.10 Interfaces.	1. Use of Objects and Classes for develop program. 2. Create program in JAVA use of function.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. Create a program in JAVA to create Constructor.

b. Mini Project:
   i. Program to add two Constructor.

c. Other Activities (Specify):

CO3: At the end of this chapter the student will describe thepointers and DMA.

Item	AppX Hrs.
Cl	12
LI	2
SW	3
SL	2
Total	19

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand about Exception Handling. SO3.2 declaration of Exception Handling SO3.3 Use of Exception Handling with array SO3.4 use Exception Handling with function .	LI 3.1 Write a program that swaps two numbers. LI 3.2 Write a program in which a function is passed address of two variables and then alter its contents.	**Unit-3.0 Exception Handling** 3.1 try, catch, 3.2 throw, 3.3 throws, finally; 3.4 Multithreading 3.5 Thread Life Cycle 3.6 Advantages and Issues 3.7 Thread Synchronization 3.8 Input Streams 3.9 Output Streams 3.10 Object Serialization 3.11 Deserialization 3.12 String Handling.	1. Use Exception Handling. 2. Learn about Multithreading.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
- i. Create a program with exception handling to check the input no is prime or not.
- ii Write Multithreading.

b. Mini Project:
- i. Program to add two Thread.

c. Other Activities (Specify):
NA

CO4: At the end of this chapter the student will know Introduction to AWT

Item	AppX Hrs
Cl	11
LI	2
SW	1
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand about AWT. **SO4.2** AWT function	LI 4.1.Create a Java applet and embed it into an HTML page. LI 4.2.Develop a Java program that showcases the use of component managers like Container and JPanel. LI 4.3.Create a Java program that demonstrates different layout managers such as BorderLayo	**Unit-4.0 Introduction to AWT** 4.1 Programming Layout. 4.2 Component Managers 4.3 Event Handling 4.4 Applet Class 4.5 Applet Life-Cycle. 4.6 Passing. Embedding in HTML. 4.7 Swing Components 4.8 JApplet. 4.9 JButton 4.10 JFrame, etc. 4.11 Sample Swing Programs.	1. Use of AWT. 2. Learn about graphics.

	ut, FlowLayout.		

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i. Implement a Java Swing program that demonstrates the use of different layout managers such as BorderLayout, FlowLayout, and GridLayout.
   ii. Utilize a custom component manager to handle this functionality efficiently.

b. **Mini Project:**
   i. Write a Java applet program that displays a simple animation using the Applet class.

CO5: At the end of this chapter the student will know.

Item	AppX Hrs
Cl	17
LI	2
SW	3
SL	2
Total	24

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about Database Connectivity. **SO5.2** Understand about Collection Classes **SO5.3** Use of Connectivity	LI5.1.WAP to calculate Factorial of a number (i) Using recursion, (ii) Using iteration LI 5.2WAP for call by value and call by reference.	**Unit-5.0 Database Connectivity** 1. Collection. 2. Introduction to Collections. 3. Understanding JDBC Architecture. 4. Establishing Database Connectivity. 5. Working with Connection Interface. 6. Statement Interface Overview. 7. Creating and Executing SQL Statements. 8. Understanding SQL Statements. 9. Working with Result Set.	1. Use of Database Connectivity. 2. JDBC Architecture

		10. Handling Database Queries. 11. Overview of Collection Framework. 12. Exploring Collection Classes. 13. Implementing JDBC Architecture.	
		14. Establishing Database Connections. 15. Executing SQL Statements. 16. Retrieving and Processing Result Sets. 17. Advanced Database Query Handling.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   1. Explain the architecture of JDBC, highlighting its key components and their roles.
   2. Implement a Java program that demonstrates the use of various collection classes such as ArrayList, LinkedList, and HashMap.

b. Mini Project:
   1. Execute SQL statements to insert, update, and delete records from the table.

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

The end-of-semester assessment for JAVA Programming will be held with written examination of 50 marks.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructions(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: At the end of this chapter thestudent will explain the core concept of javaprogramming.	10	4	3	2	19

CO2: At the end of this chapter the student will use Objects and Classes in programs.	10	3	3	2	18
CO3: At the end of this chapter the student will describe the Exception Handling.	12	2	3	2	19
CO4: At the end of this chapter the student will know AWT	11	2	3	2	18
CO5: At the end of this chapter the student will know.	17	2	3	2	24
Total Hours	60	13	15	10	98

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	**U**	**A**	
PEC-EIV-A.1	PEC-EIV01: At the end of this chapter the student will explain the core concept of java programming.	03	04	03	10
PEC-EIV -A.2	PEC-EIV02: At the end of this chapter the student will use Objects and Classes in programs.	05	03	02	10

PEC-EIV-A.3	PEC-EIV03: At the end of this chapter the student will describe the Exception Handling.	05	02	03	10
PEC-EIV-A.4	PEC-EIV04: At the end of this chapter the student will know AWT	04	04	02	10
PEC-EIV-A.5	PEC-EIV05: At the end of this chapter the student will know.	03	05	02	10
Total		20	18	12	50

Legend: R: Remember, U: Understand, A: Apply

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Programming with Java	A Primer E. Balguruswami		Sixth edition
2	Java- The Complete Reference	Patric Naughton, Herbert Schildt		Third Edition

3	Java Programming	John P. Flynt Thomson		2nd Edition

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
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8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PEC-EIV- A
Course Title: JAVA Programming

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: At the end of this chapter the student will explain the core concept of java programming.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2: At the end of this chapter the student will use Objects and Classes in programs.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: At the end of this chapter the student will describe the Exception Handling.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4: At the end of this chapter the student will know AWT	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5: At the end of this chapter the student will know.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Understand models and abstractions: automata as a basic model of computation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Computational Science 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Student will acquire to represent regular expression and Finite State Automata.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Regular Expression 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Student will acquire to represent CFL and Pushdown Automata.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Context free Grammar 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12,3.13,3.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Linear Bounded Automata and Turing Machine 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Students will Link between languages, automata, and decision problems.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Decidability 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VII

Course Code: **PEC-Elective IV-B**

Course Title : Dot Net Programming with VB.Net & ASP.Net

Pre-requisite: Basic knowledge of OOPs and any programming language.

Rationale: The study of This subject will develop an understanding of .Net Technology. This subject incorporates basic and advanced concepts of VB.Net and ASP.Net. These all concepts will help students to develop new projects and applications in .Net Technology.

Course Outcomes:

C01: Understanding of various features of .NET Framework.

C02: Design and develop event-driven GUI applications using VB.NET.

C03: Design and develop software using .net tools.

C04: Web Forms with ASP.NET.

C05: Develop dynamic Web applications using databases in .NET technology.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	(LI+T)	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
PEC	**PEC-EIV-B**	Dot Net Programming with VB.Net & ASP.Net	3	2+0	2	2	9	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	PEC-EIV	Dot Net Programming with VB.Net & ASP.Net	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC-Elective IVB	Dot Net Programming with VB.Net& ASP.Net	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understanding of various features of .NET Framework.

Approximate Hours

Item	Appx. Hrs.
Cl	08
LI	6
SW	2
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Discuss about .net framework. **SO1.2.** Discuss about Common Language Runtime, Common Type System **SO1.3.** Discuss about MSIL, Class Libraries **SO1.4.** Discuss about a Programming, Methods and Events. **SO1.5.** Discuss about a Programming into Visual Studio, IDE of VB.NET **SO1.6.** Discuss about Menu Bar, Toolbar, Project Explorer **SO1.7.** Discuss about Toolbox, Properties	1. Write an ASP.Net program for calculator. 2. Write code to implement combo box control for display city of selected state 3. Write an ASP.Net program for implementation of class.	**Unit-1: .NET Framework** 1.1 NET Framework: Features & Architecture 1.2 Common Language Runtime, Common Type System 1.3 MSIL, Class Libraries. Event Drive 1.4 Programming, Methods and Events. 1.5 Programming into Visual Studio, IDE of VB.NET 1.6 Menu Bar, Toolbar, Project Explorer 1.7 Toolbox, Properties Window, Form	1. Learn about concept of .net programming.

Window, Form Designer, Form Layout **SO1.8.** Discuss about Introduction to VB.NET and C# Applications		Designer, Form Layout, Immediate Window ASP & 1.8 ASP & HTML Forms, Introduction to VB.NET and C# Applications, MsgBox Function**,** InputBox Function, Startup Form	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Framework of .Net with example.
2. Define methods and event.
3. Define toolbar, menu bar in .net.

b. Other Activities (Specify):

Seminar and Tutorial

CO2: Design and develop event-driven GUI applications using VB.NET.

Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	06
SW	2
SL	2
Total	19

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. Understand the concept of Operators, Conditionals **SO2.2.** Discuss about Loops, Statements, Variables, Data Types	1. Write a program to implement MDI. 2. Implementation of dialog boxes. 3. Write C# program to implement	**Unit-2 Visual Basic .NET Language:** 2.1 Operators, Conditionals. 2.2 Loops, Statements, Variables, Data Types 2.3 Arrays and Dynamic	1. Practice the .Net programming with different topics.

SO2.3. Demonstrate the use of Arrays and Dynamic Arrays **SO2.4** Discuss about Operators. Procedures **SO2.5**. Discuss about Exception Handling **SO2.6**. Discuss about Using Resume Next and Resume Line **SO2.7**. Discuss about Using On Error goto **SO2.8**. Discuss about Showing and Hiding Forms, Working with Multiple Forms **SO2.9**. Discuss about Multiple Document Interface (MDI) Applications	operator overloading.	Arrays, 2.4 Operators. Procedures, Scope 2.5 Exception Handling, Creating Functions, Exception Handling, 2.6. Using On Error GoTo, Windows Forms: Loading, 2.7. Showing and Hiding Forms, Working with Multiple Forms, 2.8 Creating Windows Applications, Adding Controls to Forms, Handling Events, 2.9 Multiple Document Interface (MDI) Applications, Dialog Boxes, Controls at Run Time, Mouse Events, Keyboard Events, Beeping, Deploying Applications	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Write a program in vb.net using loop.
2. Describe mouse event in .net.
3. Write a program in vb.net use of operators.

b. Other Activities(Specify):

Seminar and Tutorial

CO3: Design and develop software using .NET tools.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	06

SW	2
SL	2
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of .NET Tools: Control Class, SO3.2 Understand the Text Boxes, Rich Text Boxes, Labels, Link Labels, Buttons, SO3.3 Discuss about the Checkboxes, Radio Buttons, Panels, SO3.4 Discuss about the Group Boxes, List Boxes, Checked List Boxes, SO3.5 Discuss about the Combo Boxes, and Picture Boxes SO3.6 Discuss about the Scroll Bars, Splitters, Track Bars, Pickers, SO3.7 Discuss about the Notify Icons, Tool Tips, and Timers, SO3.8 Discuss about the Menus, Built-in Dialog Boxes, and Printing, Image Lists, SO3.9 Discuss about the Tree and List Views, Toolbars, Status SO3.10 Discuss about the Progress Bars, and Tab Controls	1. Create a web page with use of different validation controls. 2. Write code for ADO connected modal implementation 3. Write code for ADO disconnected modal implementation	**Unit-3: .Net Tools** 3.1 .NET Tools: Control Class. 3.2 Text Boxes, Rich Text Boxes, Labels, Link Labels, Buttons. 3.3 Checkbox Scroll Bars, Splitters, Track Bars, Pickers, Radio Buttons, Panels. 3.4 Group Boxes, List Boxes, Checked List Boxes. 3.5 Combo Boxes, and Picture Boxes. 3.6 Scroll Bars, Splitters, Track Bars, Pickers. 3.7 Notify Icons, Tool Tips, and Timers 3.8 Menus, Built-in Dialog Boxes, and Printing, Image Lists, 3.9 Tree and List Views, Toolbars, Status 3.10 Progress Bars, and Tab Controls.	1. Compare and analyze all tools in .net.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Develop a windows form using label, textbox and button tools.
2. Develop a windows form using picture box and combo box.
3. Develop a windows form using list views

Other Activities (Specify):

Seminar and Tutorial

PEC-IV-0B.3: Web Forms with ASP.NET.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	6
SW	2
SL	2
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1. Understand the concept of Web Forms with ASP.NET: Web Form Controls, **SO4.2.** Discuss about HTML, Web Applications, **SO4.3.** Discuss about Multiform Web Project **SO4.4.** Discuss about Client Events, Title Bar Text, Error Page, **SO4.5.** Discuss about Search Engine Keywords **SO4.6.** Discuss about Embedding Visual Basic Code in Web	1. Write code to implement session state 2. Write code to implement application state 3. Write a program to implement exception handling.	**Unit-4 : Web Forms with ASP.NET** 4.1 Web Forms with ASP.NET: Web Form Controls. 4.2 HTML, Web Applications. 4.3 Multiform Web Project. 4.4 Client Events, Title Bar Text, Error Page. 4.5 Search Engine Keywords. 4.6 Embedding Visual Basic Code in Web Pages, 4.7 Validation Controls 4.8 Calendars. 4.9 Introduction to Windows Services	1. Learn about html, client event, Web services etc. Client event, web services

SO4.7. Discuss about Validation Controls **SO4.8.** Discuss about Calendars. **SO4.9.** Discuss about Introduction to Windows Services **SO4.10.** Discuss about web services.		4.10 Web Services	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss web form controls.
2. Define validation controls.
3. Define web services.

b. Other Activities (Specify):

Seminar and Tutorial

CO5: Develop dynamic Web applications using databases in .NET technology.

Approximate Hours

Item	Appx. Hrs.
Cl	08
LI	04
SW	2
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Understand the concept of Data Access with ADO.NET: Server Explorer Data Adaptors and Datasets, **SO5.2.** Demonstrate the use of ADO.NET Objects, Data Connection **SO5.3.** Discuss about Dragging Tables, Dataset, Data Grid. **SO5.4.** Discuss about Data Adapter Controls, Dataset Schema, **SO5.5.** Discuss about MS Jet Database, Relational Databases **SO5.6.** Discuss about Binding Controls to Databases -- Simple Binding, Complex Binding **SO5.7.** Discuss about Navigating in Datasets, Data Forms. Handling Databases in Code. **SO5.8.** Discuss about Database Access in Web Applications	1. Make a text editor (IDE) using Rich Textbox Control. 2. How design master webpage in own website. How to implement Calendar Control.	**Unit 5: Data Access with ADO.NET** 5.1 Data Access with ADO.NET: Server Explorer Data Adaptors and Datasets, 5.2 ADO.NET Objects, Data Connection, 5.3 Dragging Tables, Dataset, Data Grid 5.4 Data Adapter Controls, Dataset Schema 5.5 MS Jet Database, Relational Databases 5.6 Binding Controls to Databases – Simple and Complex Binding, 5.7 Navigating in Datasets, Data Forms. Handling Databases in Code. 5.8. Database Access in Web Applications	1. learn through practically database connectivity and use in software development

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Define dataset and dataadapter.
2 How to bind controls with database?
3. Explain Simple and Complex Binding.

b. Other Activities(Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory instruction(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+LI+SW+Sl)
CO1: Understanding of various features of .NET Framework .	08	6	02	02	18
CO2: Design and develop event-driven GUI applications using VB.NET	09	6	02	02	19
CO3: Design and develop software using .net tools.	10	6	02	02	20
CO4 Web Forms with ASP.NET.	10	6	02	02	20
CO5: Develop	08	4	02	02	16

dynamic Web applications using databases in .NET technology					
Total Hours	45	28	10	10	93

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	. NET Framework	03	02	03	08
CO-2	Visual Basic .NET Language:	03	01	05	09
CO-3	.NET Tools	03	07	02	12
CO-4	Web Forms with ASP.NET	03	05	05	13
CO-5	Data Access with ADO.NET	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end-of-semester assessment for Dot Net Programming with VB.Net & ASP.Net will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	VB.Net Programming- Black Book	Steven Holzner	Dreamtech Publications	6th edition 2008

2	Mastering VB.Net	Evangelos Petroutsos	BPB Publications	3rd Edition 2009

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PEC-IV-B
Course Title: Dot Net Programming with VB.Net & ASP.Net

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: . NET Framework.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2: Visual Basic .NET Language	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: .NET Tools	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4: Web Forms with ASP.NET	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO 5: Data Access with ADO.NET.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 1: Understanding of various features of .NET Framework	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8	Unit-1: NET Framework: 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Design and develop event-driven GUI applications using VB.NET	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7 SO2.8 SO2.9	Unit-2 : Visual Basic .NET Language: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 3: Design and develop software using .net tools.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7 SO3.8 SO3.9 SO3.10	Unit-3 **:** .NET Tools 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10	

PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 4: Web Forms with ASP.NET.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6 SO4.7 SO4.8 SO4.9 SO4.10	Unit-4: Web Forms with ASP.NET 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 5: Develop dynamic Web applications using databases in .NET technology	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7 SO5.8	Unit-5 : Data Access with ADO.NET 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

SEMESTER-VII

Course Code: OEC-I-A

Course Title: Data Mining & Warehousing

Pre-requisite: Student should have a basic understanding of Databases, Probability.

Rationale: Study of this subject will develop understanding about data and how to get insights from the data. Many E- commerce companies are using Data Mining to take insights from data. And this information from data is very useful for them. Students will learn data mining concepts by learning this subject.

Course Outcome:

CO1: Student should understand the value of Historical data and data mining in solving real-world Problems.

CO2: Student should become affluent with the basic Supervised and unsupervised learning Algorithms.

CO3: Student develops the skill in using data mining for solving real-world problems.

CO4: Understand the fundamental concepts of supervised learning and classification

CO5: Understand the foundational concepts of clustering and association rule mining.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
OEC	OEC-01 - A	Data Mining & Warehousing	3	0	1	1	5	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others)

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.)

SL: Self Learning

C: Credits

Note: SW&SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/HomeAssignment5number3 marks each (CA)	Class Test2 (2bestout Of3) 10 marks each (CT)	Seminar one (SA)	Class Activity anyone (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
PCC	OEC-01-A	Data Mining & Warehou	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1. Student should understand the value of Historical data and data mining in solving real-world problems.

Approximate Hours

Item	Appx Hrs.
CI	9
LI	0
SW	2
SL	1

Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1.Understand Data Warehousing Fundamentals. SO1.2.Comprehend Data Preprocessing Techniques. SO1.3.Explore Data Warehouse Design Principles. SO1.4.Learn Data Warehouse Implementation Strategies. SO1.5.Introduction to Pattern Warehousing.		**Module-1.0 Data Warehousing Introduction**: 1.1 Data Warehousing: Introduction, 1.2 Delivery Process, Data warehouse Architecture, 1.3 Data Preprocessing: Data cleaning, Data Integration and transformation, 1.4 Data reduction. Data warehouse 1.5 Design: Data ware house schema, 1.6 Partitioning strategy Data warehouse Implementation, 1.7 Data Marts, Meta Data, 1.8 Example of a Multidimensional Data model. 1.9 Introduction to Pattern Warehousing.	1. Learn about DBMS.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
i. Pre-Processes Techniques on Data Set
ii. Pre-process a given dataset based on Handling Missing Values
b. Mini Project:
i. Build Data Warehouse and Explore WEKA

c. Other Activities (Specify):

Perform data preprocessing tasks and demonstrate performing association rule mining on data sets

CO2: Student should become affluent with the basic Supervised and unsupervised learning algorithms.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Understand the basic concepts of OLAP systems. SO2.2. Learn about OLAP queries and their importance in data analysis. SO2.3. Identify different types of OLAP servers and their functionalities. SO2.4. Explore various OLAP operations and their roles in multidimensional data analysis. SO2.5. Gain insight into data warehouse hardware and operational design principles, focusing on security, backup, and recovery.		**Unit 2.0 OLAP Systems** 2.1. Basic concepts, 2.2. OLAP queries, 2.3. Types of OLAP servers 2.4. OLAP operations etc. 2.5. Data Warehouse Hardware and Operational 2.6. Security measures in data warehousing 2.7. Design: Security, Backup 2.8. And Recovery 2.9. Operational design considerations for efficient data warehouse management	SL1. Learn about OLAP operations

SW-2 Suggested Sessional Work (SW):

a. Assignments:
b. Demonstrate performing classification on data sets
c. Mini Project:
i. Demonstrate performing clustering on data sets
d. Other Activities (Specify):

Demonstrate performing Regression on data sets

CO3 Student develops the skill in using data mining for solving real-world problems.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1. Understand different data types and their significance in data mining. SO3.2. Evaluate the quality ofdata and the importance of preprocessing for effective analysis. SO3.3. Apply similarity measures and summary statistics to analyze and understand data distributions. SO3.4. Identify basic data mining tasks and their objectives in extracting useful patterns from data. SO3.5. Differentiate between data mining and knowledge discovery in databases and recognize the key issues in data mining.		**Module-3.0 Mining Data Streams** **3.1** Mining Data Streams **3.2** Methodologies for stream data processing and stream data systems **3.3** Frequent pattern mining in stream data **3.4** Sequential Pattern Mining in Data Streams **3.5** Classification of dynamic data streams **3.6** Class Imbalance Problem **3.7** Web Mining, Mining the web page layout structure ,Mining web link structure **3.8** Mining multimedia data on the web **3.9** Automatic classification of	1. Mining Data Streams

		web documents and web usage mining, Distributed Data Mining	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

One type of model that you can create is a Decision Tree -train a Decision Tree 14using the complete dataset as the training data. Report the model obtained after training.

b.Mini Project:

One approach for solving the problem encountered in the previous question is using 21cross-validation? Describe what is cross -validation briefly. Train a Decision Tree again using cross - validation and report your results. Does your accuracy increase/decrease? Why?

c. Other Activities (Specify):

Case Study: Create Placement. ariffile to identify the students who are eligible for placements using KNN

CO4: Understand the fundamental concepts of supervised learning and classification

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1.Understand the fundamental concepts of supervised learning and classification. SO4.2.Differentiate between various types of classification algorithms, including statistical-based, distance-based, decision tree-based, neural network-based, rule-based, and probabilistic classifiers. SO4.3.Identify the strengths and weaknesses of each classification algorithm type.		**Module 4.0 Supervised Learning** 4.1 Supervised Learning: Classification: 4.2 Statistical-based algorithms, 4.3 Distance-based algorithms, 4.4 Decision tree-based algorithms, 4.5 Neural network-based algorithms, 4.6 Rule-based algorithms,	1. Learn about Source of data

SO4.4.Gain practical experience in implementing classification algorithms using programming languages like Python or R. SO4.5.Evaluate the performance of classification models using appropriate evaluation metrics and understand how to select the most suitable		4.7 Probabilistic Classifiers 4.8 Evaluation Metrics for Classification Models 4.9 Implementation of Classification Algorithms	
algorithm for a given problem.			

SW-4: Suggested Sessional Work (SW):

a. Assignments:

All businesses have both structured and unstructured data explain it.

b. Mini Project:

Why the rapid growth of unstructured data is putting greater pressure on businesses. Explain it.

c. Other Activities (Specify):

Case Study: Create Student. Ariff file to suggest better college using Decision tree.

CO5: Understand the foundational concepts of clustering and association rule mining.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO5.1.Understand the principles and techniques of clustering and association rule mining. SO5.2.Differentiate between hierarchical and partitional clustering algorithms and their applications. SO5.3.Gain proficiency in implementing clustering algorithms like BIRCH, DBSCAN, and CURE for handling large databases. SO5.4.Learn about parallel and distributed algorithms for association rule mining, including Apriori and FP growth. SO5.5.Apply clustering and association rule mining algorithms to real-world datasets to extract valuable insights and patterns.			**Module 5.0 Clustering & Association Rule mining** 5.1. Clustering & Association Rule mining 5.2. Hierarchical algorithms, 5.3. Partitional algorithms, 5.4. Clustering large databases – BIRCH, DBSCAN, 5.5. CURE algorithms. 5.6. Association rules: Parallel 5.7. and distributed algorithms 5.8. such as Apriori and 5.9. FP growth algorithms.	1. Learn about Clustering & Association Rule mining

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Student should understand the value of Historical data and data mining in solving real-world problems.	9	2	1	12
CO.2: Student should become affluent withthe basic Supervised and unsupervised learning algorithms.	9	2	1	12
CO3: Student develops the skill in usingdata mining for solving real-world problems.	9	2	1	12
CO4: Understand the fundamental concepts of supervised learning and classification	9	2	1	12
CO5: Understand the foundational conceptsof clustering and association rule mining.	9	2	1	12
Total Hours	45	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Data warehousing introduction	05	03	02	10
CO2	OLAP Systems	05	03	02	10
CO3	Mining Data Streams	05	03	02	10
CO4	Supervised Learning	05	03	02	10
CO5	Clustering & Association Rule mining	05	03	02	10
Total		25	15	10	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Data Mining & Warehousing will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Data Mining Concepts and Techniques	Jiawei Hanand MKamber	Elsevier Publication	2011

2	Introduction to Data Mining	Vipin Kumar, Michael Steinbach	Addison Wesley	2006
3	Sequence Data Mining	G Dong and J Pei	Springer	2007

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: OEC-01 - A
Course Title: Data Mining & Warehousing

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Student should understand the value of Historical data and data mining in solving real-world problems.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Student should become affluent with the basic Supervised and unsupervised learning algorithms.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Student develops the skill in using data mining for solving real-world problems.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Understand the fundamental concepts of supervised learning and classification	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5: Understand the foundational concepts of clustering and association rule mining.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	Cos No.&Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO1,2,3,4,5	CO1: Student should understand the value of Historical data and data mining in solving real-world problems.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 Data Warehousing 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in Page number _to_
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO1,2,3,4,5	CO2: Student should become affluent with the basic Supervised and unsupervised learning algorithms.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 OLAP Systems 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9	
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO1,2,3,4,5	CO3: Student develops the skill in using data mining for solving real-world problems.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 Introduction to Data& Data Mining 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO1,2,3,4,5	CO4: Understand the fundamental concepts of supervised learning and classification	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Supervised Learning: 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO1,2,3,4,5	CO5: Understand the foundational concepts of clustering and association rule mining.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-5 Clustering & Association Rule mining: 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VII

Course Code: OEC-II - B

Course Title : Current trends and technology

Pre-requisite: Basic knowledge of HTML, CSS and JAVASCRIPT.

Rationale: Studying this subject will help students develop an understanding of current technologies such as Blockchains, ReactJS, NodeJS, Express, and MongoDB. By learning about these technologies, students will gain insights into how various industries are using them for their products and what the current demand is. As industries are seeking full-stack developers in this era of rapid technological advancement, this study will help students become industry-ready.

Course Outcomes:

CO1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits andCryptographic use in cryptocurrency.

CO2: Use of JAVAScript knowledge to learn different types of new Frameworks available ina market that are also current industry need.

CO3: Develop client-server connectivity with the use of Node JS and use of Express frameworks.

CO4: Develop algorithms for text processing applications and Dynamic programming Applications.

CO5: Design Web applications using MongoDB database with NodeJS Technology in Backend.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
OEC	OEC-II - B	Current trends and technology	3	0	2	2	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different

instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
OEC	OEC-E01-B	Current trends and technology	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Understand Concepts of Block chain, basic cryptocurrency, cryptocurrencybenefits, and cryptographic use in cryptocurrency.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	2
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Remember basics of Blockchain concepts. **SO1.2** Explain Bitcoin and understanding of smart contracts **SO1.3** Differentiate between public and private Blockchain. **SO1.4** Discuss cryptocurrency and the permission model of Blockchain. **SO1.5** Name Security Measures in Blockchain.		**Unit-1.0 : Blockchain Technology** 1.1 Introduction to Block chain, Public Ledgers. 1.2 Bitcoin, Smart Contracts, Block in a Block chain 1.3 Transactions, Distributed Consensus, Public vs Private Block chain. 1.4 Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain 1.5 Overview of Security aspects of Block chain; Basic Crypto Primitives. 1.6 Cryptographic Hash Function, Properties of a hash function 1.7 Hash pointer and Merkle tree.	1. Difference between public and private Blockchain 2. Learning of different cryptographic models used in Blockchain

		1.8 Digital Signature. 1.9 Public Key cryptography 1.10 Basic cryptocurrency	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Public ledgers.
2. Discuss basic cryptocurrency and its types.
3. Explain cryptographic hash function.

b. Other Activities (Specify):

Seminar and Tutorial

CO2: Use of JAVAScript knowledge to learn different types of new Frameworksavailable in market that are also current industry need.

Approximate Hours

Item	Appx. Hrs.
Cl	07
LI	0
SW	3
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To Understand the basics of JavaScript and role of JavaScript in web world. **SO2.2** Recall data types and variables in JavaScript **SO2.3** Understand and recall JavaScript operators and JavaScript		**Unit-2: Introduction to JavaScript** 2.1 Basics of JavaScript 2.2 JavaScript Data Types and Variables 2.3JavaScript Operators, JavaScript statements (conditional and loop)	1. Study of applications where JavaScript concepts are used 2.Study of different operators and loop statements

conditional and loop statements **SO2.4** Use of functions in JavaScript. Learning of Arrow functions **SO2.5** Understanding of classes and objects in JavaScript		2.4 JavaScript Functions simple function and arrow functions 2.5 classes, objects and constructers in JavaScript 2.6 Document Object Model (DOM) 2.7 Event Handling in JavaScript	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss JavaScript features and applications in Real world.
2. Explain Event handling in JavaScript.
3. Explain DOM.

b. Other Activities(Specify):

Seminar and Tutorial

CO3: Apply the knowledge of JAVASCRIPT in the ReactJS framework to createfront end of dynamic webpages.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	3
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO3.1. Recall the basics of ReactJS **SO3.2.** Differentiate DOM and Virtual DOM **SO3.3.** Illustrate rendering of element **SO3.4.** Explain class component and functional component **SO3.5.** Develop basic applications of React		**Unit-3 : ReactJS** 3.1 Introduction to react, features of React JS, Component based programming 3.2 3.2 Virtual DOM, JSX 3.3 Basic program in React JS 3.4 Rendering elements 3.5 Components: class components and functional components 3.6 State management, Lifecycle methods 3.7 Event handling in React 3.8 Conditional rendering 3.9 List and keys 3.10 Basic form handling in React	1. Practice Basic programs based on React concept 2. Study of list and keys

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Design a Web page to explain props and state management.
2. Explain list and keys.
3. Explain Form handling in React.

b. Other Activities(Specify):

Seminar and Tutorial

CO4: Develop client-server connectivity with the use of Node JS and use of Express Frameworks.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	3
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Recall features of NodeJS and its applicatons **SO4.2** Explain importance of MERN stack. **SO4.3** Create a web page where callbacks and errors handled. **SO4.4** Explore the concept of Modules in NodeJs. **SO4.5** Use of Export and Require in NodeJS.		**Unit-4: NodeJS** 4.1 Introduction and installation of NodeJS and its features 4.2 Importance of MERN Stack 4.3 Node JS basics: understanding the flow of request 4.4 Callbacks and error Handling 4.5 Understanding Modules. 4.6 Export and Require 4.7 Events in NodeJS 4.8 Eventemitter class	1. Study different event use in NodeJS 2. Study Event Emitter class and its functions

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss the advantages and features of NodeJS.
2. Discuss different Modules in NodeJs.
3. Discuss callbacks and error handling.

b. Other Activities (Specify):

Seminar and Tutorial

CO5: Design Web applications using MongoDB database with NodeJSTechnology in Backend.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0

SW	3
SL	2
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Recall the basics of Express and its features **SO5.2** Role of sequencing response by routers **SO5.3** Create a Web application based on Rest API **SO5.4** Use of static files and middleware. **SO5.5** Setup of MongoDB And its use in advance web development		**Unit 5: Express & MongoDB** 5.1 Basics of Express and Installation of MongoDB 5.2 Creating Routes and Responding. 5.3 Sequencing response By routes. 5.4 A Rest API Example 5.5 Static files and middleware 5.6 Mongo DB Introduction Set up MongoDB 5.7 Install Mongo client 5.8 MongoDB queries 5.9 install mongoose for node JS 5.10 The rest API example to use database	1. Study different types of trees application. 2. Explore computational geometry methods

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss the importance of Express.
2. Explain the different types of APIs used in Web development
3. Write steps to install MongoDB.

b. Other Activities (Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)

CO1: Understand Blockchain concepts, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.	10	0	3	2	15
CO2: Use of JAVAScript knowledge to learn different types of new Frameworks available in market that are also current industry need.	07	0	3	2	12
CO3: Apply the knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.	10	0	3	2	15
CO4: Develop client server connectivity with the use of Node JS and use of Express frameworks.	08	0	3	2	13
CO5: Design Web applications using MongoDB database	10	0	3	2	15
with NodeJS Technology in Backend.					
Total Hours	45	0	15	10	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Blockchain Technology	4	3	3	10

CO2	Introduction to JavaScript	3	4	3	10
CO3	ReactJS	3	3	4	10
CO4	NodeJS	2	3	5	10
CO5	Express & MongoDB	-	3	7	10
Total		12	16	22	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Current trends & Technology will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	The Road to Learn React: Your journey to master plain yet pragmatic React.js	By Robin Wieruch.		Kindle edition & 2018
2	Learn MERN stack development by building modern web apps using	by Shama Hoque		2nd Edition
	MongoDB, Express, React, and Node.js,			
3	Melanie Swan, “Block Chain: Blueprint for a New Economy”.	O’Reilly		2015

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. (Computer Science & Engineering)
Course Code: OEC-E01 - B
Course Title: Current Trends & Technology

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	1	2	2
CO1.2: Use of JAVAScript knowledge to learn different types of new Frameworks available in market that are also current industry need	2	1	2	2	1	2	3	1	1	1	2	2	2	2	2	2	2
CO3: Apply the knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.	2	2	1	1	1	2	2	1	1	2	3	3	1	1	2	2	2
CO4: Develop clientserver connectivity with the use of Node JS and use of Express frameworks.	3	2	2	2	3	2	3	1	2	1	3	3	2	3	1	2	2
CO5: Design Web applications using MongoDB database with NodeJS Technology in Backend.	2	2	2	1	1	3	3	1	1	1	2	2	2	3	1	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	Laboratory Instruction(LI)	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.		SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Block chain Technology 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Use of JAVAScript knowledge to learn different types of new Frameworks available in market that are also current industry need		SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Introduction to JavaScript 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Apply the knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.		SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 : ReactJS 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Develop client server connectivity with the use of Node JS and use of Express frameworks.		SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: NodeJS 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Design Web applications using MongoDB database with NodeJS Technology in Backend.		SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5: Express & MongoDB 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester-VII

Course Code: OEC - I

Course Title: AI using Python

Pre-requisite:

Before embarking on the "AI Using Python" program, students should possess a foundational understanding of programming concepts, preferably in Python, encompassing variables, data types, control structures, and basic functions. Additionally, a grasp of fundamental mathematics, including algebra, calculus, probability, and statistics, is essential for comprehending AI algorithms and models. Familiarity with data handling, visualization, and analysis using tools like pandas, NumPy, and Matplotlib is beneficial. While prior exposure to machine learning concepts is advantageous, a willingness to engage in critical thinking, problem-solving, and continuous learning is paramount for success in this rapidly evolving field.

Rationale: Study of this subject will lead the understanding of Artificial Intelligence. By the study of different artificial intelligence technique student will develop learning of different category of AI Branches. By the building base from this subject Student can explore different domains of AI.

Course Outcomes:

CO1: Understand the Fundamentals of Artificial Intelligence: Students will gain a solid understanding of fundamental concepts in artificial intelligence, including machine learning, deep learning, and neural networks, as well as the terminology and key principles underlying AI technologies.

CO2: Ability to Develop AI Projects: Students will be able to navigate the workflow of both machine learning and data science projects, from data acquisition and preprocessing to model training and evaluation, and apply this knowledge to develop AI projects using Python.

CO3: Apply AI in Real-world Scenarios: Students will learn how to identify suitable AI projects, collaborate effectively in AI teams, process and visualize data, and utilize technical tools to solve real-world problems across various application domains.

CO4: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.

CO5: Critically Evaluate AI's Societal Impacts: Students will critically evaluate the societal impacts of AI, including issues such as discrimination, bias, adversarial attacks, adverse uses, and the implications of AI on developing economies and job markets.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PCC	OEC- I	Computational Intelligence	3	2	1	1	7	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		

PCC	OEC- I	AI using Python	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	OEC - I	AI usingPython	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Comprehensive Understanding and Application: Students will understand and apply various computational intelligence techniques effectively.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	8
SW	1
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Define Key Concepts: Define and differentiate fundamental concepts in artificial intelligence (AI) such as machine learning, deep learning, and neural networks, demonstrating an understanding of the terminology and basic principles underlying AI technologies. **SO1.2** Identify Data Types and Sources: Identify various types of data and sources commonly used in AI applications, including structured, unstructured, and semi-structured data, and understand the importance of data quality and preprocessing in AI projects. **SO1.3** Analyze AI Applications: Analyze examples of AI applications across different domains, including natural language processing, computer vision, robotics, and healthcare, to recognize the diverse	**LI01.1** Python Basics Practice: Have students practice fundamental Python skills like data manipulation, array operations, and data visualization using pandas, NumPy, and Matplotlib. **LI01.2** Neural Network Implementation: Guide students in building a basic neural network from scratch with Python and NumPy, covering concepts like activation functions and gradient descent. **LI01.3** Data Preprocessing Workshop: Lead a workshop on common data preprocessing techniques	**Unit-1.0 Introduction** 1 Introduce AI Terminology: Define key AI concepts like machine learning and neural networks with examples. 2 Discuss AI Applications: Engage students in discussing real-world AI applications across industries. 3 Hands-on Neural Networks: Lead a practical activity explaining neural network basics. 4 Analyze Case Studies: Break students into groups to analyze AI case studies and propose solutions. 5 Guest Speaker Talk: Invite an AI expert for insights and Q&A on real-world AI implementation. 6 Debate Ethical AI: Organize a debate on AI ethics, covering bias, privacy, and societal impact.	SL01 AI Applications Exploration: Research and explore real-world AI applications in a specific industry of interest, like healthcare or finance, to understand their impact. SL02 Neural Network Architectures Study: Self-study advanced neural network architectures like CNNs and RNNs, focusing on their applications and advantages.

range of tasks that AI systems can perform. **SO1.4** Explain Basics of Neural Networks: Explain the basics of neural networks, including neuron structure, activation functions, and network architectures, to understand how these computational models are used in AI for learning and decision-making tasks. **SO1.5** Discuss Ethical and Societal Implications: Discuss the ethical and societal implications of AI technologies, including concerns related to bias, privacy, job displacement, and the responsible development and deployment of AI systems. **SO1.6** Formulate Real-world Scenarios: Formulate real-world scenarios where AI technologies can be applied to solve practical problems, demonstrating an awareness of the potential benefits and limitations of AI in various application domains.	using pandas and scikit-learn, providing datasets for hands-on practice with tasks like cleaning, scaling, and encoding. **LI01.4** AI Ethics Simulation: Conduct a simulation where students role-play as AI developers to discuss and debate ethical dilemmas such as bias, privacy, and job displacement in AI development.	7 Group Activity on Use Cases: Have groups evaluate AI benefits and limitations in different scenarios. 8 Technical Data Preprocessing Demo: Demonstrate data preprocessing techniques using Python libraries. 9 Reflect and Summarize: Wrap up with student reflections on key AI concepts and societal implications.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1.1 - AI Applications Exploration: Research and explore real-world AI applications in a specific industry of interest, like healthcare or finance, to understand their impact.

1.2 - Neural Network Architectures Study: Self-study advanced neural network architectures like CNNs and RNNs, focusing on their applications and advantages.

b. Mini Project:

"AI-Powered Sentiment Analysis Tool for Social Media Data"

c. Other Activities (Specify):

Seminar

CO2: Ability to Develop AI Projects: Students will be able to navigate the workflow of both machine learning and data science projects, from data acquisition and preprocessing to model training and evaluation and apply this knowledge to develop AI projects using Python.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	8
SW	1
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO2.1 Understand AI Project Workflow: Grasp the workflow stages in AI projects, from data handling to model deployment. **SO2.2** Select and Define AI Projects: Develop skills in choosing and defining AI projects, outlining clear objectives and scopes. **SO2.3** Collaborate in AI Teams: Learn effective collaboration within AI teams, understanding roles and fostering communication. **SO2.4** Process and Visualize Data: Acquire proficiency indata processing and visualization using Python libraries. **SO2.5** Utilize Technical Tools: Familiarize with essential technical tools for AI projects, enhancing efficiency and collaboration.	**LI02.1** Data Preprocessing Practice: Lead students in practicing data preprocessing techniques using Python libraries like pandas and scikit-learn with provided datasets. **LI02.2** Model Training and Evaluation: Guide students through training and evaluating machine learning models using Python's scikit-learn library with given datasets. **LI02.3** Project Planning Workshop: Conduct a workshop on	**Unit-2.0 Building AI projects** 2.1 AI Project Workflow Overview: Introducekey stages of AI projectslike data handling, model training, and deployment. 2.2 Data Preprocessing Practice: Guide students in hands-on data cleaning and preprocessing using Python libraries. 2.3 Model Training Demo: Demonstrate model training and evaluation with scikit-learn. 2.4 Project Scoping Exercise: Lead students in defining project scopes and objectivesfor AI projects. 2.5 Guest Speaker: Project Management: Invite an expert to discuss AI project management strategies. 2.6 Team Collaboration Workshop: Facilitate a session on effective team collaboration in AI projects. 2.7 Model Selection Guidance: Provide guidance on selecting	1. Research and understand advanced topics in fuzzy logic, such as fuzzy control systems and fuzzy inference systems, through online resources, and practical experimentation.

	project planning and management for AI projects, using sample scenarios and project management tools like Trello or Jira. **LI02.4** Collaborative AI Project: Assign students to collaborative AI project teams to develop AI prototypes, providing guidance throughout the project lifecycle.	and tuning machine learning models. 2.8 Technical Tools Introduction: Introduce essential technical tools for AI projects. 2.9 Project Presentation Practice: Have students present and provide feedback on AI project proposals.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1: Design a fuzzy control system for an autonomous vehicle navigating through varying weather conditions. Consider factors such as visibility, road surface conditions, and traffic density. Describe the membership functions, fuzzy rules, and defuzzyfication method you would use, and explain how your system adapts to different scenarios.

2: You are tasked with developing a fuzzy inference system to assist in medical diagnosis. Choose a specific medical condition (e.g., diabetes, heart disease) and outline the variables and rules needed for the fuzzy inference system. Describe how the system will interpret patient data (e.g., blood sugar levels, cholesterol levels) to provide diagnostic recommendations.

b. Mini Project Title: "Development of a Fuzzy Logic-Based Smart Thermostat for Energy-Efficient Heating and Cooling"

c. Other Activities (Specify):

Seminar

CO3: Apply AI in Real-world Scenarios: Students will learn how to identify suitable AI projects, collaborate effectively in AI teams, process and visualize data, and utilize technical tools to solve real-world problems across various application domains.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	8
SW	1
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Analyze AI Case Studies: Understand practical AI applications through case studies like smart speakers and self-driving cars. **SO3.2** Identify AI Team Roles: Recognize roles within AI teams and their responsibilities. **SO3.3** Avoid AI Pitfalls: Learn common challenges in AI development and strategies to mitigate risks. **SO3.4** Survey AI Applications: Explore diverse AI use cases across industries. **SO3.5** Understand AI's Business Impact: Gain insights into AI's role in company	**LI03.1** AI Team Role Simulation: Students role-play different AI team positions to develop project plans and simulate collaboration. **LI03.2** AI Pitfalls Analysis: Analyze case studies toidentify and propose solutions for common AI pitfalls like bias and overfitting. **LI03.3** AI Application Showcase: Research and present real-world AI applications across industries. **LI03.4** Company AI Strategy Simulation: Formulate strategic AI plans for hypothetical	**Unit-3.0 Building AI in Your Company** 3.1 AI Team Role Overview: Explore different roles within AI teams. 3.2 AI Pitfalls Discussion: Analyze common challenges in AI development. 3.3 AI Application Exploration: Investigate real-world AI applications. 3.4 Company AI Strategy: Develop strategic AI plans for hypothetical companies. 3.5 Case Study Analysis: Analyze AI implementation case studies. 3.6 AI Team Collaboration: Simulate collaboration within AI teams. 3.7 Ethical Considerations: Discuss ethical implications of AI	1. Understanding market for AI and roles to perform as an AI Data Program Code. 2. Multiple types AI bases projects.

strategy and operations.	companies in group settings.	technologies. 3.8 Industry Use Cases: Examine AI use cases across industries. 3.9 Strategic Impact of AI: Understand AI's impact on company strategy.	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1: Analyze a real-world AI case study and identify key challenges and solutions.

2: Research and present an AI application in a specific industry, discussing its impact and potential challenges.

b. Mini Project:

"AI-driven Customer Segmentation for Marketing Optimization"

c. Other Activities (Specify):

Seminar

CO4: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	8
SW	1
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO4.1 Critically Assess AI Realism: Understand AI's capabilities and limitations realistically. **SO4.2** Address Bias in AI: Recognize and mitigate bias in AI systems for fairness. **SO4.3** Evaluate AI's Job Impact: Assess AI's impact on employment and identify strategies for workforce transitions. **SO4.4** Analyze Ethical Dilemmas: Examine ethical issues in AI, fostering ethical decision-making skills. **SO4.5** Understand Socioeconomic Implications: Explore AI's socioeconomic effects and consider policy interventions.	**LI04.1** Bias Detection and Mitigation: Identify and address bias in AI algorithms using datasets and mitigation techniques. **LI04.2** Ethical AI Scenarios: Analyze ethical dilemmas in AI through case studies and propose ethical solutions. **LI04.3** Socioeconomic Impact Analysis: Investigate the socioeconomic implications of AI adoption using data analysis and discussion. **LI04.4** Policy Intervention Simulation: Simulate policy interventions to address AI's societal impacts and discuss potential outcomes.	**Unit-4 AI and Society** 4.1 AI Realism Discussion: Explore AI's capabilities and limitations realistically. 4.2 Bias Detection Workshop: Identify and mitigate bias in AI algorithms using practical examples. 4.3 Ethical Dilemma Debate: Engage in debates on ethical issues in AI, fostering ethical decision-making. 4.4 Job Impact Analysis: Assess AI's impact on employment and discuss strategies for workforce transitions. 4.5 Socioeconomic Implications Seminar: Examine AI's socioeconomic effects and discuss policy interventions. 4.6 Privacy and Surveillance Discussion: Explore ethical concerns related to privacy and surveillance in AI applications. 4.7 Algorithm Fairness Workshop: Investigate fairness issues in AI algorithms and propose solutions. 4.8 AI Governance Panel: Host a panel discussion	SL1. Self-study AI ethics frameworks by organizations like IEEE and ACM. Explore key principles like fairness and transparency. Analyze case studies to understand practical applications. Reflect on integrating ethical practices into AI projects.

		on AI governance and regulation to address societal concerns. 4.9 Policy Intervention Simulation: Simulate policy interventions to mitigate AI's negative societal impacts and foster equitable outcomes.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Analyze a recent AI ethics case study and propose solutions for any identified ethical concerns.

2.Create an AI ethics policy for an organization, outlining principles and guidelines for responsible AI development and deployment.

b. Mini Project:

"Developing an Ethical AI Decision-Making Framework"

c. Other Activities (Specify):

NA.

CO.5: Preparation for Research and Innovation: Students will be prepared to engage in research and innovation within the field of computational intelligence.

Approximate Hour

Item	Appx. Hrs.
CI	9
LI	8
SW	1
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Analyse AI Applications: Understand AI applications in a chosen domain through case studies. **SO5.2** Identify Challenges: Identify unique challenges in implementing AI solutions within the domain. **SO5.3** Apply AI Techniques: Apply relevant AI techniques to address domain-specific problems. **SO5.4** Evaluate Performance: Evaluate AI model performance using appropriate metrics. **SO5.5** Propose Solutions: Propose innovative AI solutions or enhancements for the domain.	**LI05.1** Case Study Analysis: Analyze real-world AI case studies in the domain. **LI05.2** Data Preprocessing: Prepare domain-specific datasets for analysis. **LI05.3** Model Development: Create AI models tailored to the domain. **LI05.4** Prototype Development: Design and implement a prototype AI solution for a specific domain problem.	**Unit-5.0 AI case studies related to a specific domain.** 5.1 Case Study Analysis: Analyze real-world AI case studies in the chosen domain. 5.2 Domain-specific Challenges Discussion: Discuss unique challenges and opportunities in applying AI within the domain. 5.3 Hands-on AI Techniques: Practice applying relevant AI techniques to domain-specific problems. 5.4 Performance Metrics Evaluation: Evaluate AI model performance using appropriate metrics for the domain. 5.5 Innovative Solutions Brainstorming: Brainstorm innovative AI solutions for domain-specific challenges. 5.6 Ethical Considerations Exploration: Explore ethical considerations in applying AI within the domain. 5.7 Regulatory Constraints Discussion: Discuss regulatory constraints and compliance	1. Domain-specific AI Applications: Explore AI applications in a chosen domain like healthcare or finance. Analyze case studies and emerging trends. 2. Ethical AI Implementation: Study ethical considerations in AI. Analyze bias, fairness, and transparency in AI systems.

		requirements in the domain. 5.8 Industry Expert Guest Lecture: Invite industry experts to share insights and experiences in applying AI within the domain. 5.9 Group Project Planning: Plan group projects to develop AI solutions for domain-specific problems.	

SW-5 Suggested Sessional Work (SW):
a. Assignments:

1. Analyze a recent AI application in a specific domain. Evaluate its effectiveness and discuss ethical considerations.
2. Develop a prototype AI solution for a domain-specific problem. Explain its architecture, data requirements, and potential applications.

b. Mini Project:
"AI-Powered Predictive Maintenance for Industrial Equipment"

c. Other Activities (Specify):
Seminar

Proficiency in Design and Implementation: Graduates will be proficient in designing and implementing intelligent systems using computational intelligence methods.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand the Fundamentals of Artificial Intelligence: Students will gain a solid understanding of fundamental concepts in artificial intelligence, including machine learning, deep learning, and neural networks, as well as the terminology and key principles underlying AI technologies.	9	8	1	1	19
CO2: Ability to Develop AI Projects: Students will be able to navigate the workflow of both machine learning and data science projects, from data acquisition and preprocessing to model training and evaluation, and apply this knowledge to develop AI projects using Python.	9	8	1	1	19
CO3: Apply AI in Real-world Scenarios: Students will learn how to identify suitable AI projects, collaborate effectively in AI teams, process and visualize data, and utilize technical tools to solve real-world problems across various application domains.	9	8	1	1	19
CO5: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.	9	8	1	1	19
CO5: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain	9	8	1	1	19

insights into real-world AI implementation.					
Total Hours	45	40	5	5	95

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction	02	05	03	10
CO2	Building AI projects	02	03	05	10
CO3	Building AI in Your Company	00	03	07	10
CO4	AI and Society	00	3	7	10
CO5	AI case studies related to a specific domain.	00	05	05	10
Total		04	19	27	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for AI Using Python will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson	Third Edition

2	"Python Machine Learning	Sebastian Raschka and Vahid Mirjalili	Packt Publishing	2nd edition
3	Deep Learning	Ian Goodfellow, Yoshua Bengio, and Aaron Courville	MIT Press	
4	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media	

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Mr. Brijesh Kumar Soni, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.
10. Mr. Anurag Garg, Teaching Associate, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B.Tech (Computer Science & Engineering)
Course Code: OEC -I
Course Title: AI Using Python

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Understand the Fundamentals of Artificial Intelligence: Students will gain a solid understanding of fundamental concepts in artificial intelligence, including machine learning, deep learning, and neural networks, as well as the terminology and key principles underlying AI technologies..	2	2	3	3	3	1	1	1	1	1	1	3	2	3	3	1	2
CO2: Ability to Develop AI Projects: Students will be able to navigate the workflow of both machine learning and data science projects, from data acquisition and preprocessing to model training and evaluation, and apply this knowledge to develop AI projects using Python.	1	3	2	3	2	2	2	1	1	1	1	3	2	2	2	1	3
CO3: Apply AI in Real-world Scenarios: Students will learn how to identify suitable AI projects, collaborate effectively in AI teams, process and visualize data, and utilize	2	2	2	3	3	2	1	1	1	1	1	3	1	1	2	2	2

technical tools to solve real-world problems across various application domains.																	
CO4: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2**
CO5: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Understand the Fundamentals of Artificial Intelligence: Students will gain a solid understanding of fundamental concepts in artificial intelligence, including machine learning, deep learning, and neural networks, as well as the terminology and key principles underlying AI technologies.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5.	LI01.1, LI01.2, LI01.3, LI01.4	Unit 1. Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9.	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Ability to Develop AI Projects: Students will be able to navigate the workflow of both machine learning and data science projects, from data acquisition and preprocessing to model training and evaluation, and apply this knowledge to develop AI projects using Python.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5.	LI02.1, LI02.2, LI02.3, LI02.4	Unit-2 Building AI projects 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9.	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Apply AI in Real-world Scenarios: Students will learn how to identify suitable AI projects, collaborate effectively in AI teams, process and visualize data, and utilize technical tools to solve real-world problems across various application domains.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5.	LI03.1, LI03.2, LI03.3, LI03.4	Unit-3 Building AI in Your Company 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9.	

PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5.	LI04.1, LI04.2, LI04.3, LI04.4	Unit-4 AI and Society 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Analyze AI Case Studies: Students will analyze case studies of AI applications such as smart speakers and self-driving cars, examining the roles of AI teams, common pitfalls, and major application areas to gain insights into real-world AI implementation.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5.	LI05.1, LI05.2, LI05.3, LI05.4	Unit-5 AI case studies related to a specific domain. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9.	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering Program

(Revisedason01August2023)

SEMESTER-VII

Course Code: PROJ CS-701

Course Title: Major Project-I

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

The details of COs and LOs are as follows: -

CO.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
CO.2: - The student will be able to implement the project plan and manage the project.
CO.3: - The student will be able to present the complete project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	PROJ CS-701	Major Project-I	0	12	0	0	12	6

INTRODUCTION TO PROJECT WORK/INTERNSHIP

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

2. To learn skills and abilities which are otherwise not possible either in classroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints and circumstances,
   - Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)

- Skill to learn from real life self- experiences (lifelong learning)
- Skill to manage the real-life engineering / professional projects
- Skill to plan and organize the self / group professional work
- skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self-real-life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Internship/Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
  - **The work on the topic should be theoretically and practically feasible.**
  - **The project work on the topic should be completed within approx. Three and half months.**
  - **Availability of required resources should be certain. Cost of project work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1

  to 2 students).
- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering *(AI-DS)*
Course Code: EEC701
Course Title: Capstone Project-I

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	

Semester - VIII

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester-VIII

Course Code: PEC-Elective V-A

Course Title : Internet of Things

Pre-requisite: Student should know basic knowledge of computer & digital electronics.

Rationale: It's all about the role of Sensors log Data IoT is the super set of information technology driven by the sensors and cloud to make the real things like smart things for your network. To understand the concepts of web of Things, Cloud of Things and emphasis on Mobile cloud.

Course Outcomes:

CO1. Acquire the knowledge of IoT concept and its Architecture.

CO2. Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).

CO3. Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.

CO4. Familiarize and understand the basic Sensor data Communication Protocols.

CO5. Develop the application skills regarding the Smart City Streetlights control & monitoring.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PEC	PEC-Elective IV-A	Internet of Things	2	2	2	1	7	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PEC	PEC-Elective V-A	Internet of Things	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PEC	PEC – Elective V A	Internet of Things	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1. Acquire the knowledge of IoT concept and its Architecture

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	4
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand the Definition and concept of Internet of Things. **SO1.2** Understand the concept of Characteristics of IoT **SO1.3** Understand the IoT Conceptual framework. **SO1.4** Preparation of Physical design, Logical design of IoT with Architectural view. **SO1.5** Preparation of Application of IoT.	LI01.1: Controlling the Light Emitting Diode (LED) with a push button. LI01.2:Interfacing the RGB LED with the Arduino	**Unit-1.0 Theoretical Framework of IoT** 1.1. Introduction to IoT 1.2 Definition of IoT 1.3 Characteristics of IoT 1.4 IoT Conceptual framework 1.5 IoT Architectural view 1.6 Physical design of IoT 1.7 Logical design of IoT 1.8 Application of IoT	1. Learn basics of IoT 2. Design of IoT

CO.2: Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).

Approximate Hours

Item	Appx Hours
Cl	7
LI	4
SW	2
SL	1
Total	14

Session Out comes (SOs)	(LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Concept of Machine-to-Machine (M2M) **SO2.2** Understanding about the SDN (Software defined networking). **SO2.3** Concept of NFV (Network function virtualization) for IoT. **SO2.4** Understanding the Data Storage in IoT. **SO2.5** Preparation of IoT cloud Based Services.	LI02.1: Controlling the LED blink rate with the potentiometer interfacing with Arduino LI02.2: Detection of the light using photo resistor	**Unit 2.0 Machine-to-Machine (M2M)** 2.1 Intro to M2M 2.2 SDN (Software defined networking) and 2.3 NFV (Network function virtualization) for IoT 2.4 Data Storage in IoT-I 2.5 Data Storage in IoT-II 2.6 IoT cloud Based Services.-I 2.7 IoT cloud Based Services.-II	1. Workflow of Machine Learning

CO3. Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.

Approximate Hours

Item	Appx. Hours
Cl	12
LI	4
SW	2
SL	1
Total	19

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Concept of Design principles for web connectivity **SO3.2** Understanding Web communication Protocols for connected devices **SO3.3** Understanding the Message communication Protocols for connected devices. **SO3.4** Understanding about SOAP, REST, HTTP Restful andweb Sockets. **SO3.5** Concept of Internet Connectivity,	LI03.1: Interfacing of temperature sensor LM35 with Arduino LI03.2: Interfacing Servo Motor with the Arduino	**Unit-3.0 : Design principles for web connectivity** 3.1 Web communication Protocols for connected devices 3.2 Message communication 3.3 Protocols for connected devices. 3.4 SOAP, 3.5 REST, 3.6 HTTP Restful and 3.7 web Sockets. 3.8 Internet	1. Designing of Web Connectivity 2. Communication Protocol

Internet based communication, IP addressing in IoT and Media Access Control.		Connectivity Principles: 3.9 Internet Connectivity features 3.10 Internet based communication 3.11 IP addressing in IoT 3.12 Media Access Control	

CO4. Familiarize and understand the basic Sensor data Communication Protocols.

Approximate Hours

Item	Appx Hours
Cl	10
LI	4
SW	2
SL	1
Total	17

Session Outcomes(SOs)	**(LI)**	**Classroom Instruction(CI)**	**Self-Learning(SL)**
SO4.1 Understanding about the Sensor Technology **SO4.2** Preparation of Participatory Sensing **SO4.3** Understanding about the Industrial IoT and Automotive IoT **SO4.4** Actuator, Sensor data Communication Protocols **SO4.5** Understanding about the Radio Frequency Identification Technology and Wireless Sensor Network Technology.	LI04.1. Interfacing of the Active Buzzer with Arduino. LI04.2: Interfacing of the Relay with Arduino.	Unit 4.0 **Sensor Technology** 4.1 Intro to Sensor Technology 4.2 Types of Sensors 4.3 Participatory Sensing 4.4 Industrial IoT and 4.5 Automotive IoT 4.6 Actuator 4.7 Sensor data Communication Protocols 4.8 Radio Frequency Identification Technology 4.9 Wireless Sensor Network Technology. 4.10 Examples of IoT	1. How Sensor works 2. Working of wireless sensor network

CO5. Develop the application skills regarding the Smart City Streetlights control & monitoring

Approximate Hours

Item	Appx Hours
Cl	8
LI	4
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about the concept of IoT Design methodology: **SO5.2** Preparation of Specification-Requirement, Process, Model, service. **SO5.3** Preparation of necessary Functional & Operational View **SO5.4** Understanding about the IoT Privacy and security solutions, Raspberry Pi & Arduino devices **SO5.5** Understanding about the IoT Case Studies: Smart City Streetlights control & monitoring.	LI05.1: Building Intrusion Detection System with Arduino and Ultrasonic Sensor LI05.2: Directional Control of the DC motor using Arduino	**Unit 5.0: IoT Design methodology** 5.1 Specification-Requirement 5.2 Process, Model, service 5.3 Functional view 5.4 Operational View 5.5 IoT Privacy and security solutions 5.6 Raspberry Pi 5.7 Arduino devices. 5.8 IoT Case Studies: Smart City Streetlights control & monitoring.	1. IoT Designing 2. IoT privacy

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructions (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+LI+SW+Sl)
CO 1: Acquire the knowledgeof IoT concept and its Architecture.	8	4	2	1	15
CO 2: Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	7	4	2	1	14
CO 3: Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	12	4	2	1	19

CO 4: Familiarize and understand the basic Sensor data	10	4	2	1	17
CO 5: Develop the application skills regarding the Smart City	08	4	2	1	15
Total Hours	45	20	10	5	80

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**			**Total**
		R	**U**	**A**	**Marks**
CO-1	Acquire the knowledge of IoT concept and its Architecture.	01	01	03	05
CO-2	Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	01	01	03	05
CO-3	Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	03	03	01	07
CO-4	Familiarize and understand the basic Sensor data Communication Protocols.	02	03	01	06
CO-5	Develop the application skills regarding the Smart City Streetlights control & monitoring.	01	03	01	05
Total		08	11	09	28

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Internet of Things will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. ImprovedLecture
2. Tutorial
3. CaseMethod
4. GroupDiscussion
5. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	**Title**	**Author**	**Publisher**	**Edition &Year**
1	"Internet of Things (A Hand book approach)	Vijay Madisetti & Arshdeeep Bahga	Universal Press	First Edition
2	"The Internet of Things: Connecting Objects"	Hakima Chaouchi	Wiley publication	First

3	"MySQL for The Internet of Things"	Charless Bell	A Press publication.	Second
5	Lecture note provided by Dept. of C A & I T And Science, AKS University, Satna .			

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course: B. Tech. (Computer Science & Engineering)
Course Code: PEC-Elective V-A
Course Title: Internet of Things

Course Outcomes	Program Outcomes												Program Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Acquire the knowledge of IoT concept and its Architecture.	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	3	
CO 2: Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	2	3	1	1	2	2	1	1	1	1	1	1	2	2	3	2	
CO 3: Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	3	2	2	2	2	2	1	1	1	1	1	2	2	3	1	1	
CO 4: Familiarize and understand the basic Sensor data Communication Protocols.	3	2	3	3	2	3	1	2	2	1	2	3	2	1	3	2	
CO 5: Develop the application skills regarding the Smart City Streetlights control & monitoring	3	2	3	2	3	2	1	2	1	1	2	3	3	3	2	1	

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO:1,2,3,4,5,6, 7,8,9,10,11,12 PSO:1,2,3,4	CO-1: Acquire the knowledge of IoT concept and its Architecture.	SO1.1 SO1.2 SO1.3 SO1.4	LI01.1,LI01.2	Unit-1.0 Theoretical Framework of IoT 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As Mentioned in Page no._____to ______
PO:1,2,3,4,5,6, 7,8,9,10,11,12 PSO:1,2,3,4	CO 2 : Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	SO2.1 SO2.2 SO2.3 SO2.4	LI02.1,LI02.2	Unit-2 Machine-to-Machine (M2M)2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO:1,2,3,4	CO3 : Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI03.1,LI03.2	Unit-3 : Design principles for web connectivity 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO:1,2,3,4,5,6, 7,8,9,10,11,12 PSO:1,2,3,4	CO4: Familiarize and understand the basic Sensor data Communication Protocols.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI04.1,LI04.2	Unit-4 : Sensor Technology 4.1,4.2,4.3,4.4,4.5,4.6,4.7,48,4.9,4.10	
PO:1,2,3,4,5,6, 7,8,9,10,11,12 PSO:1,2,3,4	CO 5: Develop the application skills regarding the Smart City Streetlights control & monitoring.	SO5.1 SO5.2 SO5.3 SO5.4	LI05.1,LI05.2	Unit5: IoT Design methodology 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) program

(Revised as on 01 August 2023)

Semester-VIII

Course Code: PEC-Elective V-B

Course Title : Introduction to Robotics

Pre-requisite: Strong foundation in mathematics (including algebra and calculus), proficiency in programming languages (e.g., Python, C++), and basic understanding of physics and mechanics are key prerequisites for studying robotics.

Rationale: Robotics can also help students develop life skills and social skills also help students prepare for a technological future.

Course Outcomes:

CO1: At the end of this chapter the student will explain the Introduction to Robotics.

CO2: At the end of this chapter the student will understand the Need of AI in Robotics.

CO3: At the end of this chapter the student will understand game playing in AI.

CO4: At the end of this chapter the student will understand Robotics fundamentals.

CO5: At the end of this chapter the student will use Robotics and Its Applications

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
PEC	**PEC-Elective V-B**	Introduction to Robotics	2	2+0	2	2	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC-IElective B	Introduction to Robotics ion	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PEC	PEC-IElective B	Introduction to Robotics	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: **At the end of this chapter the student will explain the Introduction to RoboticProcess Automation**.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	2
SL	2
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand about Introduction to Robotics Fundamentals of Robotics **SO1.2** Understand Robot Kinematics, Position Analysis **SO1.3** Understand Robot Programming languages &	LI1.1 Students engage in constructing actual robots using various components such as motors LI 1.2 constructing Actual robots using sensors, and Microcontrollers.	**Unit-1.0 Introduction**: 1.1 Introduction to Robotics 1.2 Fundamentals of Robotics. 1.3 Robot Kinematics: 1.4 Position Analysis.	1.Start with simple projects to apply theoretical knowledge. Build basic robot models using kits like Arduino or Raspberry Pi, gradually advancing to more complex projects.

systems **SO1.4** Introduction, the three levels of robot programming **SO1.**5 requirements of a robot programming language **SO1.6** problem speculator robot programming languages **SO1.**7 Learn about the Programming. Testing & debugging & their Tools. .	LI1.3 providing a practical understanding of the physical aspects of robotics	1.5 Dynamic Analysis and Forces 1.6 Robot Programming languages & systems 1.7 Introduction, the three levels of robot programming 1.8 requirements of a robot programming language 1.9 problem speculator robot programming languages	2. Experiment with sensor integration, motor control, and programming to enhance your practical skills.
		1.10 DH Parameters 1.11 Coordinate Transformation 1.12 Trajectory Planning	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Research and present an overview of the history and evolution of robotics.
2. Explore various applications of robotics in different industries.

b. Other Activities (Specify):

Seminar and Tutorial

CO2: At the end of this chapter the student will understand the Need of AI in Robotics.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	04
SW	2
SL	2
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand about History, state of the art **SO2.2**Understand	LI02.1 writing and implementing code to control robot	**Unit-2.0 Need of AI in Robotics** 2.1 History, state of the art	1. learn about Need of AI in Robotics
about Need of AI in Robotics. **SO2.3**Use of Thinking and acting humanly **SO2.4** Understand about intelligent agents **SO2.5**Understand about structure of agents	Movements. LI02.2 respond to sensor inputs, and execute specific tasks, enhancing student's programming proficiency in languages like Python, C++, or Specialized robotics Languages.	2.2 Need of AI in Robotics. 2.3 Thinking and acting humanly 2.4 intelligent agents 2.5 structure of agents 2.6 Computed Torque Control 2.7 Localization of Mapping 2.8 Probabilistic Robotics 2.9 Path Planning 2.10 BFS	

		2.11 DFS 2.12 A-Star	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Design a simple electronic circuit for a robot using components like resistors, capacitors, and transistors.
2. Explain the purpose and functionality of each component in the circuit. .

b. Other Activities (Specify):

Seminar and Tutorial

CO3: At the end of this chapter the student will understand game playing in AI.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	2
SW	2
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understand AI and game playing. **SO3.2** Understand plausible move generator **SO3.3** Use of static evaluation moves generator **SO3.4** Understand About game playing strategies **SO3.5** Understand about Problems in game laying.	LI3.1 Practical work includes integrating sensors like cameras, accelerometers, or proximity sensors into robotic systems, allowing students to grasp the importance of sensor data in decision-making processes for robots.	**Unit-3.0 Game Playing**: 3.1 AI and game playing 3.2 Plausible move generator. 3.3 static evaluation move generator 3.4 game playing strategies 3.5 Problems in game laying	1. learning game playing strategies 2. AI and game playing

		3.6 D-Star 3.7 Voronio 3.8 Hybrid Approaches 3.9 Joint Motion Control 3.10 Control PWM 3.11 Feedback Control 3.12 Sensor Integration	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Write a program to control the movement of a simulated robot in a 2D environment.
2. Implement basic algorithms for obstacle avoidance and path planning.

b. Other Activities(Specify):

Seminar and Tutorial

CO4: At the end of this chapter students will understand robotics fundamentals

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	2
SW	2
SL	2
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO4.1 Understand about Robot Classification **SO4.2** Understand about Robot Specification notation **SO4.3** Understand Kinematic representations and transformations **SO4.4** learn dynamics Techniques trajectory planning and control.	LI.4.1 Students experiment with designing and implementing control algorithms to regulate the behavior of robots, covering concepts such as feedback control, trajectory planning, and obstacle avoidance.	**Unit-4 : Linear Bounded Automata and Turing Machine** 4.1 Robot Classification 4.2 Robot Specification notation 4.3 kinematic representations and transformations 4.4 dynamics techniques 4.5 Trajectory planning and control. 4.6 Jacobians 4.7 Inverse Kinematics 4.8 Introduction to Reinforcement Learning 4.9 Localization and mapping 4.10 Potential Field 4.11 Perception 4.12 AI and game playing	1. learn about Robot Classification 2. learn about kinematic representations

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Choose a specific type of robotic hardware (e.g., wheeled robot, robotic arm) and analyze its components and structure.

b. Other Activities(Specify):

Seminar and Tutorial

CO5: At the end of this chapter the student will use Robotics and Its applications.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	2
SW	2
SL	2

Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 DDD concept and Intelligent robots. **SO5.2** Understand about file Robot anatomy- Definition **SO5.** Understand about law of robotics **SO5.4** Understand about History and Terminology of Robotics-Accuracy **SO5.5** Understand repeatability of Robotics-Simple problems-Specifications of Robot	LI5.1 Experiment with designing and implementing control algorithms to regulate the behavior of robots, covering concepts such as feedback control, trajectory planning, and obstacle avoidance.	**Unit-5.0** **Robotics and Its applications** 5.1 DDD concept and Intelligent robots 5.2 Robot anatomy-Definition 5.3 law of robotics 5.4 History and Terminology of Robotics-Accuracy	1. learn law of robotics 2. Pneumatic and Electric system
-Speed of Robot **SO5.**6 Understand Robot joints and links-Robot classifications-Architecture of robotics systems-Robot Drives systems-Hydraulic **SO5.7**Learn about Pneumatic and Electric system		5.5 repeatability of Robotics 5.6 Simple Problems-Specifications of Robot 5.7 Speed of Robot 5.8 Robot joints and links-Robot 5.9 Classifications 5.10 Architecture of robotic	

		systems 5.11 Robot Drive systems- Hydraulic Pneumatic and Electric system	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Solve kinematic equations for a robotic arm or manipulator.

b. Other Activities(Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructions (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: At the end of this chapter the	12	6	2	2	22
student will explain the Introduction to Robotics.					
CO2: At the end of this chapter the student will understand the Need of AI in Robotics.	12	4	2	2	20
CO3: At the end of this chapter the student will understand game playing in AI.	12	2	2	2	18

CO4: At the end of this chapter the student will understand Robotics fundamentals.	12	2	2	2	18
CO5: At the end of this chapter the student will use Robotics and Its Applications	12	2	2	2	18
Total Hours	60	16	10	10	96

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction	05	02	02	09
CO2	Need of AI in Robotics	02	03	05	10
CO3	Game Playing	02	03	06	11
CO4	Robotics fundamentals	2	03	05	10
CO5	Robotics and Its applications	-	05	05	10
Total		11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end-of-semester assessment for Introduction to Robotics will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Robotics, Vision and Control: Fundamental Algorithms in MATL AB	Peter Cork	Springer	2011
2	Robotics: Everything You Need to Know About Robotics from Beginner to Experts	Peter Mc Kinnon	Create space Independent Publishing Platform	2016
3	Introduction to AI Robotics	Robin R. Murphy	MIT press	2001
4	Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques	Francis X. Govers	Packt Publishers	2018

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Assistant Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: PEC-IV-B
Course Title: Introduction to Robotics

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: At the end of thischapter the student will explain the Introduction to Robotics.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO 2 : At the end of this chapter the student will understand the Need of AI in Robotics	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3.At the end of this chapter the student will understand game playing in AI .	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO 4: At the end of this chapter the student will understand Robotics fundamentals	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO 5: At the end of this chapter the student will use Robotics and Its applications	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.		Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1. At the end of this chapter the student will explain the Introduction to Robotics.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7	LI01.1,LI01.2 LI01.3	**Unit-1.0 Introduction** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9 1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2. At the end of this chapter the student will understand the Need of AI in Robotics.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI02.1,LI02.2	**Unit-2.0 Need of AI in Robotics** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12	
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3 At the end of this chapter the student will understand game playing in AI.	SO3. 1 SO3. 2 SO3.3 SO3.4 SO3.5	LI03.1	**Unit-3.0 Game Playing**: 3.1,3.2,3.3,3.4,3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12	
PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4. At the end of this chapter the student will understand Robotics fundamentals.	SO4.1 SO4.2 SO4.3 SO4.4	LI04.1	**Unit-4.0 Robotics fundamentals** 4.1,4.2,4.3,4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12	

PO 1,2,3,4,5,6,7 , 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5**.** At the end of this chapter the student will use Robotics and Its applications	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7	LI05.1	**Unit-5.0 Robotics and Its Applications** 5.1,5.2,5.3,5.4,5.5,5.6,5.6,5.7, 5.8, 5.9, 5.10, 5.11, 5.12	

Semester-VIII

Course Code: OEC-Elective II - A

Course Title : Statistical Thinking for Data Science

Pre-requisite: Student should have basic knowledge of Statistics and database

Rationale: Statistical Thinking for Data Science boosts the discovery of new and unexpected insights from data.

Course Outcomes:

CO1: Understand the statistical foundation for data science

CO2: Apply statistical thinking in collecting, modeling and analyzing data

CO3: Apply statistical thinking in collecting, modeling and analyzing data

CO4: Ability to visualize all types of data

CO5: Understand how to use R for different types of data

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
OEC	OEC Elective II -A	Statistical Thinking for Data Science	2	2	2	1	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
OEC	OEC Elective II -A	Statistical Thinking for Data Science	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
OEC	OEC Elective IIA	Statistical Thinking for Data Science	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

OECII – A.1: Understand the statistical foundation for data science

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Define Data acquisition **SO1.2** Explain cleaning and aggregation **SO1.3** Explain Exploratory data analysis **SO1.4** Discuss data Visualization **SO1.5** Model creation and validation .	LI1.1. Calculate the mean, median, and mode for a given dataset. LI1.2. Determine the standard deviation and variance of a set of data points. LI1.3. Create a histogram and interpret the distribution of a dataset.	**Unit 1: Introduction to Data Science: (9 lecture)** 1.1 Data acquisition-I 1.2 Data acquisition-II 1.3 Cleaning-I 1.4 Cleaning-II 1.5 Aggregation 1.6 Exploratory data analysis 1.7 Visualization 1.8 Feature engineering 1.9 Model creation and validation	1. Learn Feature engineering

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   (i) **Discuss about different techniques of data analysis**

b. **Presentation**

OECII - A.2: Apply statistical thinking in collecting, modeling and analyzing data

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To Understand Statistical Thinking, **SO2.2** To learn different approaches of data sampling **SO2.3** To Explain Probability **SO2.4** To Explain Statistical Inference	LI2.1. Apply the concept of conditional probability to a real-world scenario. LI2.2. Use the binomial distribution to model a probability scenario. LI2.3. Apply the normal distribution to solve a problem involving z-scores. .	**Unit-2: Statistical Thinking 1(9 lectures)** 2.1 Examples of Statistical Thinking, 2.2 Numerical Data 2.3 Summary Statistics 2.4 From Population to Sampled Data 2.5 Different Types of Biases 2.6 Introduction to Probability 2.7 Concepts of Probability 2.8 Introduction to Statistical Inference 2.9 Concepts of Statistical Inference	1. learn different types of Biases.

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) **Write about numerical data?**

b. Presentation

OECII - A.3: Apply statistical thinking in collecting, modeling and analyzing data

Approximate Hours

Item	AppX Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3. 1 To understand Association and Dependence	LI3.1. Compute	**Unit3:Statistical Thinking 2 (9 lecture)**	I. Learn about

SO3.2 know the Conditional Probability and Bays Rule SO3.3 To understand the Linear Regression. SO3.4 develop a Special Regression Model	probabilities for simple events and joint events. LI3.2. Calculate the margin of error and construct a confidence interval. LI3.3. Perform a hypothesis test and interpret the results.	3.1 Association and Dependence 3.2 Association and Causation 3.3 Conditional Probability 3.4 Conditional Probability 3.5 Bays Rule 3.6 Simpsons Paradox 3.7 Confounding 3.8 Introduction to Linear Regression 3.9 Special Regression Model.	Simpsons Paradox

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) Explain Association and Causation

b. **Presentation**

OECII - A.4: Ability to visualize all types of data

Approximate Hours

Item	App X Hrs
Cl	9
LI	6
SW	2
SL	1
Total	18

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand the Goals of statistical graphics and data visualization **SO4.2** Explain the Graphs of Data **SO4.3** implement Graphs of Fitted Models	LI4.1. Use autocorrelation and partial autocorrelation functions in time series analysis. LI4.2. Apply ARIMA modeling to	**Unit-4 : Exploratory Data Analysis and Visualization (9 lectures)** 4.1. Goals of statistical graphics and 4.2. data visualization 4.3. Graphs of Data 4.4. Graphs of Data 4.5. Graphs of Fitted Models	i. Draw a different graphs to fitted models

SO4.4 To Understand the Principles of graphics	make predictions in a time series dataset. LI4.3. Evaluate the accuracy of time series forecasts using appropriate metrics.	4.6. Graphs to Check Fitted Models 4.7. What makes a good graph? 4.8. Principles of graphics. 4.9. Principles of graphics.	

SW-4 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) Write the Principles of graphics?

b. Presentation

c. Pictorial representation of different graphs for data visualization.

OECII - A.5: Understand how to use R for different types of data

Approximate Hours

Item	AppX Hrs
Cl	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1To Understand Bayesian inference **SO5.2** Discuss combining models and data in a forecasting problem **SO5.3** To Explain Bayesian hierarchical modeling for studying public opinion **SO5.4** To Understand Bayesian modeling for Big Data	LI5.1. Apply Bayes' Theorem to update probabilities based on new information. LI5.2. Identify trends and seasonality in a time series dataset. LI5.3. Develop a research question for a	**Unit5: Introduction toBayesian Modeling (8 lectures)** 5.1 Bayesian inference-I 5.2 combining models and data 5.3 forecasting problem 5.4 Bayesian hierarchical modeling 5.5 studying public opinion	Learn forecasting problem

	data science project.	Bayesian modeling for Big Data	

SW-5Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) Explain in detail about Bayesian hierarchical modeling
b. Presentation:
c. **Other Activities (Specify): Group discussion of important topics.**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1. Understand the statistical foundation for data science	9	6	2	1	**18**
CO2 Apply statistical thinking in collecting, modeling and analyzing data	9	6	2	1	**18**
CO3 Apply statistical thinking in collecting, modeling and analyzing data	9	6	2	1	**18**
CO4 Ability to visualize all types of data	9	6	2	1	**18**
CO5 Understand how to use R for different types of data	6	6	2	1	**15**
Total Hours	42	30	10	5	87

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Unit 1: Introduction to Data Science	03	02	03	08
CO-2	Unit-2: Statistical Thinking 1	03	01	05	09
CO-3	Unit3:Statistical Thinking2	03	07	02	12
CO-4	Unit-4 : Exploratory Data Analysis and Visualization	03	05	05	13
CO-5	Unit5: Introduction to Bayesian Modeling	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Statistical Thinking for Data Science will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Pla
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Computational Thinking: A Primer For Programmers And Data Scientists	G Venkatesh	Notion Press	2022
2	Data Science A Beginner's Guide	C. Raju	Penguin Random House	2023

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: OECII - A

Course Title: Statistical Thinking for Data Science

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1 Understand the statistical foundation for data science	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2 Apply statistical thinking in collecting, modeling and analyzing data	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3 Apply statistical thinking in collecting, modeling and analyzing data	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO4 Ability to visualize all types of data	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
CO5 Understand how to use R for different types of data	2	3	1	1	2	3	-	-	2	-	2	2	3	2	2	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1** Understand the statistical foundation for data science	SO1.1 SO1.2 SO1.3 SO1.4	LI1.1,LI1.2,LI1.3	**Unit 1: Introduction to Data Science: (9 lecture)** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2** Apply statistical thinking in collecting, modeling and analyzing data	SO2.1 SO2.2 SO2.3 SO2.4	LI2.1,LI2.2,LI2.3	**Unit-2: Statistical Thinking 1** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3** Apply statistical thinking in collecting, modeling and analyzing data	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3	**Unit3:Statistical Thinking2** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4** Ability to visualize all types of data	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI4.2,LI4.3	**Unit-4 : Exploratory Data Analysis and Visualization** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5** Understand how to use R for different types of data	SO5.1 SO5.2 SO5.3 SO5.4	LI5.1,LI5.2,LI5.3	**Unit5: Introduction to Bayesian Modeling** 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) Program

(Revised as on 01 August 2023)

Semester VIII

Course Code: OEC Elective II - B

Course Title: Autonomous Systems

Pre-requisite: Student should have basic knowledge of computer network

Rationale: An Autonomous Network can accelerate the enforcement of network policies across an organization's devices and can self-monitor and continuously optimize itself to the demands of the users.

Course Outcomes:

OECII - B.1: Complete understanding of autonomous systems.
OECII - B.2 functional architecture in autonomous systems is a robust, scalable, flexible, and efficient System
OECII - B.3: Create a model of basic autonomous vehicle
OECII - B.4: Understand, design and implement an autonomous robot.
OECII - B.5: Understand, design and implement an autonomous drone

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
OEC	OEC Elective II -B	Autonomous Systems	2	2	2	1	7	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks (PRA+ ESA)**
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
OEC	OEC Elective II- B	Autonomous Systems	15	20	5	5	5	50	50	100

Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)		
			Progressive Assessment (PRA)	End Semester Assessment	Total Marks (PRA+ ESA)

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			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
OEC	OEC Elective II- B	Autono mous Systems	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

OECII – B.1: Complete understanding of autonomous systems.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	02
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 To understand autonomous systems SO1.2 Explain AI in autonomous systems SO1. 3To understand Robots SO1.4 Discuss about the difference between Autonomous systems vs robots .	LI01.1 Introduction to Autonomous Systems Overview of Autonomous Systems Architecture Introduction to sensors and actuators, Basic concepts	**Unit 1: Introduction (7 lectures)** 1.1 What are autonomous systems? 1.2 AI in autonomous systems 1.3 Robots 1.4 Autonomous systems Vs robots. 1.5 Learning working autonomous systems 1.6 Sensor Fusion	1. Learn about the components of Autonomous systems

	of control systems	1.7Localization and Mapping (SLAM) 1.8 Safety and Reliability 1.9 Safety and Reliability 1.10 Continuous Learning and Adaptation 1.11 Examples 1.12 Case study	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
(i) Discuss about Robots

b. Pictorial representation of a simple Robot

OECII - B.2: functional architecture in autonomous systems is a robust, scalable, flexible, and efficient system

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	02
SW	02
SL	01
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand Major functions in an autonomous system **SO2.2** To learn Motion Modeling **SO2.3** To Explain Coordinate frames and transforms **SO2.4** To Understand point mass model	LI02.1 Sensor Integration and Data Acquisition Types of sensors used in autonomous systems Data acquisition techniques Hands-on exercises with sensor integration.	**Unit-2: Functional architecture** **(12 lectures)** **2.1** Major functions in an autonomous system 2.2 Motion Modeling 2.3 Kinematics 2.4 Dynamics 2.5 Trajectory Planning 2.6 Motion Control 2.7 Uncertainty Estimation 2.8 Coordinate frames 2.9 frames transform 2.10 point mass model 2.11 examples 2.12 case study	1. learn the coordination between frames

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Draw a motion model.
(ii) Presentation

OECII - B.3: Create a model of basic autonomous vehicle

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	02
SW	02
SL	01
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 To understand Vehicle modeling SO3.2 know the Sensor Modeling SO3.3 To understand the inertial sensors SO3.4 To understand GPS	LI03.1 Control Systems and Actuator Implementation Control algorithms used in autonomous systems Actuator types and implementation Practical exercises on controlling actuators	**Unit3:** Modeling in autonomous systems (9 lectures) 3.1 Vehicle modeling 3.2 kinematic and dynamic 3.3 bicycle model 3.4 two-track models 3.5 Sensor Modeling 3.6 encoders 3.7 inertial sensors 3.8 GPS. 3.9 State Estimation and Localization 3.10 Human Behavior Modeling 3.11 Validation and Verification 3.12 Case study	1. Learn about two-track models

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
i. Explain bicycle model
b. **Presentation**

OECII - B.4: Understand, design and implement an autonomous robot.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	02
SW	02
SL	01
Total	17

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand Localization and mapping fundamentals of LIDA Rand and visual SLAM **SO4.2** Explain the Navigation of Global path planning and Local path planning **SO4.3** To Understand Control structures **SO4.4** Implementation of Sample controllers	LI04.1 Localization and Mapping Techniques for localization in autonomous systems Simultaneous Localization and Mapping (SLAM) Practical exercises on implementing localization algorithms.	**Unit-4: SLAM (12 lectures)** 4.1 Localization and mapping fundamentals 4.2 LIDA Rand 4.3 visual SLAM 4.4 Navigation 4.5 Global path planning 4.6 Local path planning 4.7 Vehicle control 4.8 Control structures 4.9 PID control 4.10 Linear quadratic regulator 4.11 Sample controllers. 4.12 case study	1. Draw a Vehicle control structures

SW-4 Suggested Seasonal Work (SW):

a. Assignments:
i. Discuss about the PID control?

b. Presentation
c. Pictorial representation of Linear quadratic regulator

OECII - B.5: Understand, design and implement an autonomous drone

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	2
SW	2
SL	1
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 To **Understand** drones and its applications **SO5.2** To Discuss components and plate forms propulsion **SO5.3** To Explain concepts of flight, regulatory norms and regulations **SO5.4** To **Understand** Machine learning and deep learning for autonomous driving	LI05.1 Path Planning and Navigation Path planning algorithms Navigation techniques for autonomous systems	**Unit5: Drones (12 lectures)** 5.1 Overview 5.2 Definition 5.3 applications 5.4 components 5.5 platforms 5.6 Propulsion 5.7 on-board flight control 5.8 payloads, communications 5.9 concepts of flight, regulatory norms and regulations 5.10 Machine learning and deep learning for autonomous driving 5.11 Learning by example 5.12 Case study.	1. case study on applications of drones

SW-5Suggested Seasonal Work (SW):

a. Assignments:
i. Explain in detail about the components of drones
b. Presentation:
c. Other Activities (Specify): Draw a basic diagram of the parts of drones?

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Complete understanding of autonomous systems.	12	2	2	1	17
CO2: Complete understanding of autonomous systems.	12	2	2	1	17
CO3: Create a model of basic autonomous vehicle	12	2	2	1	17
CO4: Understand, design and implement an autonomous robot.	12	2	2	1	17
CO5: Understand, design and implement an autonomous drone.	12	2	2	1	17
Total Hours	60	10	10	5	85

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Introduction	03	02	03	08
CO-2	Functional architecture	03	01	05	09
CO-3	Modeling in autonomous systems	03	07	02	12
CO-4	SLAM	03	05	05	13
CO-5	Drones	03	02	03	08
Total		15	17	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Autonomous Systems will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:
1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Reinforcement Learning: An Introduction	Richard S. Sutton, Andrew G. Barto	Bradford Books	2018
2	Intelligent Autonomous Systems	Dilip Kumar Pratihar, Lakhmi C. Jain	Web of Science.	2010

B. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

Curriculum Development Team
1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering

Course Code: OEC Elective II - B

Course Title: Autonomous Systems

Course Outcomes	Program Outcomes												Program Specific Outcomes				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4	PSO5
	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies
CO1	3	2	3	2	3	3	1	1	1	1	1	3	2	2	3	2	3
CO2	3	3	2	3	3	2	1	2	1	1	1	3	2	3	2	1	3
CO3	3	3	3	3	3	2	1	2	2	1	1	3	2	3	2	2	3
CO4	3	2	3	2	3	2	1	2	1	1	1	3	2	2	3	2	2
CO5	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Complete understanding of autonomous systems.	SO1.1 SO1.2 SO1.3 SO1.4	LI01.1,LI01.2	Unit-1 Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: functional architecture in autonomous systems is a robust, scalable, flexible, and efficient system	SO2.1 SO2.2 SO2.3 SO2.4	LI02.1,LI02.2	Unit-2 Functional architecture 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8, 2.9, 2.10, 2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3 Create a model of basic autonomous vehicle	SO3.1 SO3.2 SO3.3 SO3.4	LI03.1,LI03.2	Unit-3 Modeling in autonomous systems 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Understand, design and implement an autonomous robot.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI04.1,LI04.2	Unit-4 SLAM 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11, 4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO.4: Understand, design and implement an autonomous drone	SO5.1 SO5.2 SO5.3 SO5.4	LI05.1,LI05.2	Unit-5 Drones 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11, 5.12	

Semester-VIII

Course Code: OEC Elecive III - A

Course Title: Cloud Computing

Pre-requisite: Database Management System

Rationale: Cloud Computing is important because it helps to process and store large amount of data sets on virtual space.

Course Outcomes:

CO1: Students should be familiar with various characteristics of the cloud platforms.
CO2: Learn how virtual platform works for application execution and storage.
CO3: Create relational database and other cloud-based file system.
CO4: Understand the privacy issues and security strategies in cloud storage.
CO5: Implement real time application over various cloud-based platform.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
OEC	OEC Elecive III - A	Cloud Computing	3	0	2	1	6	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, and mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
OEC	OEC Elective III- A	Cloud Computing	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO.1: Students should be familiar with various characteristics of the cloud platforms.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding the characteristics of cloud. **SO1.2** Understanding various components of cloud. **SO1.3** Understanding various models of cloud. **SO1.4** Understanding cloud computing platforms.		**Unit-1.0 Cloud Computing** 1.1 Introduction to Service Oriented Architecture, 1.2 Web Services, Basic Web Services Architecture, 1.3 Introduction to SOAP, WSDL and UDDI; 1.4 REST full services: Definition, Characteristics, Components, Types; 1.5 Software as a Service, Platform as a Service, 1.6 Organizational scenarios of clouds, 1.7 Administering & Monitoring cloud services, 1.8 Benefits and limitations, 1.9 Study of a Hypervisor.	Learning components, models, and various platforms of cloud.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. SOAP
2. WSDL

b. Mini Project:

Organizational Scenarios of Clouds

c. Other Activities (Specify):

NA

CO.2: Learn how virtual platform works for application execution and storage.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understanding significance of computing technology. **SO2.2** Understanding Multitenant Software. **SO2.3** Understanding basics of Ajax and Mashups. **SO2.4** Understanding virtualization applications in enterprises.		**Unit-2.0 Virtualization** 2.1 Utility Computing, 2.2 Elastic Computing, 2.3 Ajax: asynchronous 'rich' interfaces, 2.4 Mashups: User interface, 2.5 Services Virtualization Technology: 2.6 Virtualization applications in enterprises, 2.7 Pitfalls of virtualization 2.8 Multitenant software: multi-entity support, 2.9 Multi schema approach, multi-tenancy using cloud data stores.	Learning computing and virtualization in cloud.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Utility Computing
2. Elastic Computing

b. Mini Project:

Services Virtualization Technology

c. Other Activities (Specify):

NA

CO.3: Create relational database and other cloud-based file system.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding various types of cloud file system. **SO3.2** Understanding basics of MapReduce Model. **SO3.3** Understanding parallel computing. **SO3.4** Understanding relational operations with MapReduce model.		**Unit-3.0 Data in cloud computing** 3.1 Relational databases, Relational operations, 3.2 Cloud file systems: GFS and HDFS, 3.3 Features and comparisons among GFS, HDFS etc, 3.4 Big Table, H Base and Dynamo. 3.5 Map-Reduce and extensions: 3.6 Parallel computing, 3.7 The Map-Reduce model: Parallel efficiency of Map Reduce, 3.8 Enterprise batch processing, 3.9 Example/Application of MapReduce.	Exporting cloud file system and MapReduce model.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. GFS
2. HDFS

b. Mini Project:

MapReduce Model

c. Other Activities (Specify):

NA

CO.4: Understand the privacy issues and security strategies in cloud storage.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding security fundamentals in cloud system. **SO4.2** Understanding cloud security architecture. **SO4.3** Understanding trusted cloud computing. **SO4.4** Understanding identity management and access control.		**Unit-4.0 Cloud Security** 4.1 Security fundamentals, 4.2 Vulnerability assessment tool for cloud, 4.3 Privacy and Security in cloud: 4.4 Cloud computing security architecture, 4.5 General Issues, 4.6 Trusted Cloud computing, 4.7 Security challenges: virtualization security management-virtual threats, 4.8 VM security recommendations, specific security techniques, 4.9 Secure Execution Environments and Communications in cloud.	Learning privacy and security concerns in cloud.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Privacy and Security in Cloud.
2. Virtualization Security Management.

b. Mini Project:

Identity Management and Access Control

c. Other Activities (Specify):

NA.

CO.5 Implement real time application over various cloud-based platform.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding implementing real time application over cloud platform. **SO5.2** Understanding Billing and Accounting System. **SO5.3** Understanding load balancing in cloud. **SO5.4** Understanding resource optimization and reconfiguration.		**Unit-5.0 Issues in cloud computing** 5.1 Implementing real time application; 5.2 QOS Issues in Cloud, 5.3 Dependability, data migration, streaming in Cloud. 5.4 Cloud Middleware, inter cloud issues. 5.5 Mobile Cloud Computing, agrid of clouds, sky computing, 5.6 Load balancing, monitoring in cloud, 5.7 Resource optimization, resource dynamic reconfiguration 5.8 Installing cloud platforms and performance evaluation, 5.9 Features and functions of cloud computing platforms.	Learning data migration and load balancing in cloud.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Data Migration
2. Resource Optimization

b. Mini Project:

Mobile Cloud Computing

c. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1**:** At the end of this chapter the student should be familiar with various characteristics of the cloud platforms.	9	0	2	1	12
CO.2**:** At the end of this chapter the student will learn how virtual platform works for application execution and storage.	9	0	2	1	12
CO.3: At the end of this chapter the student will create relational database and other cloud-based file system.	9	0	2	1	12
CO.4: At the end of this chapter the	9	0	2	1	12

student will understand the privacy issues and security strategies in cloud storage.					
CO.5: At the end of this chapter the student will implement real time application over various cloud-based platform.	9	0	2	1	12
Total Hours	45	0	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO.1	Cloud Computing	02	05	01	08
CO.2	virtualization	02	03	05	10
CO.3	Data in cloud computing .	02	03	07	12
CO.4	Cloud Security	-	3	7	10
CO.5	Issues in cloud computing	-	05	05	10
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Cloud Computing will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Enterprise Cloud Computing	Shroff Gautam	Cambridge Publication	2010, 1st Edition
2	Cloud Security	Dr. Kumar	Wiley-India	2012, 2nd Edition
3	Cloud Computing: A Practical Approach	Antohy T Velte	McGraw Hill	2009, 1st Edition

Curriculum Development Team

1. Dr. Akhilesh K. Waoo, HOD, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Program: Bachelor of Technology (Computer Science and Engineering)
Course Code: OECIII - A
Course Title: Cloud Computing

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Computer knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Students should be familiar with various characteristics of the cloud platforms.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Learn how virtual platform works for application execution and storage.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Create relational database and other cloud-based file system.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Understand the privacy issues and security strategies in cloud storage.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5: Implement real time application over various cloud-based platform.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students should be familiar with various characteristics of the cloud platforms.	SO1.1 SO1.2 SO1.3 SO1.4	Unit-1 1. Cloud Computing 1.1,1.2,1.3,1.4,1.5,1.6, 1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Learn how virtual platform works for application execution and storage.	SO2.1 SO2.2 SO2.3 SO2.4	Unit-2 Virtualization 2.1,2.2,2.3,2.4,2.5,2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Create relational database and other cloud-based file system.	SO3.1 SO3.2 SO3.3 SO3.4	Unit-3 Data in the cloud 3.1,3.2,3.3,3.4,3.5,3.6, 3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the privacy issues and security strategies in cloud storage.	SO4.1 SO4.2 SO4.3 SO4.4	Unit-4 Cloud Security 4.1,4.2,4.3,4.4,4.5,4.6, 4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Implement real time application over various cloud-based platform.	SO5.1 SO5.2 SO5.3 SO5.4	Unit-5 Issues in cloud computing 5.1,5.2,5.3,5.4,5.5,5.6, 5.7,5.8,5.9	

Semester VIII

Course Code: OEC Elective III - B

Course Title: English for Research Paper Writing

Pre- requisite: Students should have basic knowledge of presenting themselves, their thoughts and ideas

Rationale: Writing a research paper is the primary channel for passing on knowledge to the scientist working in the same field or related fields. It is important to know the skill of writing papers to demonstrate your ability to understand, relate to what has been learnt, as well as receive critical peer feedback.

CO 1: Student will learn how to improve their writing skills, and level of readability

CO2: Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness

CO3: Students will learn about what to write in each section of paper

CO4: Students will understand significance of each section of paper, and learn how to write it at the same time.

CO5: Ensure the good quality of paper at very first-time submission

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
RC	OEC Elective III -B	English for Research Paper Writing	2	0	2	1	5	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA + ESA)
RC	OEC Elective III - B	English for Research Paper Writing	15	20	5	5	5	50	50	100

Course-Curriculum Detailing

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO 1: Student will learn how to improve their writing skills, and level of readability

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0

SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO1.1 Students learn to design the research paper. SO1.2 Students learn to read the research paper in a systematic way. SO1.3 Examine and identify the redundancy in a research paper SO1.4 Learn to summarise and be concise SO1.5 Understand the concept of ambiguity and vagueness		Unit 1: Preparation of Research Paper 1.1 Steps to introduce to the technique of reading research paper 1.2 Breaking up of sentences, 1.3 structuring paragraphs 1.4 structuring paragraphs continued 1.5 Making the paper concise 1.6 Making the paper concise continued 1.7 removing redundancy 1.8 removing redundancy Continued 1.9 Concept of Ambiguity and Vagueness	Reading research papers on relevant topics

CO2: Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness

Approximate Hours

Item	Appx Hours
Cl	9
LI	0
SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**Self - Learning (SL)**
SO2.1: Students learn to create a contrast between previous and present work. SO2.2: Learn paraphrasing tool SO2.3: Use of plagiarism check tool SO2.4: Students understand the concept of hedging and criticising	.	UNIT 2 – Paraphrasing and checking Plagiarism 2.1 Clarifying Who Did What, Highlighting Your Findings, 2.2 Hedging and Criticising, 2.3 Paraphrasing 2.4 Plagiarism 2.5 Clarification of previous work and their order 2.6 Highlighting your work 2.7 Paraphrasing and its tools 2.8 Plagiarism Check Software 2.9 Use of Plagiarism Check Software	Learn different AI tools for Writing

CO3: Students will learn about what to write in each section of paper

Approximate Hours

Item	Appx Hours
Cl	9
LI	0
SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO3.1**:** Students learn to write a research paper in proper format. SO3.2: Students are able to understand different sections of paper. SO3.3: Create an effective	.	Unit-3**:**Planning Sections of a Paper 3.1: Introduction to sections of a research paper. 3.2: Key skills to write an Abstract and 3.3 Key skills to write an Introduction. 3.4: Skills to write Review of Literature. 3.5: Key skills to write Methodology. -I 3.6: Key skills to write Methodology. -II	Study key skills to write the abstract and Methodology

abstract and introduction. SO3.4**:** Describe Review of Literature. SO3.5: Learn to write Methodology of Research Paper.		3.7 Skills to draw diagrams 3.8 Key skills to plot result graphs 3.9 Key skills to write future scope	

CO4: Students will understand significance of each section of paper, and learn how to write it at the same time.

Approximate Hours

Item	Appx Hours
Cl	9
LI	0
SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO4.1: Students learn to state the result of their findings. SO4.2: Students learn to draw conclusions of their research SO4.3: Students are able to analyse and discuss their result of paper SO4.4: Students are able to evaluate their paper SO4.5: Students learn to assess their work	.	Unit-4 : Finalising the Research Paper 4.1 Results of research findings-I 4.2 Results of research findings-II 4.3 Drawing conclusion of the research-I 4.4 Drawing conclusion of the research-II 4.5 Discussion on the result of paper-I 4.6 Discussion on the result of paper-II 4.7 Final check of the paper-I 4.8 Final check of the paper-II 4.9 Discussion of future scope	Study of to find research gaps

through a final check.			

CO5: Ensure the good quality of paper at very first-time submission

Item	Appx Hours
Cl	9
LI	0
SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO5.1: Students are able to understand effective research paper writing skills		Unit 5- Research Paper Publication 5.1: Useful Phrases for effective research paper writing-I 5.2: Useful Phrases for effective research paper writing-II 5.3: Useful Phrases for effective research paper writing-III 5.4 Selection of appropriate journal 5.5 Identify Predatory journal 5.6 Check submission format of research papers 5.7: Paper submission techniques-I 5.8: Paper submission techniques-II 5.9: Paper submission techniques-III	Study of different journals

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Student will learn how to improve their writing skills, and level of readability	9	0	1	10

CO2: Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	9	0	1	10
CO3: Students will learn about what to write in each section of paper	9	0	1	10
CO4: Students will understand significance of each section of paper, and learn how to write it at the same time.	9	0	1	10
CO5: Ensure the good quality of paper at very first-time submission.	9	0	1	10
Total Hours	45	0	05	50

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
1	Unit 1: Preparation of Research Paper	2	5	3	10
2	Unit 2: Paraphrasing and checking Plagiarism	3	4	3	10
3	Unit 3: Planning Sections of a Paper	2	3	5	10
4	Unit 4: Finalising the Research Paper	2	2	6	10
5	Unit 5: Research Paper Publication	1	2	7	10
Total		10	16	24	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for English for Research Paper Writing s will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion

5. Brainstorming

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering
Course Code: OEC Elective III - B
Course Title: English for Research Paper Writing

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: : Student will learn how to improve their writing skills, and level of readability	2	2	1	1	3	2	2	3	2	2	1	1	**2**	**3**	**3**	**1**	**2**
CO 2 : Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	2	2	2	1	3	2	2	3	2	2	2	1	**2**	**2**	**2**	**1**	**3**
CO 3: Students will learn about what to write in each section of paper	2	3	2	1	3	2	2	3	2	3	2	1	**1**	**1**	**2**	**2**	**2**
CO 4: Students will understand significance of each section of paper, and learn how to write it at the same time	1	-	2	1	1	1	-	-	1	-	2	1	**3**	**3**	**3**	**2**	**2**
CO 5: Ensure the good quality of paper at very first-time submission	1	2	2	1	2	2	1	3	1	2	2	1	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Student will learn how to improve their writing skills, and level of readability	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 Self-grooming, Basic Etiquettes andPresentation Skill 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	SO2.1 SO2.2 SO2.3 SO2.4	Unit-2 Confidence building skills, InterviewSkills and Resume Writing 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Students will learn about what to write in each section of paper	SO3.1 SO3.2 SO3.3 SO3.4 So3.5	Unit-3 Public Speaking Skills& Conversational Skills 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Students will understand significance of each section of paper, and learn how to write it at the same time	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4 Functional Grammar and Vocabulary Building 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Ensure the good quality of paper at very first-time submission	SO5.1	Unit-5 Indian Writing inEnglish& Hindi Statistics 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

SEMESTER-VIII

Course Code: PROJ CS-801

Course Title: Project-III: Internship/Major Project-II

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

The details of COs and LOs are as follows: -

CO.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
CO.2: - The student will be able to implement the project plan and manage the project.
CO.3: - The student will be able to present the complete project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	PROJ CS-701	Major Project-I	0	12	0	0	12	6

INTRODUCTION TO PROJECT WORK/INTERNSHIP

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

3. To learn skills and abilities which are otherwise not possible either in classroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints and circumstances,
   - Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)

- Skill to learn from real life self-experiences (lifelong learning)
- Skill to manage the real-life engineering / professional projects
- Skill to plan and organize the self / group professional work
- skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self-real-life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Internship/Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
  - **The work on the topic should be theoretically and practically feasible.**
  - **The project work on the topic should be completed within approx. Three and half months.**
  - **Availability of required resources should be certain. Cost of project work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1

  to 2 students).

- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering *(AI-DS)*
Course Code: EEC701
Course Title: Capstone Project-I

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	