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 – Cyber Security)

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

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A K S University, Satna

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum & Syllabus of B.Tech. Computer Science & Engineering - Cyber Security) 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 [Cyber Security] Program, which seamlessly integrates the most recent technological advancements and adheres to the guidelines set forth by 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 – Cyber Security 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- Cyber Security) Program

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*

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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

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 Cyber Security 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 planning and 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 169 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: 12 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 beenmeticulously 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

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 curriculum to 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 Commuter 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

PEO1. Excel in professional career and/or higher education by acquiring knowledge in mathematical, computing, and engineering principles.
PEO2. Analyze real-life problems, and design computing systems appropriate to its solutions that are technically sound, economically feasible, and socially acceptable.
PEO3. Exhibit professionalism, ethical attitude, communication skills, and teamwork in their profession and adapt to current trends by engaging in lifelong learning.

Program Outcomes

Graduates in engineering will be able to:

- **PO1 - Engineering knowledge:** Use their understanding of physics, math, engineering fundamentals, and your chosen engineering specialty to solve challenging engineering challenges even in the field of AI and Data Science.
- **PO2 - Problem analysis:** Using the fundamental concepts of mathematics, the natural sciences, and engineering sciences, identify, formulate, study research material, and analyze difficult engineering problems 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, and 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 modeling 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 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 PSO2 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 Artificial Intelligence and Data Science technologies in the fields of engineering and computer science.
- **PSO5:** Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.

A K S University

Faculty of Engineering and Technology

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

General Course Structure and 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:

As per the AICTE model Curriculum for the UG Degree Course in Computer Science and Engineering, the total number of credits proposed for the four-year B. Tech/B.E. in Computer Science and Engineering Artificial Intelligence and Data Science (AI-DS) is kept as 169.

C. Structure of UG Program in AI-DS:

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

S. No.	Category	Breakup of Credits
1.	Humanities & Social Science Courses	10
2.	Basic Science Courses	16
3.	Engineering Science Courses	08
4.	Program Core Courses (Branch specific)	71
5.	Professional Elective Courses (Branch specific)	16
6.	Open Elective Courses (from Humanities, Technical Emerging or other Subjects)	06
7.	Project work, Seminars and Internships in Industry or elsewhere, or research courses	38
8.	Audit Courses Part-I [Environmental Sciences, Indian Constitution]	(non-credit)
9	Audit Courses Part-II [Sustainable Development Goals, Indian Knowledge System]	4
	TOTAL	**169**

D. Course Code and Definition:

Course code	Definitions
L	Lecture
T	Tutorial

P	Practical
C	Credits
HS	Humanities & Social Science Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Professional Elective Courses
OE	Open Elective Courses
AU	Audit Courses
EEC	Employment Enhancement Courses (Project/Summer Internship/Seminar)

- **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 a suffix with the Course Code for identifying the level of the course. The digit at hundred's place signifies the year in which the course is offered. e.g. 101, 102 … etc. for the first year. 201, 202 …. etc. for second year.301, 302 … for third year.

- **Category-wise Courses**

Humanities & Social Sciences Courses [HS]

(i) Number of Humanities & Social Science Courses: 4

(ii) Credits: 10

Sl. No	Course Code	Course Title	Sem	Total Credits	Hours per week			Total Hours [× 15]
					Lecture	Tutorial	Practical	
1	HS101	Communication Skills	1	3	2	0	2	60
2	HS102	Design Thinking	1	1	0	0	2	30
3	HS401	Personality Development through Life Enlighten Skills	4	3	3	0	0	45
4	HSMC (H-102)	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	2	3	2	1	0	45
Total Credits				10				

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Basic Science Courses [BS]

(i) Number of Basic Sciences Courses: 04 (ii) Credits: 16

Sl. No	Course Code	Course Title	Sem	Total Credits	Hours per week			Total Hours [× 15]
					Lecture	Tutorial	Practical	
1	BS101	Physics	1	4	3	0	2	75
2	BS102	Mathematics-I	1	4	3	1	0	60
3	BS201	Mathematics-II	2	4	3	1	0	60
4	BS202	Chemistry	2	4	3	0	2	75
Total Credits				**16**				

Engineering Science Courses [ES]

(i) Number of Engineering Sciences Courses: 02 (ii) Credits: 08

Sl. No	Course Code	Course Title	Sem	Total Credits	Hours per week			Total Hours [× 15]
					Lecture	Tutorial	Practical	
1	ES101	Problem Solving and Programming	1	4	3	0	2	75
2	ES103	Mathematical Concepts for AI	1	4	3	1	0	60
Total Credits				**8**				

Program Core Courses [PC]

(i) Number of Program Core Courses: 18 (ii) Credits: 71

Sl. No	Course Code	Course Title	Sem	Total Credits	Hours per week			Total Hours [× 15]
					Lecture	Tutorial	Practical	
1	PC202	Object Oriented Programming	2	4	3	0	2	75
2	PC203	Data Structures	2	4	3	0	2	75
3	PC204	Discrete Mathematical Structures	2	4	3	1	0	60
4	PC205	Modern Computer Architecture	2	3	3	0	0	45
5	PC301	Algorithm Analysis and Design	3	4	3	0	2	75
6	PC302	Database Systems	3	4	3	0	2	75
7	PC303	Computer Networks	3	4	3	0	2	75
8	PC304CYS	Cyber Security and Cyber Law	3	4	3	0	2	75
9	PC305	Artificial Intelligence	3	4	3	1	0	60
10	PC401	Theory of Computation	4	4	3	1	0	60

11	PC402	Software Engineering	4	4	3	0	2	75
12	PC403	Applied Cryptography	4	4	3	0	2	75
13	PC404	Operating System	4	4	3	0	2	75
14	PC501	Data and Visual Analytics in AI	5	4	3	0	2	75
15	PC502	Ethical Hacking	5	4	3	1	0	60
16	PC503	Identity and Access Management	5	4	3	0	2	75
17	PC504	Introduction to Cloud Security	5	4	3	0	2	75
18	PC701	Soft Computing	7	4	3	0	2	75
19	PC702	AI for Everyone	7	3	3	0	0	45
Total Credits				**74**				

Professional Elective Courses [PE]

(i) Number of Professional Elective Courses: 04 (ii) Credits: 16

Sl. No	**Course Code**	**Course Title**	**Sem**	**Total Credits**	**Hours per week**			**Total Hours [× 15]**
					Lecture	**Tutorial**	**Practical**	
1	PE701	Professional Elective-I	**7**	4	3	0	2	75
2	PE702	Professional Elective-II	**7**	4	3	0	2	75
3	PE801	Professional Elective-III	8	4	3	0	2	75
4	PE802	Professional Elective-IV	8	4	3	0	2	75
Total Credits				**16**				

For a detailed syllabus of the Professional Elective Course, Refer to Appendix II.

Open Elective Courses [OE]

(i) Number of Open Elective Courses: 2 (ii) Credits: 6

Sl. No	**Course Code**	**Course Title**	**Sem**	**Total Credits**	**Hours per week**			**Total Hours [× 15]**
					Lecture	**Tutorial**	**Practical**	
1	OE301	Open Elective – I	3	3	3	0	0	45
Total Credits				**3**				

For a detailed syllabus of the Open Elective Course, Refer to Appendix I.

Project Work, Seminar, and Internship in Industry or Elsewhere

Sl. No	CourseCode	Course Title	Sem	Total Credits	Hours per week			Total Hours [× 15]
					Lecture	Tutorial	Practical	
1	EEC 401, 501	Minor Project	4,5	3+3	0	0	6+6	90+90
2	EEC 601	Internship	6	16	-	-	-	-
3	EEC 701,801	Capstone Project I & II	7,8	6+10	-	-	-	-
Total Credits				**6**				

For some suggested internships, Refer to Appendix III.

Audit Courses [AU] Part-I

Note: These are mandatory non-credit courses.

S. No.	CourseCode	Course Title	Sem	Credits	L	T	P	Total Hours [× 15]
1	AU202	Environmental Science	4	0	3	0	0	45
2	AU301	Indian Constitution	5	0	3	0	0	45
Total Credits				**0**				

Audit Courses [AU] Part-II

Note: These are mandatory non-credit courses.

S. No.	Course Code	Course Title	Semester	Credits	L	T	P	Total Hours [× 15]
1	AU203	Sustainable Development Goals	1	2	2	0	0	30
2	AU302	Indian Knowledge System	2	2	2	0	0	30
Total Credits				**4**				

Research Courses [RC] Part-I

Note: These are research-related courses.

S. No.	Course Code	Course Title	Sem	Credits	L	T	P	Total Hours [× 15]
1	RC601	English for Research Paper	6	2	2	0	2	60
2	RC602	Research Methodology and IPR	6	2	2	0	2	60
Total Credits				**4**				

E. Mandatory Visits/ Workshop/Expert Lectures:

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

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

c. It is mandatory to organize at least one expert lecture per semester for eachbranch by inviting resource persons from domain-specific industries.

F. Evaluation Scheme (Suggestive only):

a. **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 internalassessment and end-semester exams to pass.

b. **For Practical Courses:** (The weightage of the Internal assessment is 50% and for End Semester Exam is 50%) The student has to obtain at least 40% marks individually both in the internal assessment and end-semester exams to pass.

c. **For Summer Internship / Projects / Seminar etc.** Evaluation is based on work done, quality of the 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 number of 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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(Revised as on 01 August 2023)

Semester-wise Structure and Curriculum

Semester I						
3-Week Orientation Programme						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	HS101	Communication Skills	2	0	2	3
2.	BS102	Mathematics-I	3	1	0	4
3.	BS101	Physics	3	0	2	4
4.	ES103	Mathematical Concepts for AI and Data Science	3	1	0	4
5.	BS202	Chemistry	3	0	2	4
6.	ES101	Problem Solving and Programming	3	0	2	4
7.	AU203	Sustainable Development Goals	2	0	0	2
Total						**25**

Semester II						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	BS201	Mathematics-II	3	1	0	4
2.	PC202	Object Oriented Programming	3	0	2	4
3.	PC203	Data Structures	3	0	2	4
4.	PC204	Discrete Mathematical Structures	3	1	0	4
5.	PC205	Modern Computer Architecture	3	0	0	3
6.	HS102	Design Thinking	0	0	2	1
7.	AU302	Indian Knowledge System	2	0	0	2
Total						**22**

Semester III						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PC301	Design and Analysis of Algorithms	3	0	2	4
2.	PC302	Database Systems	3	0	2	4
3.	PC303	Computer Networks	3	0	2	4
4.	PC304CYS	Cyber Security and Cyber Law	3	0	2	4
5.	PC305	Artificial Intelligence	3	1	0	4
6.	Open Elective-I: [Choose Any 1]		3	0	0	3
	OE001	Internet of Things (IoT)				
	OE002	Robotics				
7.	HSMC(H-102)	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	2	1	0	3
Total						**26**

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Semester IV						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PC401	Theory of Computation	3	1	0	4
2.	PC402	Software Engineering	3	0	2	4
3.	PC403	Applied Cryptography	3	0	2	4
4.	PC404	Operating System	3	0	2	4
5.	HS401	Personality Development through Life Enlighten Skills	3	0	0	3
6.	EEC401	Minor Project	3	0	6	3
7.	AU202	Environmental Science	3	0	0	0
Total						**22**

Semester V						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PC501	Data and Visual Analytics in AI	3	0	2	4
2.	PC502	Identity and Access Management	3	0	2	4
3.	PC503	Introduction to IT Security Auditing	3	0	2	4
4.	PC504	Ethical Hacking	3	1	0	4
5.	EEC501	Minor Project	0	0	6	3
6.	AU301	Indian Constitution	3	0	0	0
Total						**19**

Semester VI						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PC601	Cloud Security	3	1	2	5
2.	PC602	Vulnerability and Penetration Testing	3	0	2	4
3.	**Professional Elective-I: [Choose Any 1]**		2	1	0	3
	PEC01	Big Data Analytics				
	PEC02	Pattern Recognition & Visual Recognition				
4.	**Professional Elective-II: [Choose Any 1]**		3	0	2	4
	PEC03	Web Engineering & Technology				
	PEC04	Project Management				
5.	PC603	Digital Forensic	3	1	0	4
7.	EEC601	Evaluation of Internship -I	0	0	4	2
Total						**22**

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Semester VII						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PC701	Java Programming	3	0	2	4
2.	**Professional Elective-III: [Choose Any 1]**		3	0	0	3
	PEC05	Computational Intelligence				
	PEC06	Wireless & Mobile Computing				
3.	**Professional Elective-IV: [Choose Any 1]**		3	0	2	4
	PEC07	Security Intelligence				
	PEC08	Dot Net Programming with VB.Net & ASP.Net				
4.	**Open Elective-I [Choose Any 1]**		3	0	0	3
	OEC01	Security Assessment and Risk Analysis				
	OEC02	Current Trends and Technologies				
5.	BSC-701	Biology	2	1	0	3
6.	EEC701	Major Project-I	0	0	8	4
Total						**21**

Semester VIII						
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	**Professional Elective-V:[Choose Any 1]**		2	0	2	3
	PEC09	Blockchain Technology				
	PEC10	Statistical Thinking for Data Science				
2.	**Open Elective-II:[Choose Any 1]**					
	OEC03	Intrusion Detection System	2	0	2	3
	OEC04	AI using Python				
3	**Open Elective-III:[Choose Any 1]**					
	OEC05	Linux and Shell Programming	3	0	0	3
	OEC06	AI for Everyone				
4.	EEC801	Capstone Project (Part II)	-	-	-	6
Total						**15**

Semester-I

Course Code: HS101

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 should be 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 boosts the confidence and prepares them to face the audience fearlessly.

Course Outcomes:

After completion of the course:

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.

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

CO.3 Students will be able to communicate effectively in Hindi and English languages without hindrances.

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.

CO.5 The 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)	
Program Core (PCC)	HS101	Communication Skills	3	0	1	1	5	3

Legend: 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**CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L).

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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		
PCC	HS101	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: 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.

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 given topics.

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 to influence mass through skit and dramas.		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 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.	2. Prepare a play on the given topics.

CO2: 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.

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 of social media 2.5. Group Discussion on lives, pros and cons of technology 2.6. Students will be able 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 Children Will 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: Students will be able to 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 effectively through 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: 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.

Approximate Hours

Item	Appx. Hrs
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: The Understanding of Indian Culture and English Language will be developed through the 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)**
SO5.1 Students will beable to understand the value of Indian Literature (R.K. Narayan) **SO5.2** Students will beable to understandthe value of Indian Literature (Nissim Ezekiel) **SO5.3** Students will beable to understandthe value of Indian Literature (Khushwant Singh) **SO5.4** Students will beable to understandthe value of Indian Literature (Mulk Raj Anand) **SO5.5** Students will beable to understandthe 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 thetopics (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 the Importance of Team Work.	12	1	1	14
CO.3: Students will be able to communicate effectively in Hindi and 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 through the 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. Stannard Allen	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

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : HS101
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-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: Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and real-world problems.	-	-	-	-	1	1	1	2	3	3	1	-	2	3	3	1	2
CO 2 : Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.	-	1	1	-	-	2	2	2	3	3	2	-	2	2	2	1	3
CO 3: Use of operations involving vectors and matrices depend on the specific operations being performed.	-	-	-	-	-	-	-	-	2	3	1	-	1	1	2	2	2
CO 4: Use and apply hypothesis testing on different datasets.	-	-	-	-	-	-	-		1	3	-	-	3	3	3	2	2
CO 5: Use statistical methods to analyze and collect data.	-	-	1	-	-	1	-	-	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	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 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 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, InterviewSkills and Resume Writing 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 inEnglish& 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	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revised on 01 August 2023)

Semester-I

Course Code: BS102

Course Title: Mathematics-I

Pre-requisite: Student should have basic knowledge of basic calculus and vector calculus.

Rationale: It enables the development of pupils' natural ability to think logically, solve puzzles and apply these skills to real-life problems.

Course Outcomes:

BS102.1 Understand basic algebra.
BS102.2 Understand and apply calculus.
BS102.3 Understand and apply vector calculus.
BS102.4 Understand and apply differential equations.
BS102.5 Understand and apply multivariate calculus.

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)	
BS	BS102	Mathematics-I	4	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 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)		
BS	BS-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.

BS102.1 Understand basic algebra.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding Vector spaces and Subspaces. SO1.2 Explain canonical forms. SO1.3 Discuss symmetric bilinear forms. SO1.4 Define skew symmetric bilinear forms.	.	**Unit-1:(1) Linear Algebra** **1.1** Vector spaces, **1.2** Subspaces, **1.3** basis and dimension, **1.4** linear transformations , representation of transformations by Matrices, **1.5** linear functionals, **1.6** transpose of linear transformations , **1.7** canonical forms. **1.8** Linear functionals and **1.9** adjoints, **1.10** Bilinear forms, **1.11** symmetric bilinear forms, **1.12** skew symmetric bilinear forms	1. Learn about basis and dimension. 2. transpose of linear transformations.

SW-1 Suggested Sessional Work (SW):

a. Assignments: -

(1) Vector spaces, linear transformations, representation of transformations by Matrices.

(2) transpose of linear transformations, canonical forms.

(3) Linear functionals and adjoints, Bilinear forms, symmetric bilinear forms, skew symmetric bilinear forms.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

BS102.2 Understand and apply calculus.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Define Continuity and differentiability. SO2.2 Discuss Lagrange's mean value theorem. SO2.3 To learn about Rolle's Theorem . SO2.4 Explain Double and Triple Integrals.	.	**Unit-2** : Calculus **2.1** Continuity **2.2** Differentiability of a function of single variable **2.3** statement of Rolle's Theorem, **2.4** Lagrange's mean value theorem **2.5** It's applications. **2.6** Double Integrals **2.7** Triple Integrals **2.8** Calculations **2.9** Areas **2.10** Volumes, **2.11** Change of variables 2.12 Based Numerical	1. statement of Rolle's Theorem. 2. Double and Triple Integrals.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

Question based on Double and Triple Integrals.

(1) Explain Rolle's Theorem and Lagrange's mean value theorem.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

BS102.3 Understand and apply vector calculus.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand Integrals of Vector Functions . SO3.2 To learn Green's formula. SO3.3 Explain Surface integral. SO3.4 Explain Stoke's formula.	.	**3.1.** Unit-3 Vector Calculus **3.2.** Vector Calculus **3.3.** Applications. **3.4.** Integrals of Vector Functions: **3.5.** Line integrals, **3.6.** Green's formula **3.7.** Based Numerical **3.8.** path independence, **3.9.** Surface integral: definition, **3.10.** evaluation, **3.11.** Stoke's formula, **3.12.** Gauss-Ostrogradsky divergence theorem.	1. To learn about Green's formula. 2. Gauss-Ostrogradsky divergence theorem.

SW-3 Suggested Sessional Work (SW):

a. Assignments: -

(1) Question based on Integrals of Vector Functions.

(2) Question based on Surface integral.

(3) Gauss-Ostrogradsky divergence theorem.

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

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

BS102.4 Understand and apply differential equations.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 To Understand Ordinary Differential Equations. SO4.2 To learn Bernoulli's equations. SO4.3 To understand Second order and Higher order linear differential equations. SO4.4 Explain Exact equations and Integrating factor	.	**4.1.** Unit-4 Differential Equations **4.2.** Ordinary Differential Equations **4.3.** Based Numerical **4.4.** First order linear equations, **4.5.** Bernoulli's equations **4.6.** Based Numerical **4.7.** Exact equations. **4.8.** Based Numerical	1. First order linear equations, 2. To learn about Exact equations.

		4.9. Integrating factor, **4.10.** Second order **4.11.** Higher order linear differential equations with constant coefficients **4.12.** Based Numerical	

SW-4 Suggested Sessional Work (SW):

a. Assignments:
(1) Question based on Ordinary Differential Equations.
(2) Bernoulli's equations, Exact equations.
(3) Second order and Higher order linear differential equations with constant coefficients.

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

c. Other Activities (Specify):
NA

BS102.5 Understand and apply multivariate calculus.

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

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

SO5.1 To understand Integral Calculus. SO5.2 To learn about surface area. SO5.3 Explain Improper integrals. SO5.4 define Lagrange multipliers.		**Unit** 5 Multivariate Calculus 5.1 Integral Calculus 5.2 Definite Integrals as a limit of sums, 5.3 Applications of integration to area, 5.4 Volume, 5.5 surface area, 5.6 Improper integrals 5.7 Functions of several variables 5.8 Continuity and differentiability, 5.9 mixed partial derivatives 5.10 local maxima and minima for function of two variables, 5.11 Lagrange multipliers 5.12 Based Numerical	1. Applications of integration to area. 2. local maxima and minima for function of two variables.

SW-5 Suggested Sessional Work (SW):

a. Assignments: -

(1) Applications of integration to area, volume, surface area, Improper integrals.
(2) Functions of several variables, Lagrange multipliers.

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 (SI)	Total hour (Cl+SW+Sl)
BS102.1 Understand basic algebra.	12	2	1	15
BS102.2 Understand and apply calculus.	12	2	1	15
BS102.3 Understand and apply vector calculus.	12	2	1	15
BS102.4 Understand and apply differential equations.	12	2	1	15

BS102.5 Understand and apply multivariate calculus.	12	2	1	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Linear Algebra	03	01	01	05
CO-2	Calculus	02	02	01	05
CO-3	Vector Calculus	03	07	05	15
CO-4	Differential Equations	04	06	05	15
CO-5	Multivariate Calculus	03	04	03	10
Total		15	20	15	50

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

The end of semester assessment for 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. Case Method
4. Group Discussion
5. Demonstration
6. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)

Suggested Learning Resources:

A. Books:

S.No.	Title	Author	Publisher	Edition & Year
1	Calculus and Analytic Geometry.	G. B. Thomas, R. L. Finney.	Pearson Education.	Ninth Edition 2010
2	Higher Engineering Mathematics,	B. V. Ramana	Tata McGraw Hill,	2017
3	Advanced Engineering Mathematics	E. Kreyszig	Wiley,	2015

B. Alternative NPTEL/SWAYAM Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Basic calculus for Engineers, Scientists and Economists	Prof. Joydeep Dutta	IIT Kanpur

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: BS102

Course Title: Mathematical -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: Understand basic algebra	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Understand and apply calculus	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Understand and apply vector calculus.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Understand and apply differential equations.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Understand and apply multivariate calculus	3	2	1	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 algebra	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Linear Algebra 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 : Understand and apply Calculus	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Calculus 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: Understand and apply vector calculus.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Vector 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand and apply differential equations.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Differential Equation 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: Understand and apply multivariate calculus	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Multivariate 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	

Semester-I

Course Code:	BS-101
Course Title:	Engineering Physics
Pre- requisite:	Students should be familiar with the fundamentals of laser, fiber optics, holography, diffraction, polarization, oscillations, ultrasonics, and SHM.
Rationale:	Engineering is a crucial part of our society because it provides solutions to the problems we face in our daily lives. Engineering physicists may help develop instruments, measurement techniques, or prototype systems related to: Acoustics such as sound reproduction, hall design, and speakers. Communications such as fiber optics, lasers, antenna design, and wireless communications.

Course Outcomes:

BS-101.1: Through this chapter students are brought to learn about Simple Harmonic Motion and particles executing S.H.M. Types of vibrations are also studied

BS-101.2: Harmonic motion gives the knowledge of composition of two simple harmonic motion and the construction of Lissajous figures. It also gives the true knowledge of various types of oscillations.

BS-101.3: Interference chapter gives the concept of light wave and its equation, meaning of coherence, interference fringes, interference by Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination etc.

BS-101.4: Diffraction section explains about various types of diffractions in details, knowledge of grating and its resolving power and Polarization section gives the knowledge of production and analyzing of different polarized light, specific rotation

BS-101.5: To expose the students to the basic concepts of optical fibers and their properties also provide adequate knowledge about the Industrial applications of optical fibers, to expose the students to the Laser fundamentals, to provide adequate knowledge about Industrial application of lasers, to provide adequate knowledge about holography and medical applications of Laser

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revised 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)	
Program Core (PCC)	BS-101	Engineering Physics	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 Assignment5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one(SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+ AT)		
PCC	BS 101	Engineering Physics	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus outlines the expected learning outcomes that students should achieve through different modes of instruction, such as classroom instruction (CI), laboratory instruction (LI), sessional work (SW), and self-learning (SL), at both the course and session levels. Students should demonstrate their mastery of Session Outcomes (SOs) as the course proceeds, which will lead to their overall attainment of Course Outcomes (COs) at the end of the course.

BS-101.1: Through this chapter students are brought to learn about Simple Harmonic Motion and particles executing S.H.M. Types of vibrations are also studied

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)**
SO 1.1 Production, detection and uses of ultrasonics Wave SO 1.2 Reverberation & Sabine's formula (no derivation) SO 1.3 Review of Basic Kinematics (displacement, velocity, acceleration) SO 1.4 Review of Basic Kinematics (Time Period and Phase of Vibration) SO 1.5 Dynamics (restoring force and energetics) of Simple Harmonic Motion SO 1.6 Differential Equation of SHM SO 1.7 Superposition of two SHM in One Dimension SO 1.8 Charge Oscillations in LC Circuits	LI.1.1. Experimental Analysis of Charge Oscillations in LC Circuits	Unit 1: **Ultrasonics & SHM** 1.1: History of Ultrasonics & SHM 1.2 Distinguish between Classical Waves and Mechanical Waves 1.3: Experimental explanation about displacement, velocity & acceleration 1.4: Experimental explanation about time period & Phase of Vibration 1.5: Experimental explanation about dynamics of simple harmonic motion 1.6: Mathematical explanation of simple harmonic motion by using differential equation method 1.7: Mathematical explanation of superposition of two 1-D SHM waves 1.8: Mathematical explanation of charge oscillation in LC Circuits 1.9: Experimental explanation of charge oscillation in LC Circuits	1: Classification of Waves 2: Unterstand about (displacement, velocity, acceleration, time period & phase of vibration) according to basic kinematics 3: Mathematical explanation of SHM by using differential method

SW-1 Suggested Sessional Work (SW):

A. Assignments: Ultrasonic methods of NDT use beams of mechanical waves (vibrations) of short wavelength and high-frequency, transmitted from a small probe and detected by the same or other probes. Such mechanical waves can travel large distances in fine-grain metal, in the form of a divergent wave with progressive attenuation.

B. Mini Project: Make a Propulsion model

C. Other Activities (Specific):

BS-101.2: Harmonic motion gives the knowledge of composition of two simple harmonic motion and the construction of Lissajous figures. It also gives the true knowledge of various types of oscillations

Approximate Hours

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

Session Outcomes (SOs)	**Laboratory Instruction (L I)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO 2.1 Differential Equation of a Damped Oscillator and Different Kinds of Damping SO 2.2 Methods of describing damping of an oscillator - logarithmic decrement, Relaxation time, Quality factor, Band width. SO 2.3 Series LCR circuit as a damped oscillator SO 2.4 Forced Oscillations: States of forced oscillations SO 2.5 Differential equation of forced	Experimental Analysis of Forced Oscillations in Series LCR Circuit	Unit 2: **Oscillations** 2.1: Elementary Proof of Differential Equation of a Damped Oscillator and Explanation about different kinds of damping 2.2 Mathematical Methods of describing damping of an oscillators 2.3: Experimental explanation about Series LCR circuit as a damped oscillator 2.4: Experimental explanation about Forced Oscillations 2.5: Experimental explanation about Differential equation of forced oscillator (its displacement, velocity and Impedance) 2.6: Mathematical explanation of Displacement and Velocity with	1: Explain about Different Kinds of Damping 2: Explain about behavior of displacement and velocity with Driver's Frequency Power, bandwidth, Quality factor and amplification of forced oscillator. 3: Mathematical explanation of Damped

oscillator – its displacement, velocity and Impedance SO 2.6 Behavior of Displacement and Velocity with Driver's Frequency Power, bandwidth, Quality factor and amplification of forced oscillator. SO 2.7 Resonance in forced oscillators SO 2.8 Forced Oscillations in Series LCR Circuit		Driver's Frequency Power, bandwidth, Quality factor and amplification of forced oscillator. 2.7 : Mathematical explanation of Resonance in forced oscillators 2.8 : Mathematical explanation of Forced Oscillations in Series LCR Circuit 2.9 : Experimental explanation of Forced Oscillations in Series LCR Circuit	Oscillations by using differential method

SW-2 Suggested Sessional Work (SW):

A. Assignments:
B. (1) Determine the equation of motion for system.
(2) What would be the steady state of solution.
C. Mini Project:
D. Other Activities (Specific): Experimental Analysis of Forced Oscillations in Series LCR Circuit

BS-101.3: Interference chapter gives the concept of light wave and its equation, meaning of coherence, interference fringes, interference by Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination etc.

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)
SO 3.1 Wave equation and its solution SO 3.2 Characteristic Impedance of a String,		**Unit-3: Wave Motion and interference** 3.1 Elemetry Proof of Wave equation and its solution 3.2 Explain the characteristic impedance of a String	

SO 3.3 Reflection and Transmission of waves on a string at a Boundary SO 3.4 Reflection and Transmission of Energy SO 3.5 The matching of impedances SO 3.6 Division of wave front and amplitude SO 3.7 Fresnel's biprism SO 3.8 Newton's rings SO 3.9 Michelson interferometer and its applications for determination of λ and dλ	To determine the wavelength of Sodium light by using Fresnels biprism Method To determine the wavelength of Sodium light by using Newtons Ring Experiment To determine the wavelength of He-Ne Laser by using Michelson Interferometer Experiment	3.3 Explain about reflection and transmission of waves on a string at a boundary 3.4 Discribe reflection and transmission of energy 3.5 The matching of impedances 3.6 Experimental explanation about Division of wave front and amplitude 3.7 Mathematical & Experimental explanation of Fresnel's biprism 3.8 Mathematical & Experimental explanation of Newton's rings 3.9 Mathematical & Experimental explanation of Michelson interferometer and its applications for determination of λ and dλ	Mathematical & Experimental explanation of Frenels biprism Mathematical & Experimental explanation of Newtons ring Experiment Mathematical & Experimental explanation of Frenels biprism Experiment

Suggested Sessional Work (SW):

A. Assignments:

(1). In the double-hole experiment using white light, consider two points on the projection screen, one corresponding to a path difference of 5000 Å (point A), and the other corresponding to a path difference of 40,000 Å (point B). (i) Find all the wavelengths (in the visible region) which correspond to constructive and destructive interference at point A. (ii) Find all the wavelengths (in the visible region) which correspond to constructive and destructive interference at point B.

(2) In Young's double-hole experiment, the distance between the two holes is 0.5 mm, $\lambda=5 \times 10^{-5}$ cm, and D = 50 cm. What will be the fringe width?

B. Mini Project: - Project on Wave Nature of light

C. Other Activities: -

1. To determine the wavelength of Sodium light by using Fresnel's biprism Method
2. To determine the wavelength of Sodium light by using Newtons Ring Experiment
3. To determine the wavelength of He-Ne Laser by using Michelson Interferometer Experiment

BS-101.4: Diffraction section explains about various types of diffractions in details, knowledge of grating and its resolving power and Polarization section gives the knowledge of production and analyzing of different polarized light, specific rotation

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)**
SO 4.1 Fresnel and Fraunhofer diffraction SO 4.2 Qualitative Changes in Diffraction Pattern on Moving from single slit to Double Slit SO 4.3 Plane Transmission Grating SO 4.4 Dispersive Power & Resolving Power of a Grating SO 4.5 Methods of Polarization SO 4.6 Analysis of Polarized Light SO 4.7 Quarter and Half Wave Plates SO 4.8 Double Refraction	To determine the wavelength of monochromatic light by using Fresnel's & Fraunhofer Diffracting Method To determine the wavelength of He-Ne laser using transmission grating. To design a hollow prism and used it find the refractive index of a given liquid. To determine the double refraction by using Nicol Prism	**Unit-4 : Diffraction & Polarization** 4.1 Distinguish between Fresnel and Fraunhofer diffraction 4.2 Mathematical & Experimental method to explain about the Qualitative Changes in Diffraction Pattern on Moving from single slit to Double Slit 4.3 Experimental analysis about Plane Transmission Grating 4.4 Explain Dispersive Power & Resolving Power of a Grating 4.5 Explain mathematical methods of Polarization 4.6 Analysis of Polarized Light 4.7 Quarter and Half Wave Plates 4.8 Double Refraction part 1 4.9 Double Refraction part 2	Mathematical & Experimental explanation of Polarization Mathematical & Experimental explanation of Double Refraction Experiment

SW- 4 Suggested Sessional Work (SW):

A Assignments:

[1]. Polarizing angle.

a. At what incident angle is sunlight reflected from a lake plane- polarized?
b. What is the refraction angle?

[2]. In Young's double-hole experiment, the distance between the two holes is 0.5 mm, $\lambda=5\times10^{-5}$ cm, and D = 50 cm. What will be the fringe width?

B Mini Project: - Project on Polarized Light of light

C Other Activities: -

1. To determine the wavelength of He-Ne laser using transmission grating
2. To determine the slit width using the diffraction pattern.
3. To design a hollow prism and used it find the refractive index of a given liquid.

BS-101.5: To expose the students to the basic concepts of optical fibers and their properties also provide adequate knowledge about the Industrial applications of optical fibers, to expose the students to the Laser fundamentals, to provide adequate knowledge about Industrial application of lasers, to provide adequate knowledge about holography and medical applications of Laser.

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)**
SO 5.1 LASER Production SO 5.2 Spontaneous Emission & Stimulated Emission. SO 5.3 Einstein's Coefficients SO 5.4 Helium-Neon SO 5.5 Ruby and Semiconductor Lasers SO 5.6 Applications of Lasers		**Unit 5: Lasers, Fiber Optics and Holography** 5.1 Elementary idea of LASER Production 5.2 Distinguish between Spontaneous Emission & Stimulated Emission. 5.3 Mathematical proof of Einstein's Coefficients 5.5 Explain construction & working of Ruby and Semiconductor Lasers 5.6 Applications of Lasers	1. Mathematical & Experimental explanation of optical Fibre. 2. Mathematical & Experimental explanation of Holography Experiment.

SO 5.7 Basics of optical Fibre SO 5.8 Fibre Optics sensors & Applications of Optical Fibre in communication systems SO 5.9 Holography		5.7 Basics of optical Fiber (numerical aperture, coherent bundle, step index and graded index fiber, material dispersion) 5.8 Fiber Optics sensors & Applications of Optical Fiber in communication systems 5.9 Holography (Basic principle, theory and requirements).	

SW- 4 Suggested Sessional Work (SW):

A Assignments:

1. Basics of optical Fibre (numerical aperture, coherent bundle, step index and graded index fibre, material dispersion)
2. (2) Explain construction & working of Helium-Neon.

B Mini Project: - Project on Holograms in Real Life: How the Technology Works and Industry Use Cases

C Other Activities: -

1. To determine the wavelength of He-Ne laser using transmission grating
2. To determine the slit width using the diffraction pattern.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction [LI]	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
BS 101.1: Through this chapter students are brought to learn about Simple Harmonic Motion and particles executing S.H.M. Types of vibrations are also studied.	9	6	2	1	18
BS 101.2: Harmonic motion gives the knowledge of composition of two simple harmonic motion and the construction of Lissajous figures. It also gives the true knowledge of various types of oscillations.	9	6	2	1	18
BS-101.3: Interference chapter gives the concept of light wave and its equation, meaning of coherence, interference fringes, interference by Fresnel's biprism, Newton's rings, Michelson interferometer and its	9	6	2	1	18

applications for determination etc.					
BS-101.4: Diffraction section explains about various types of diffractions in details, knowledge of grating and its resolving power and Polarization section gives the knowledge of production and analyzing of different polarized light, specific Rotation	9	6	2	1	18
BS 101.5: Classify the types of optical fibers and discuss the various losses and dispersion involved in optical fibers and discuss about various optical sources, optical detectors, optical connectors and splices.	9	6	2	1	18
Total Hours	45	30	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

Unit	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
Unit-1	Ultrasonics & SHM	03	01	01	05
Unit-2	Oscillations	02	06	02	10
Unit-3	Wave Motion and interference	03	07	05	15
Unit-4	Diffraction & Polarization	-	10	05	15
Unit-5	Lasers, Fibre Optics and Holography	03	02	-	05
Total		11	26	13	50

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

The end of semester assessment for Engineering Physics 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	Engineering Physics	A.B. Bhattacharya	Khanna Publishing House, 2020	Revised edition 21 edition 2020
2	Physics for Engineers	N.K. Verma	Prentice Hall India	2017
3	Physics of Vibrations and Waves	H.J. Pain	National Council for Cement and Building Materials	5th Edition, Wiley, 2006
4	Optics	Ajoy Ghatak	McGraw Hill Education India,	2017
5	Department Provided Lab Manual			
6	Engineering Physics Lab Manual			
7	Lecture note provided by Dept. of Physics, AKS University, Satna.			

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B.Tech (CSE) Cyber Security
Course Code : BS-101
Course Title: Engineering Physics

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: Students are brought to learn about Simple Harmonic Motion and particles executing S.H.M. Types of vibrations are also studied	1	1	2	2	3	2	3	2	2	1	3	2	3	3	3	1	-
CO 2: Harmonic motion gives the knowledge of composition of two simple harmonic motion and the construction of Lissajous figures. It also gives the true knowledge of various types of oscillations.	1	2	2	2	1	2	3	2	1	1	2	2	2	2	2	1	-
CO3 : Interference chapter gives the concept of light wave and its equation, meaning of coherence, interference fringes, interference by Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination etc..	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	-
CO.4: Diffraction section explains about various types of diffractions in details, knowledge of grating and its resolving power and Polarization section gives the knowledge of production and analyzing of different polarized light, specific rotation	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	-
CO 5: Classify the types of optical fibers and discuss the various losses and dispersion involved in optical fibers and discuss about various optical sources, optical detectors, optical connectors and splices.	-	-	-	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: Students are brought to learn about Simple Harmonic Motion and particles executing S.H.M. Types of vibrations are also studied.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		**Unit-1.0 Ultrasonics & SHM** **1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9**	As mentioned, above
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Harmonic motion gives the knowledge of composition of two simple harmonic motion and the construction of Lissajous figures. It also gives the true knowledge of various types of oscillations.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		**Unit-2- Oscillations** **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 : Interference chapter gives the concept of light wave and its equation, meaning of coherence, interference fringes, interference by Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination etc..	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		**Unit-3: Wave Motion and interference** **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: Diffraction section explains about various types of diffractions in details, knowledge of grating and its resolving power and Polarization section gives the knowledge of production and analyzing of different polarized light, specific rotation	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		**Unit-4 : Diffraction & Polarization** **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: Classify the types of optical fibers and discuss the various losses and dispersion involved in optical fibers and discuss about various optical sources, optical detectors, optical connectors and splices	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		**Unit 5: Lasers, Fiber Optics and Holography** **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 [Cyber Security] Program

(Revised on 01 August 2023)

Semester-I

Course Code: ES-103

Course Title: Mathematical Concepts for AI And DS

Pre-requisite: Mathematical concepts provide the foundation for understanding the algorithms, models, and methodologies used in AI and DS.

Rationale: Math helps in understanding logical reasoning and attention to detail.

Course Outcomes:

ES-102.1: Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and real-world problems.

ES-102.2: Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.

ES-102.3: Use of operations involving vectors and matrices depend on the specific operations being performed.

ES-102.4: Use and apply hypothesis testing on different datasets.

ES-102.5: Use statistical methods to analyze and collect 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)	
Program Core (PCC)	ES-103	Mathematical Concepts for AI And DS	4	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 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	ES 103	Mathematical Concepts for AI And DS	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. Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and 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)
SO1.1 To Understand The intercept and slope **SO1.2** To learn about the system of equation **SO1.3** To understand the exponentials and logarithms. **SO1.4** To know about quadratic equation.	.	**Unit-1.0 Equations, Functions and Graphs** **1.1** Introduction to linear equations **1.2** Intercepts and slopes **1.3** System of equations **1.4** Exponentials, radicals and logarithms, **1.5** Polynomials **1.6** Polynomial operations **1.7** Factorizations **1.8** Introduction to quadratic equations **1.9** Functions	1. Learn about Exponential and logarithms. 2. Learn about system of equations

SW-1 Suggested Sessional Work (SW):

a. Assignments: -

(1) Explain the system of equations with one – one example.
(2) Write the formula of Exponentials, radicals and logarithms.
(3) Questions based on polynomial, quadratic and intercepts.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

CO.2: Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.

Approximate Hours

Item	Appx. Hrs.
Cl	10

LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. To Understand Introduction to limits **SO2.2.** To learn about continuity and differentiability **SO2.3.** To understand the derivatives to analyse function **SO2.4.** To learn about the Second order derivatives	.	**Unit-2: Derivatives and Optimizations** 2.1. Rate of change 2.2. Introduction to limits 2.3. Continuity 2.4. Finding limits 2.5. Differentiability 2.6. Derivative rules and operations 2.7. Using derivatives to analyse functions 2.8. Second order derivatives 2.9. Optimization functions 2.10. Multivariate differentiation	1. About continuity and differentiability. 2. Understand the Optimization functions and Multivariate differentiation.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

(1) Questions based on continuity, limits and differentiability.

(2) using derivatives to analyse functions and Second order derivatives.

(3) Questions based on Optimization functions and Multivariate differentiation.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

CO.3: Use of operations involving vectors and matrices depend on the specific operations being performed.

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revised on 01 August 2023)

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. To know about introduction to vectors **SO3.2.** To Understand the matrices **SO3.3.** To learn about system of equations with matrices, **SO3.4.** To Learn About Eigen values and eigen vectors.	.	**Unit-3 : Vectors and Matrices** 3.1 Introduction to vectors 3.2 Vector addition 3.3 Vector multiplication 3.4 Introduction to matrices 3.5 Matric multiplication 3.6 Properties of matrices 3.7 Types of matrices 3.8 Matrix division 3.9 Solving system of equations with matrices 3.10 Matrix transformations 3.11 Eigen values and eigen vectors 3.12 Rank of matrix	1. Matrix and types of matrices. 2. solving system of equations with matrices. 3. question based on Eigen values and eigen vector.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

(1) Questions based on vector multiplication and matric multiplication.
(2) solving system of equations with matrices.
(3) Introductions of matrix and types of matrices.
(4) Questions based on Eigen values and eigen vectors and rank of matrix.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

ES-102.4. Use and apply hypothesis testing on different datasets.

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revised on 01 August 2023)

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Understanding dependent and independent events **SO4.2.** Understanding the Random variables **SO4.3.** Understanding the types of Random variable **SO4.4.** Understand the joint probability distribution. **SO4.5.** To Know about Bayes' theorem.	.	**Unit-4 Probability** 4.1. Basic rules and axioms events 4.2. Sample space 4.3. Dependent and independent events 4.4. Conditional probability, 4.5. Random variables 4.6. Continuous and discrete, expectation 4.7. Variance 4.8. Distributions- joint and conditional 4.9. Bayes' Theorem 4.10. Popular distributions: binomial 4.11. Bernoulli 4.12. Poisson 4.13. Exponential 4.14. Gaussian	1. To Learn about dependent and independent events. 2. Learn about random variables. 3. To Understand binomial, Bernoulli, Poisson, exponential, Gaussian,

SW-4 Suggested Sessional Work (SW):

a. Assignments:

(1) Explain types of random variable with example.
(2) State and prove Bayes' Theorem with example.
(3) Question based on joint and conditional probability.
(4) Question based on Binomial, Bernoulli, Poisson, gaussian.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

NA

ES-102 5: Use statistical methods to analyze and collect data.

Approximate Hours

Item	Appx. Hrs.
Cl	15
LI	0
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Understanding Sampling and Sampling Distributions **SO5.2 To** learn about Methods of Estimation **SO5.3** Understanding Z-interval, t-interval **SO5.4** To learn about Hypothesis Testing		**Unit 5 Statistics** 5.1 Fundamentals of Data: Collection 5.2 Summarization, and 5.3 Visualization 5.4 Sampling 5.5 Sampling Distributions, 5.6 Central Limit Theorem 5.7 Methods of Estimation, 5.8 Unbiased estimators 5.9 Confidence Interval Estimation: 5.10 Z-interval, 5.11 t-interval 5.12 Hypothesis Testing, 5.13 Types of Errors, 5.14 Rejection Region Approach and 5.15 p-value Approach.	1. To learn about Z-interval, t-interval. 2. To understand Collection, Summarization, and Visualization.

SW-5 Suggested Sessional Work (SW):

a. Assignments: -

(1) Explain types of Errors.
(2) Solve question based on Methods of Estimation and Unbiased estimators.
(3) Define Hypothesis Testing, Rejection Region Approach and p-value Approach.
(4) Question based on Central Limit Theorem, Collection, Summarization, and Visualization.

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)
ES-103.1: Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and real-world problems.	9	2	1	12
ES-103.2: Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.	10	2	1	13
ES-103.3: Use of operations involving vectors and matrices depend on the specific operations being performed.	12	2	1	15
ES-103.4: Use and apply hypothesis testing on different datasets.	14	2	1	17
ES-103 5: Use statistical methods to analyze and collect data.	15	2	1	18
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	
CO-1	Equations, Functions and Graphs	03	01	01	05
CO-2	Derivatives and Optimizations	02	02	01	05
CO-3	Vectors and Matrices	03	07	05	15
CO-4	Probability	04	06	05	15
CO-5	Statistics	03	04	03	10
Total		15	20	15	50

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

The end of semester assessment for Mathematical Concepts for AI And DS 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	Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares.	StephenBoyd, Lieven Vandenberghe	Cambridge University Press.	2018
2	Probability and statistics for Engineers and Scientists	Walpole, Myers	Myers and Ye, Pearson Education	2012
3	Advanced Engineering Mathematics	Wylie and Barrett	McGraw Hill	1995

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Essential Mathematics for Cyber Security	Prof. Sanjeev Kumar Prof. S. K. Gupta	IIT Roorkee

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security] **Course Code : ES103**

Course Title: Mathematical Concepts for AI And DS

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: Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and real-world problems.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Use of operations involving vectors and matrices depend on the specific operations being performed.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Use and apply hypothesis testing on different datasets.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Use statistical methods to analyze and collect data.	-	-	-	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: Analyzing the graph of a function is a powerful way to understand its behavior, make predictions, and solve mathematical and real-world problems.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Equations, Functions and Graphs 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 : Discuss of Derivatives and optimization are closely related concepts in mathematics and have important applications in various fields, engineering, and machine learning.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Derivatives and Optimizations 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: Use of operations involving vectors and matrices depend on the specific operations being performed.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Vectors and Matrices 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: Use and apply hypothesis testing on different datasets.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Probability 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: Use statistical methods to analyze and collect data.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 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	

Course Code: BS202

Course Title: Engineering Chemistry

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 to understand the basic principle of chromatography and spectroscopic analysis.

Course Outcomes:

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

BSC- 103.1 Apply VSEPR theory to predict the three-dimensional shapes of molecules.

BSC-103.2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule.

BSC-103.3: Explain and apply the concept of Intermolecular forces, Hydrogen bond, and transition metal complexes.

BSC- 103.4 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.

BSC-103.5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopic techniques.

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)	BS202	Engineering Chemistry	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 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	BS202	Engineering Chemistry	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.

BSC- 103.1 Apply VSEPR theory to predict the three-dimensional shapes of molecules.

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. Describe the classification of	LI1.1. Determination of specific density of given liquid	**Unit 1: Atomic and Molecular Structure & Periodic properties**	**1.** History of development of periodic table

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.	LI.1.2. Determination of viscosity of given liquid LI.1.3 Paper chromatography, Thin layer chromatography.	**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 Determination of 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 types of electron gain enthalpy	**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.

BSC-103.2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule.

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 explain 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

BSC-103.3: understand the concept of Intermolecular forces, Hydrogen bond, Transition metal complexes by applying this concept

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)

SO2.1 Describe Ionic, dipolar, London dispersion force, vander Waals interaction SO2.2 explain Hydrogen bond and types of hydrogen bond SO2.3 Coordination compounds SO2.4 describe Metal ligand bonding by VBT SO2.5 explain Metal ligand bonding by CFT	LI3.1. Synthesis a inorganic metal complex LI3.2. Determine the two acid and two basics radical LI.2.3.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):

BSC- 103.4 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.

BSC-103.5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopic techniques.

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)
BSC- 103.1: Apply VSEPR theory to predict the three-dimensional shapes of molecules.	09	04	02	01	16
BSC-103.2: Describe the concept of symmetry, chirality and optical activity and synthesize chiral drug molecule	09	06	02	01	18
BSC-103.3: Explain and apply the concept of Intermolecular forces, Hydrogen bond, and transition metal complexes	09	04	02	01	16

BSC- 103.4: 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.	09	04	02	01	16
BSC-103.5: Collectively aim to equip students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of various spectroscopic techniques.	09	04	02	01	14
Total Hours	45	22	10	05	80

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 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 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.

Program: B.Tech. CSE [Cyber Security]
Course Title: Engineering Chemistry
Course Code: BS202

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 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: 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	-
CO 2 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 equip students 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 predict the 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 its application
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 drug molecule** 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 bond, and transition metal complexes.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI.3.1, LI.3.2 LI.3.3	Unit-3 **Intermolecular forces and Transition 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.
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 & entropy and 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 students with a comprehensive understanding of the theoretical principles, practical methodologies, and diverse applications of 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.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-I

Course Code: ES-101

Course Title: Problem Solving and Programming

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:

ES 101.1: Understand the basic concept of Programming languages, software, algorithm and flowchart.
ES 101.2: Acquire knowledge regarding the building blocks of programming language.
ES 101.3: Apply python for solving basic programming solutions.
ES 101.4: Create algorithms using learnt programming skills.
ES 1015: 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)	ES 101	Problem Solving and Programming	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 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	ES101	Problem Solving and 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.

CT 101.1: Understand the basic concept of Programming languages, software, algorithm and flowchart.

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 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.	**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

CT 101.2: Acquire knowledge regarding the building blocks of programming language.

Approximate Hours

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

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 Write a program add.py that takes 2 numbers as command line arguments and prints its sum. **LI.2.3.** Using a for loop, write a program that prints out the decimal equivalents	**Unit-2 Datatypes and Operators, Variables, Sequences and Iteration** 2.1. Data Types 2.2. Different types of Data types 2.3. Expressions, Precedence Rules 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

	of 1/2, 1/3, 1/4, . 1/10. **LI.2.4.** Write a program using a for loop that loops over a sequence. What is sequence? **LI.2.5.** Write a program using a while loop 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

CT 101.3: Gain an understanding of the various types of Conditional Statements, Loops, Arrays and Strings.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	8
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. 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 prints a countdown from that number to zero. **LI.3.3.** Write function to compute gcd, lcm of two numbers. **LI.3.4.** Write a program to implement Merge sort. 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-dimensionalarrays, 3.8 Different types of user defined data types 3.9 Structure 3.10Union	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

CT 101.4: Familiarize with a concise overview of the Dictionaries and methods.

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)
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 numbers of characters in the string and store them in a dictionary data structure. **LI.4.2.** Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.	**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.

CT 101.5: Comprehend the functions of different File Handling and Memory Management.

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)**
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 program to count frequency 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?	**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)
ES 101.1**:** At the end of this chapter the student will know the basic concept of programming.	7	4	2	1	14

ES 101.2**:** At the end of this chapter the student will use Operators in programs.	12	10	2	1	25
ES 101.3: At the end of this chapter the student will describe the control flow statements.	10	8	2	1	21
ES 101.4: At the end of this chapter the student will make function and Dictionary	10	4	2	1	17
ES101.5: Comprehend the functions of .csv and file handling functions.	6	4	2	1	13
Total Hours	45	30	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CT101.1	Understand the basic concept of Programming languages, software, algorithm and flowchart.	02	05	01	08
CT101.2	Acquire knowledge regarding the building blocks of programming language.	02	03	05	10
CT101.3	Apply python for solving basic programming solutions.	02	03	07	12
CT101.4	Create algorithm using learnt programming skills.	1	3	6	10
CT101.5	Understand real world problems and developing computer solutions for those.	1	05	04	10
Total		8	19	23	50

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

The end of semester assessment for Problem Solving and Programming 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

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : ES101

Course Title: Problem Solving and 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.
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 SO 2.2 SO 2.3 SO 2.4	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 SO 3.3 SO 3.4	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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

Course Code: AU203

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:

VAC101.1: Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.
VAC101.2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.
VAC101.3: 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.
VAC101.4: 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.
VAC101.5: 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	
Program Core VAC	AU203	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 (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)		
VAC	AU203	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.

VAC101.1: Examine critically the 17 newly minted UN Sustainable Development Goals and understand the 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.

VAC101.2: : 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)

VAC101.3: 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.

VAC101.4: 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.

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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 is crucial in reducing the impacts of climate change **SO4.2** Discuss causes of emission of GHGs and its consequences **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 importance of sustainable production and consumption **SO4.**5 Climate change is disrupting national economies and affecting lives and livelihoods, especially for the most 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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VAC101.5: 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.

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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 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)
VAC101.1: Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	6	1	1	8
VAC101.2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	6	1	1	8
VAC101.3: 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
VAC101.4: 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
VAC101.5: 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. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog,Fac ebook,Twitter, Whatsapp, Mobile,Online sources)
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	ttps://www.iau-hesd.net/news/5180-berlin-declaration-education-sustainable development-adopted-unesco-esd-conference-17-19

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : AU203
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. Need and Importance of Sustainable Development	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2. Education for Sustainable Development (ESD): Tools, Systems, and Innovation for Sustainability	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3.Discuss the sustainable production and consumption	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4. How Climate Change may be Threat to Sustainable Development	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5. Role of Corporations and Ecological Sustainability	-	-	-	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. Need and Importance 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. Education for Sustainable Development (ESD): Tools, Systems, and Innovation for 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.Discuss the sustainable production and consumption	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. How Climate Change may be Threat to Sustainable Development	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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5. Role of Corporations and Ecological Sustainability	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	

Semester-II

Course Code: **BS201**

Course Title: Mathematics II

Pre-requisite: Understanding of basic concepts such as limits, derivatives, integration, and their applications.

Rationale: Mathematics is essential for everyday life and understanding our world. It helps us have better problem-solving skills.

Course Outcomes:

BS201.1: Students would be able to understand the behavior of series and their applications.

BS201.2: Students would be able to understand each series requires individual analysis and testing for convergence or divergence.

BS201.3: Understanding mathematical concepts, including logic, set theory, and proof techniques.

BS201.4: Students would be able to understand number system and its applications.
BS201.5: Students would be able to understand the concept of probability and statistics and apply in real life.

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)	BS201	Mathematics II	4	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 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 (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PCC	BS-201	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.

BS-201.1**:-** Students would be able to Understand the behavior of series and their applications.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	2
SL	1
Total	14

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

SO1.1 To Understand Limit of a sequence **SO1.2** To learn about properties of convergent sequences. **SO1.3** To understand tests for convergence and divergence **SO1.4** To know about Leibnitz test.	.	**Unit-1. Sequences and Series** 1.1 Limit of a sequence 1.2 monotone. 1.3 Cauchy sequences 1.4 Properties of convergent sequences 1.5 Examples. 1.6 Infinite series 1.7 Positive series. 1.8 tests for convergence and divergence. 1.9 integral test 1.10 Alternating series 1.11 Leibnitz test.	1. properties of convergent sequences with examples. 2. Question based on Leibnitz test.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
(1) Limit of a sequence, Infinite series, positive series.
(2) Tests for convergence and divergence.
(3) integral test, alternating series, Leibnitz test.
(4) Cauchy sequences and properties of convergent sequences with example.

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

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

BS-201.2**:** Students would be able to Understand each series requires individual analysis and testing for convergence or divergence.

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)

SO2.1 To Understand Pointwise and uniform convergence. **SO2.2**To learn about basic aspects of Power series. **SO2.3**To understand the Fourier series.	.	**Unit-2 : Functional Series** 2.1 Pointwise and uniform convergence. 2.2 basic aspects of Power series. 2.3 Fourier series. 2.4 Numerical based on it 2.5 Examples	1. About Pointwise and uniform convergence. 2. Understand the Fourier series.

SW-2 Suggested Sessional Work (SW):

a. Assignments:
(1) Point wise and uniform convergence.
(2) basic aspects of Power series and Fourier series.

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

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

BS-201.3: Understanding mathematical concepts, including logic, set theory, and proof techniques.

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 To know about Statements. **SO3.2**To Understand the Operation on sets. **SO3.3 To** learn about functions. **SO3.4 To** Learn About Relations.	.	Unit-3 : Math Foundation 3.1Statements 3.2. Quantifiers. 3.3 Operation on sets 3.4. Numerical based on it 3.5 Functions. 3.6 Types of Functions	Question based on Statements. Functions and Relations

		3.7 Relations 3.8 Proofs. 3.9 Numerical based on it.	

SW-3 Suggested Sessional Work (SW):

a. Assignments:
(1) Question based on Statements and Quantifiers.
(2) Operation on sets and functions and Relations.

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

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

BS-201.4. Students would be able to understand number system and its applications.

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 Understanding Countability of algebraic numbers. **SO4.2** Understanding the Equivalence classes. **SO4.3** Understanding the Fermat's little theorem. **SO4.4** Understand the Wilson's theorem and Primitive root theorem.	.	**Unit-4 Number System** **4.1** Countability of algebraic numbers **4.2** Transcendental numbers. **4.3** construction of Liouville's number, 4.4. Equivalence classes, **4.5** construction of real numbers (using Cauchy sequences), **4.6** Fermat's little theorem. **4.7** using it for Miller-Rabin primality test. **4.8** Wilson's theorem **4.9** Primitive root theorem.	1 To Learn about. . Countability of algebraic numbers. 2 Learn about Equivalence classes. 3 To Understand Fermat's little theorem.

SW-4 Suggested Sessional Work (SW):

a. Assignments:
(1) Construction of Liouville's number and Equivalence classes.
(2) Construction of real numbers (using Cauchy sequences) and Fermat's little theorem.
(3) Wilson's theorem and Primitive root theorem.
(4) Countability of algebraic numbers and transcendental numbers.

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

c. Other Activities (Specify):
NA

BS-201. 5:- Students would be able to understand the concept of probability and statistics and apply in real life.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	2
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understanding properties of probability and conditional probability. **SO5.2 To** learn about discrete and continuous random variables. **SO5.3** Understanding Chebyshev inequality. **SO5.4 To** learn about Normal distributions and Limit Theorems.		**Unit 5 :- Probability** **5.1** Sample space and events, 5.2 definitions of probability. **5.3** properties of probability, 5.4 conditional probability. **5.5** Random variables: distribution functions, 5.6 discrete and continuous random variables, **5.7** moments of random variables	1. To learn about discrete and continuous random variables . 2. To understand Special Distributions.

		5.8 conditional expectation, **5.9** Chebyshev inequality, functions of random variables. **5.10** Special Distributions: Bernoulli, Binomial, Geometric, Pascal, Poisson, Exponential, Uniform, **5.11** Normal distributions, Limit Theorems: Law of large numbers.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

(1) Definitions of probability, properties of probability and conditional probability.
(2) moments of random variables and conditional expectation.
(3) Random variables: -distribution functions, discrete and continuous random variables.
(4) Special Distributions: - Bernoulli, Binomial, Geometric, Pascal, Poisson, Exponential, Uniform.
(5) Normal distributions and Limit Theorems.

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)
BS-201.1:- . Students would be able to Understand the behavior of series and their applications.	11	2	1	14
BS-201.2:- Students would be able to Understand each series requires individual analysis and testing for convergence or divergence	5	2	1	8

BS-201.3:- : understanding mathematical concepts, including logic, set theory, and proof techniques.	9	2	1	12
BS-201.4:- Students would be able to Understand number system and its applications.	9	2	1	12
BS-201.5:- Students would be able to Understand the concept of probability and statistics and apply in real life.	11	2	1	14
Total Hours	45	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Sequences and Series**	03	04	03	10
CO-2	**Functional Series**	02	02	01	05
CO-3	**Math Foundation**	03	02	05	10
CO-4	**Number System**	04	04	03	11
CO-5	**Probability**	03	06	05	14
Total		15	18	17	50

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

The end of semester assessment for 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. 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	Probability and statistics for Engineers and Scientists.	Walpole, Myers	. Myers and Ye, Pearson Education	2012
2	Advanced Engineering Mathematics.	Wylie and Barrett	McGraw Hill	1995
3	Advanced Engineering Mathematics	M.D. Greenberg	Pearson Education Asia	2002

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Engineering Mathematics - I	Prof. Jitendra Kumar	IIT Kharagpur
2.	Probability and Statistics	Prof. Somesh Kumar	IIT Kharagpur

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : BS201

Course Title: Mathematics-II

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
BS-201.1:- . Students would be able to Understand the behavior of series and their applications.	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	2
BS-201.2:- Students would be able to Understand each series requires individual analysis and testing for convergence or divergence	2	3	2	1	2	2	1	1	1	1	1	1	3	2	3	2
BS-201.3:- : understanding mathematical concepts, including logic, set theory, and proof techniques.	2	2	2	2	2	2	1	1	1	1	1	2	1	2	1	2

BS-201.4:- Students would be able to Understand number system and its applications.	3	2	3	3	2	3	1	2	2	1	2	3	3	3	2	1
BS-201.5:- Students would be able to Understand the concept of probability and statistics and apply in real life.	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	BS-201.1:- . Students would be able to Understand the behavior of series and their applications.	SO1.1 SO1.2 SO1.3 SO1.4		**Unit-1. Sequences and Series** 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	BS-201.2:- Students would be able to Understand each series requires individual analysis and testing for convergence or divergence	SO2.1 SO2.2 SO2.3		**Unit-2 : Functional Series** 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	BS-201.3:- : understanding mathematical concepts, including logic, set theory, and proof techniques.	SO3.1 SO3.2 SO3.3 SO3.4		**Unit-3 : Math Foundation** 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	BS-201.4:- Students would be able to Understand number system and its applications.	SO4.1 SO4.2 SO4.3 SO4.4		**Unit-4 Number System** 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	BS-201.5:- Students would be able to Understand the concept of probability and statistics and apply in real life.	SO5.1 SO5.2 SO5.3 SO5.4		**Unit 5 : Probability** 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 [Cyber Security] Program

(Revisedason01August2023)

Semester-II

Course Code:	PC202
Course Title:	Object Oriented Programming
Pre- requisite:	Programming in C
Rationale:	OOP concept helps the program to be closer to real-world objects. Also, OOP allows code to be reusable and make it simpler.

Course Outcomes:

PC 202.1: Understand the basic concepts of OOPs.
PC 202.2: Understand the concept of Polymorphism & Inheritance
PC 202.3: Apply different Python library to solve programming problems.
PC 202.4: Understand the advanced concepts of python and apply for Accessing web data.
PC 202.5: Understand the advanced concepts of python and apply for Accessing database.

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)	PC202	Object Oriented Programming	3	2	1	0	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 of teacher to ensure outcome of Learning.

AKS University

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Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

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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	Class Test 2 (2 best out of 3)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)	(ESA)	
PCC	PC 202	Object Oriented 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)		
PCC	PC 202	Object Oriented 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.

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PC202.1: Understand the basic concepts of OOPs.

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)
SO1.1 Understand the concept of Object-Oriented Programming. **SO1.2** Difference between OOP and POP **SO1.3** Apply OOP concept in real life problems.	LI.1.1 Write a Python program to create a calculator class. Include methods for basic arithmetic operations. LI.1.2Write a program in Python to demonstrate the Parameterized Constructor. LI.1.3 Write a program in Python to demonstrate Array of object. LI.1.4 Write a NumPy program to compute the cross product of two given vectors.	**Unit-1.0 Introduction to Object Oriented Programming Paradigms** **(8- Lectures)** 1.1 Introduction to various programming paradigms 1.2 advantages of OOP, comparison of OOP with Procedural Paradigm 1.3 Classes and Objects: Prototyping 1.4 Referencing the variables in functions, Inline 1.5 static and friend functions 1.6 Memory allocation for classes and objects 1.7 Arrays of objects 1.8 Constructors	1. Prepare a list for OOP & POP base Languages.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Create a poster for OOP features.
ii. Explain Constructor with Example.
iii. Explain static and friend function.

PC**202.2: Understand the concept of Polymorphism & Inheritance.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	8
SW	2
SL	1
Total	23

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the concept of Polymorphism & Inheritance. **SO2.2** Use Polymorphism & Inheritance in problems **SO2.3** Demonstrate the use of meta class	LI.2.1. Write a NumPy program to calculate the QR decomposition of a given matrix. LI.2.2. Write a program in python to demonstrate multiple inheritance. LI.2.3. Write a program in python to demonstrate Overriding Methods. LI.2.4. Write a program in python to demonstrate	**Unit-2.0 Polymorphism & Inheritance** (12- Lectures) 2.1. Introduction to Polymorphism 2.2. Polymorphism with a Function and Objects 2.3. Overriding Methods 2.4. type conversions from basic data types to user defined and vice versa 2.5. Base classes and Derived classes 2.6. types of inheritance 2.7. various types of classes	1. How Polymorphism is used to solve real life problems.

	Exception Handling in an array using a function.	2.8. Invocation of Constructors and Destructors in Inheritance 2.9. aggregation, composition 2.10. classification hierarchies 2.11. meta class/abstract classes 2.12. Unit Testing and Exceptions.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

iv. Prepare a chart for Inheritance types.
v. Explain overriding method.
vi. Explain unit testing and exceptions.

PC202.3: Apply different Python library to solve programming problems.

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)**
SO3.1 Understand the concept of Python Libraries. **SO3.2** Use various libraries in data modelling & visualization. **SO3.3** Apply various libraries for data prepressing.	LI.3.1 Write a Pandas program to convert a Panda Module Series to Python list and its type. LI.3.2 Write a	**Unit-3.0 Python libraries** (10- Lectures) 3.1. Basics of open-source libraries for data preprocessing 3.2. Data Analysis with python 3.3. Data Analysis libraries 3.4. Data Modelling 3.5. Type of an object 3.6. Special Methods for	1. Learn all python libraries related to data visualization.

	Pandas program to convert a NumPy array to a Pandas series. LI.3.3 Write a program to interchange first and last elements in a list	Data Modelling in Python 3.7. Data Visualization 3.8. Data Visualization in Python using Matplotlib. 3.9. Data Visualization in Python using Seaborn 3.10. Data Visualization in Python using Plotly	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

vii. Explain data modelling.

viii. Explain data visualization.

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PC202.4: Understand the advanced concepts of python and apply for accessing web data.

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)
SO4.1 Understand the concept of access web data **SO4.2** Use of sockets **SO4.3** Demonstrate the use of Retrieving Web Page.	LI.4.1 Write a program to implement Matplotlib library. LI.4.2 Write a program to create grade calculator. LI.4.3 Write a program to read	**Unit-4.0** Using Python to Access Web Data **(4- Lectures)** 4.1. Regular Expressions 4.2. Regular Expression Functions. 4.3. Extracting Data 4.4. Sockets 4.5. Socket methods 4.6. Using the Developer Console to Explore	1. How can we handle network socket exceptions?

	and write data from a file. LI.4.4 Create a Python project to get the citation from Google scholar using title and year of publication, and volume and pages of journal.	HTTP 4.7. Retrieving Web Page 4.8. Parsing Web Pages	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

ix. Program to establish a connection between server & client.

x. Explain Retrieving Web Page process in python

xi. Explain Regular Expression Functions.

PC202.5: Understand the advanced concepts of python and apply for accessing database.

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)**
SO5.1 Understand the concept of database in Python. **SO5.2** Demonstrate the use of CRUD.	LI.5.1 Create a Python project to get total Covid-19 cases, total deaths due to Covid-19, total Covid-19 patients recovered in	**Unit-5.0** Using Databases with Python **(7- Lectures)** 5.1. Using Databases 5.2. Single Table CRUD 5.3. Designing a Data Model. 5.4. Representing a Data Model 5.5. Inserting Relational	1.Compare and analyze all JOIN.

	the world.	Data 5.6. Reconstructing Data with JOIN 5.7. Many to Many Relationships.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

xii. Explain CRUD operation.

xiii. Write database Connectivity process in python.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC202.1: Understand the basic concepts of OOPs.	08	02	01	11
PC202.2: Understand the concept of Polymorphism & Inheritance.	12	02	01	15
PC202.3: Apply different Python library to solve programming problems.	10	02	01	13
PC202.4: Understand the advanced concepts of python and apply for Accessing web data.	08	02	01	11
PC202.5: Understand the advanced concepts of python and apply for Accessing database.	07	02	01	10
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	Introduction to Object Oriented Programming Paradigms	03	02	03	08
CO-2	Polymorphism & Inheritance	03	01	05	09
CO-3	Python libraries	03	07	02	12

CO-4	Using Python to Access Web Data	03	05	05	13
CO-5	Using Databases with Python	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Introduction to Object Oriented 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 software 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	How to Think Like a Computer Scientist: Learning with Python	Allen Downey, Jeff Elkner and Chris Meyers	SoHo Books	2009
2	Mastering Object-Oriented Programming	R.S. Salaria	Khanna Book Publishing Co., Delhi	2007
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.	Python for Data Science	Prof. Raghunathan Rangaswami	IIT Madras

2.	The Joy of Computing Using Python	Prof. Sudarshan Prof.Yayati Gupta Iyengar	IIT Ropar, IIIT Dharwad

Curriculum Development Team

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CO-PO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: PC202
Course Title: Object Oriented Programming

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	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	3	3	3	1	3	1	1	1	3	2	2	3	2	3
CO2	3	3	2	3	2	2	1	2	1	1	1	3	2	3	2	1	3
CO3	3	2	3	3	3	2	1	2	1	1	1	3	2	2	2	2	3
CO4	3	2	3	2	3	2	1	3	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

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: Understand the basic concepts of OOPs.	SO1.1 SO1.2 SO1.3	LI.1.1, LI.1.2, LI.1.3, LI.1.4	Unit-1.0 Introduction to Object Oriented Programming Paradigms 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	CO2: Understand the concept of Polymorphism & Inheritance	SO2.1 SO2.2 SO2.3	LI.2.1, LI.2.2, LI.2.3, LI.2.4	Unit-2 Polymorphism & Inheritance. 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	CO3: Apply different Python library to solve programming problems.	SO3.1 SO3.2 SO3.3	LI.3.1, LI.3.2, LI.3.3, LI.3.4	Unit-3: Python libraries 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	**CO4: U**nderstand the advanced concepts of python and apply for Accessing web data.	SO4.1 SO4.2 SO4.3	LI.4.1, LI.4.2, LI.4.3, LI.4.4	Unit-4: Using Python to Access Web Data 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	**CO 5:** Understand the advanced concepts of python and apply for Accessing database**.**	SO5.1 SO5.2	LI.5.1	Unit5: Using Databases with Python 5.1,5.2,5.3,5.4,5.5,5.6,5.7	

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Semester-II

Course Code: **PC203**

Course Title: **Data Structures**

Pre-requisite: To study this Course, a student must have basic knowledge of computers

Rationale: Data structures are used to implement the physical forms of abstract data types. Data structures are a crucial part of designing efficient software

Course Outcomes:

After completion of course, students would be able to:

PC203.1: Understand the different types of data structure to be implemented using any programming language

PC203.2: Choose the data structures that effectively model the information in a problem and an analysis the efficiency trade-offs (run time and memory usage) among alternative data structure implementation so combinations.

PC203.3: Design, implement, test, and debug programs using a variety of data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs.

PC203.4: Apply efficient data structure (linked lists, stacks and queues) to solve a particular problem.

PC203.5: Apply Sorting and Searching

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)	PC203	Data Structures.	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 teachers 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 (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC 203	Data Structures	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	PC 203	Data Structures	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 show case their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) outer course's conclusion.

PC203.1: Understand the different types of data structure to be implemented using any programming Language.

Approximate Hours

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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)**
O1.1 Understand the Data Structures and data types **SO1.2** Explain Recursion, time and space complexity of algorithms **SO1.3** Discuss Stacks, queues, Infix, Postfix & Prefix **SO1.4** Definition double Ended dequeue **SO1.**5 Explain priority queues	LI.1.1 Write a program to implement stack in c using an array. LI.1.2 Write a program to implement queue in c using an array. LI.1.3 Write a program to implement post fix conversion in c using stack.	**Unit-1 Introduction**: (12-Lectures) 1.1 Introduction to Data Structures and data types 1.2 Efficient use of memory 1.3 Recursion 1.4 time and space complexity of algorithms 1.5 Big O Notation and the notations 1.6 Elementary Data Structures: Stacks and queues 1.7 Infix Postfix & Prefix conversions 1.8 evaluations of expressions 1.9 multiple, stacks and queues. 1.10 priority queues 1.11 double end dequeue. 1.12 implementation of stacks and queues	1. Recursion, time and space complexity of algorithms 2. Stacks, queues, Infix, Postfix & Prefix conversions

SW-1: Suggested Sessional Work (SW):

a. **Assignments:**
   i. Stacks, queues, Infix
   ii. multiple, stacks and queues,
   iii. implementation of stacks and queues
b. **Mini Project:** None
c. **Other Activities (Specify):** Seminar

PC203.2: Choose the data structures that effectively model the information in a problem and analyses the efficiency trade-offs (run time and memory usage) among alternative data

structure implementations or combinations.

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)**
SO2.1 To Understand the Singly linked lists **SO2.2** To learn polynomial addition, sparse matrices **SO2.3** To lean about doubly linked lists **SO2.4** Explain circular linked list **SO2.5** Explain Applications of Stacks.	LI.2.1 Write a program to insert and delete elements from a singly linked list. LI.2.2 Write a program to implement doubly linked list. LI.2.3 Write a program to implement polynomial addition.	**Unit2: Linked Lists (10-Lectures)** **2.1** Singly linked lists **2.2** linked stacks and queues **2.3** polynomial addition **2.4** sparse matrices **2.5** doubly linked lists, circular linked list **2.6** dynamic storage management **2.7** Applications of Stacks **2.8** Queues and Linked lists **2.9** Garbage collection, **2.10** Josephus Problem	1. Linked stacks and queues 2. Doubly linked lists

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

iv. Queues and Linked lists.
v. Garbage collection, Josephus Problem
vi. Polynomial addition, sparse matrices

PC203.3: Design, implement, test, and debug programs using a variety of data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs.

Approximate Hours

Item	Appx. Hrs.

Cl	8
LI	6
SW	2
SL	2
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand Basic terminology **SO3.2**To learn binary trees, binary tree **SO3.3**To understand traversal, representations of binary tree **SO3.4 Explain t**hreaded Trees **SO3.5** learn about AVL tree-tree	LI.3.1 Write a program to implement binary tree. LI.3.2 Write a program to implement binary search tree. LI.3.3 Write a program to implement AVL tree.	**Unit3: Trees (8-Lectures)** 3.1 Basic terminology, 3.2 binary trees 3.3 traversal, representations of binary tree, 3.4 application of trees 3.5 decision tree, game trees, 3.6 Threaded Trees 3.7 Binary Search Tree, 3.8 AVL tree, B-tree	1. binary trees, binary tree 2. traversal, representations of binary tree

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**

vii. Application of trees, decision tree, game trees,

viii. traversal, representations of binary tree

ix. AVL tree, B-tree

PC203.4: Apply efficient data structure (linked lists, stacks and queues) to solve a particular problem.

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	6
SW	2
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Evaluation of Graph presentations **SO4.2** Understanding the Graph Traversals **SO4.3** To learn 3Dijkstra's algorithm for Shortest path **SO4.4** To lean about Prim's and Kruskal's Algorithm **SO4.5** Discuss Minimal Spanning tree	LI.4.1 Write a program to implement graph in c. LI.4.2 Write a program to implement graph traversal in c. LI.4.3 Write a program to implement shortest path algorithm.	**Unit-4: Graph Theory (6-Lectures)** 4.1 Graph representations I 4.2 1Graph representations II 4.3 Graph Traversals I 4.4 Graph Traversals II 4.5 Dijkstra's algorithm for Shortest path 4.6 Prim's and Kruskal's Algorithm for Minimal Spanning tree.	1. Graph representations 2. Prim's and Kruskal's Algorithm for Minimal Spanning tree

SW-4 Suggested Sessional Work (SW):

a. Assignments:

x. Graph Traversals

xi. 3Dijkstra's algorithm for shortest path

xii. Prim's and Kruskal's Algorithm for Minimal Spanning tree

PC203.5: Apply Sorting and Searching

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	6
SW	2
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 To Understand Linear search **SO5.2** Explain binary search and hash search **SO5.3** learn this Sorting: Insertion sort **SO5.4** To understand quick sort **SO5.5** Explain heap sort, and Bucket sort	LI.5.1 Write a program to implement linear search and binary search. LI.5.2 Write a program to implement hash search. LI.5.3 Write a program to implement all sorting methods.	**Unit5: Sorting and Searching (Lectures 9)** 5.1 Searching: Linear search, 5.2 binary search 5.3 hash search. 5.4 Sorting: Insertion sort, 5.5 selection sort bubble sort, 5.6 quick sort, 5.7 Merge sort, 5.8 heap sort 5.9 Bucket sort	1. Bubble sort 2. Bucket sort

SW-5 Suggested Sessional Work (SW):

a. Assignments:

xiii. Binary search and hash search.

xiv. Selection sort, bubble sort, quick sort

xv. Heap sort, and Bucket sort

Brief of Hours suggested for the Course Outcome

Course Out comes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC203.1: Understand the different types of data structure to be implemented using any programming Language.	12	02	02	16
PC203.2: Choose the data structures that effectively model the information in a problem and analyses the efficiency trade-offs (run time and memory usage) among alternative data structure implementations or Combinations.	10	02	02	14

PC203.3: Design, implement, test, and debug programs using a variety of data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs.	08	02	02	12
PC203.4: Apply efficient data structure (linked lists, stacks and queues) to solve a particular problem	06	02	02	10
PC203.5: Apply Sorting and Searching.	09	02	02	13
Total Hours	45	10	10	65

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction and Elementary Data Structures	03	02	03	08
CO-2	Linked Lists	03	01	05	09
CO-3	Trees	03	07	02	12
CO-4	Graph Theory	03	05	05	13
CO-5	Sorting and searching	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Introduction to 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 to software 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	Data Structures	R.S. Salari,	Khanna Book Publishing	2019
2	Data Structures and Program Design in CByRobertL Kruse,	C.L. Tondo, Bruce Leung	Pearson Education	2007
3	Expert Data Structures with C/3rdEdition	R.B. Patel	Khanna Book Publishing	2020

Curriculum Development Team

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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PC203

Course Title: Data Structures

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	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	
CO 1	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	2	3
CO 2	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3	3
CO 3	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	2	3
CO 4	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2	2
CO 5	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, 5	CO-1: Understand the different types of data structure to be implemented using any programming Language.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI.1.1, LI.1.2, LI.1.3	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 above
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Choose the data structures that effectively model the information in a problem and analyses the efficiency trade-offs (run time and memory usage) among alternative data structure implementations or combinations.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI.2.1, LI.2.2, LI.2.3	Unit-2 Linked Lists 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 : Design, implement, test, and debug programs using a variety of data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI.3.1, LI.3.2, LI.3.3	Unit-3 : Trees 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: Apply efficient data structure (linked lists, stacks and queues) to solve a particular problem.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI.4.1, LI.4.2, LI.4.3	Unit-4: Graph Theory 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: Apply Sorting and Searching	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI.5.1, LI.5.2, LI.5.3	Unit-5: Sorting and searching 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

Semester-II

Course Code: PC 204

Course Title: Discrete Mathematical structures.

Pre-requisite: Understanding of basic concepts such as groups, rings, set theory and their application.

Rationale: Mathematics is essential for everyday life and understanding our world. It helps us have better problem-solving skills.

Course Outcomes:

PC 204.1: Students would be able to understand the concept of mathematical reasoning and their applications.

PC 204.2: Students would be able to understand the concept of set theory and its properties.

PC 204.3: understanding mathematical concepts, including logic, set theory, and proof techniques.

PC 204.4: Students would be able to Understand Graph theory and its application.

PC 204.5: Students would be able to Understand the concept of Groups, rings fields and discrete probability and apply in real life.

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)	PC204	Discrete Mathematical structures.	4	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 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)		
PCC	PC-204	Discrete Mathematical structures.	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.

PC 204.1: Students would be able to understand the concept of mathematical reasoning and their applications.

Approximate Hours

Item	AppX Hrs
Cl	08
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 To Understand Preposition and nigation **SO1.2** To learn about properties of conjunction form **SO1.**3 To understand The implication and equivalence **SO1.4** To know about Reasoning structure	.	**Unit-1. Mathematical reasoning** **1.1** The concept of preposition and nigation **1.2** Disjunction and conjunction **1.3** the property of conjunction and disjunction **1.4** The Implication and equivalence. **1.5** the truth table predicates quantifiers natural deduction. **1.6** The rules of inference**.** **1.7** The methods of proofs, Resolution principles. **1.8** The Application to PROLOG.	1. properties of conjunction and disjunction form with examples. 2. Question based on truth table.

W-1 Suggested Sessional Work (SW):

a. Assignments: -

i. To evaluate prepositions and negation.
ii. The concept of disjunction and Conjunction form.
iii. Draw the truth table.
iv. Application to PROLOG.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities.

PC 204.2: Students would be able to understand the concept of set theory and its properties.

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 To Understand the concept of poset. **SO2.2** To learn about basic concepts of Power series. **SO2.3** To understand the Application of function.	.	**Unit-2: Set Theory** 2.1 paradoxes in set theory 2.2 inductive definition of sets and proof by in duction. 2.3 peano postulates. 2.4 the concept of relation. 2.5 Properties of Relation. 2.6. equivalence relation with example. 2.7 partition of sets 2.8 partial order relation or poset. 2.9 well-ordered sets.	1. About set the ory. 2. Understand the concept of Relations with example .

SW-2 Suggested Sessional Work (SW):

a. Assignments:

v. Inductive definition of sets and proof by

vi. The definition of relation with example and their types

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

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

Quiz,

PC 204.3: understanding mathematical concepts, including logic, set theory, and proof techniques.

Approximate Hours

Item	Appx. Hrs
Cl	10
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO3.1 To know about Statements. **SO3.2** To Understand the Operation on sets. **SO3.3** To learn about functions. **SO3.4** To Learn About Relations.	.	**Unit-3: Combinatorics and Function**. **3.1** Elementary Combinatorics. **3.2** Operation on sets and functions. **3.3** counting techniques**.** **3.4** The concept of Recurrence relation . **3.5** generating functions. **3.6** The concept of function; mappings **3.7** Injection and surjections function. **3.8** The concept of composition of function. **3.9** Inverse and special functions. **3.10** Recursive function theory.	1. Question based on Statements. 2. Functions and Relations

SW-3 Suggested Sessional Work (SW):

a. Assignments: -

vii. Question based on composition of function.
viii. Operation on sets and functions and Relations.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

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

Quiz, Class Test.

PC 204.4: Students would be able to Understand Graph theory and its application.

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 Understanding the elements of graph theory **SO4.2** Understanding the Equivalence classes. **SO4.3**Understanding the spanning trees **So4.4** Understand the hamiltonian path	.	**Unit-4 Graph theory**. **4.1** The concept of Graph theory **4.2** definition of graph **4.3**elements of growth theory **4.4** the definition of eular graph. **4.5** the hamitonial path **4.6** The concept of tree **4.7** The tree traversals **4.8** The spanning trees. **4.9** The properties of trees. **4.10** The Represention of relations by graphs**.**	i. To Learn about. Eular graph. ii. Learn about Equivalence classes. iii. To Understand the spanning trees.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

I. The definition and example of Graph
II. Construction of trees, Spanning trees with example.
III. The theorem based on the trees.
IV. The Representation of relation by graphs.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

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

NA

PC 204.5: Students would be able to Understand the concept of Groups, rings fields and discrete prob ability and apply in real life.

Item	AppX Hrs
Cl	09
LI	0
SW	2

SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO5.1 Understanding properties of probability and conditional probability. **SO5.2** To learn about discrete and continuous random variables. **SO5.3** Understanding group, rings and fields theory. **SO5.4** To learn about properties of groups.		**Unit5:- Groups, rings, fields, discrete probability**. **5.1** definition and elementary properties of groups **5.2** semi groups **5.3** monaids **5.4** The concept of rings **5.5** The concept of fields **5.6** understand the vector space and lettice **5.7** Introduction discrete random variables **5.8** Application to binary search trees. **5.9** The properties of probability.	1. To learn about discrete and continuous random variables. 2. To understand the group theory.

SW-5 Suggested Sessional Work (SW):

a. Assignments: -

ix. Definitions of probability, properties of probability and conditional probability.
x. moments of random variables and conditional expectation.
xi. definition and elementary properties of Groups
xii. The concept of ring theory.

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)
PC204.1: Students would be able to Understand the concept of mathematical reasoning and their applications.	8	2	1	11

PC204.2: Students would be able to Understand The concept of set theory and its properties.	9	2	1	12
PC204.3: understanding mathematical concepts, including logic, set theory, and proof techniques.	10	2	1	13
PC204.4: Students would be able to Understand Graph theory and its application	09	2	1	12
PC204.5: Students would be able to Understand the concept of Groups, rings fields and discrete probability and apply in real life.	09	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	
CO-1	**Mathematical reasoning.**	03	04	03	10
CO-2	**The concept of Set theory.**	02	02	01	05
CO-3	**Combinatorics and function.**	03	02	05	10
CO-4	**Graph theory.**	04	04	03	11
CO-5	**Groups, rings, fields and discrete probability.**	03	06	05	14
Total		15	18	17	50

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

The end of semester assessment for Discrete Mathematical structures. 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	Discrete mathematics and applications.	K.H.Rosen	Tata McGraw Hill	2007 6th edition
2	Discrete structures.	S.B.Singh	Khanna book publishing	2019 3rd edition
3	Combinatorics and Graph theory.	S.B. Singh	Khanna book publishing	2018 3rd edition

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Discrete mathematical structures video course.	Prof. Kamala krithi vasan	IIT Madras
2.	Discrete mathematics	Prof. Sudarshan Iyengar.	IIT Ropar, IIT Gandhinagar

Curriculum Development Team

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CO, PO and PSO Mapping

Program: B. Tech. [Cyber Security]
Course Code : PC-204
Course Title: Discrete Mathematical Structure

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-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.
PC204.1: Students would be able to Understand the concept of mathematical reasoning and their applications.	2	2	3	1	1	1	1	1	1	1	1	2	2	2	3	3	1
PC204.2: Students would be able to Understand The concept of set theory and its properties.	2	3	2	1	2	2	1	1	1	1	1	1	2	3	2	1	1
PC204.3: understanding mathematical concepts, including logic, set theory, and proof techniques.	2	2	2	2	2	2	1	1	1	1	1	2	3	2	2	1	1
PC204.4: Students would be able to Understand Graph theory and its application	3	2	3	3	2	3	1	2	2	1	2	3	3	3	1	2	2
PC204.5: Students would be able to Understand the concept of Groups, rings fields and discrete probability and apply in real life.	3	2	3	2	3	2	1	2	1	1	2	3	2	2	1	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	**PC204.1:** Students would be able to Understand the concept of mathematical reasoning and their applications.	SO1.1 SO1.2 SO1.3 SO1.4		**Unit-1. Mathematical reasoning** 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	**PC204.2:** Students would be able to Understand The concept of set theory and its properties.	SO2.1 SO2.2 SO2.3 SO2.4		**Unit-2 : Set Theory** 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	**PC204.3:** understanding mathematical concepts, including logic, set theory, and proof techniques.	SO3.1 SO3.2 SO3.3 SO3.4		**Unit-3: Combinatorics and Function** 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	**PC204.4:** Students would be able to Understand Graph theory and its application	SO4.1 SO4.2 SO4.3 SO4.4		**Unit-4 Graph theory** 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	**PC204.5:** Students would be able to Understand the concept of Groups, rings fields and discrete probability and apply in real life.	SO5.1 SO5.2 SO5.3 SO5.4		**Unit5:- Groups, rings, fields, discrete probability** 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 [Cyber Security] Program

(Revisedason01August2023)

Semester-II

Course Code: PC205

Course Title: Modern Computer Architecture

Pre- requisite: Basics of understanding of operating system, digital system, low level programming knowledge etc.

Rationale: The computer architecture governs the design of a family of computers and defines the logical interface that is targeted by programming languages and their compilers.

Course Outcomes:

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

PC205.l Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

PC205.2 Analyze different computer architectures and their applications.

PC205.3 Understand modern design structures of Pipelined and Multiprocessors systems.

PC205.4 Understand distributed computing architecture and high-performance computing.

PC205.5 Work on CUDA programming that enable them to harness the computational power of GPUs for general-purpose computing tasks.

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)	PC205	Modern Computer Architecture	4	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 teachers 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 (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC 205	**Modern Computer Architecture**	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.

PC205.l Student will able to understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	12

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Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Understand the logic of combinational and sequential circuits. **SO1.2** Understanding computer registers and instructional cycle. **SO1.3** Understand adder and subtractor circuits. **SO1.4** Understanding pipelining. **SO1.5** Understand cache characteristics and architecture. .		**Unit-1.0 Basics** **(12 Lectures)** **1.1** Designing combinational and sequential logic **1.2** computer registers and instructions **1.3** timing and control and instructions cycle **1.4** memory reference instruction **1.5** I/O interruption **1.6** Adder and Subtractor circuits **1.7** Booth Multiplication Algorithm **1.8** Pipelining Review **1.9** control hazards and the motivation forcaches **1.10** cache characteristics and basic superscalar architecture basics	1. Read the topics related to digital logic design, computer architecture, and computer organization.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Booth multiplication algorithm for multiplying binary numbers using shifts and additions.

ii. Explain I/O operations that may interrupt the normal program execution for handling external events.

b. Mini Project: Design combinational and sequential circuits.

b. Other Activities (Specify): Evaluate the purpose of cache memory & it's types.

PC205.2 Analyze different computer architectures and their applications.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	2
SL	1
Total	17

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Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revisedason01August2023)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self learning (SL)
SO2.1 To Understand memory technologies use in computers. **SO2.2** To learn about locality principles and caching. **SO2.3** To understand the working of cache memory and problems. **SO2.4** To learn about various optimization techniques to improve overall system performance. **SO2.**5 To learn about Advanced NoC topics may include fault tolerance, power management, and Quality of Service (QoS).		**Unit 2.0- Multi-core Architecture** **(15 Lectures)** 2.1 Memory technologies 2.2 Hierarchical memory systems 2.3 the locality principle and caching 2.4 direct- mapped caches and block size 2.5 cache conflicts 2.6 associative caches 2.7 write strategies 2.8 advanced optimizations 2.9 performance improvement techniques 2.10 DRAM – organization, access techniques, scheduling algorithms and signal systems. 2.11 Tiled Chip Multicore Processors (TCMP) 2.12 Network on Chips (NoC) 2.13 NoC router – architecture, design, routing algorithms and flow control techniques 2.14 Advanced topics in NoC and storage – compression, prefetching, QoS	1. Learn about NoC that is a communication infrastructure for connecting cores on a chip.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explain hierarchical memory systems involve organizing memory into multiple levels with different access speeds and capacities.

ii. Explain cache conflicts occur when multiple memory blocks map to the same cache location.

b. Mini Project:

Write down memory scheduling algorithms and signal systems govern how memory requests are prioritized and managed.

c. Other Activities (Specify):

Collect information about Advanced NoC topics.

PC205.3 Understand modern design structures of Pipelined and Multiprocessors systems.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Understand how Parallel multiprocessors and multicomputer systems involve multiple processors or computers working together to solve a problem. **SO3.2** Understand distributed and concurrent programs. **SO3.3** Differentiate between Synchronous vs. Asynchronous Executions.		**Unit-3.0 Distributed Computing Systems and Concurrency** (11 Lectures) 3.1 Relation to Parallel Multiprocessors/multicomputer System Design Concepts 3.2 Distributed and Concurrent Programs 3.3 Message Passing vs. Shared Memory Systems 3.4 Synchronous vs. Asynchronous Executions 3.5 Design Issues and Challenges 3.6 Distributed Computing Technologies 3.7 Clocks and Synchronization 3.8 Coordination and Agreement Algorithms 3.9 Global state and distributed Transactions I	1. Read about Researches in these fields need to consider issues like scalability, fault tolerance, and communication protocols to design robust and high-performance distributed applications.

SO3.4 Understand clock and synchronization. **SO3.5** Understand how to Manage a global state in a distributed system.			

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. How distributed transactions ensure atomicity, consistency, isolation, and durability across multiple nodes.

ii. Differentiate between Synchronous vs. Asynchronous Executions.

b. Mini Project:

c. Other Activities (Specify):

i. How Parallel Multiprocessors/Multicomputer Systems can improve performance and solve larger computational tasks.

PC205.4 Understand distributed computing architecture and high-performance computing.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	0
SW	2
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO4.1 Understanding HPC architecture involves designing systems that can deliver high performance for demanding computational tasks. **SO4.2** Understand about		**Unit-4 : High Performance Computing (HPC)** (12 Lectures) 4.1 HPC Architecture 4.2 Parallel Processing 4.3 Parallel Memory Models 4.4 Data vs. Task Parallelism 4.5 High Throughput	1. Use of HTC in scientific computing, data analysis, and distributed computing environments.

Parallel processing involves breaking down a computational task into smaller subtasks that can be executed simultaneously. **SO4.3**Understand Data vs. Task Parallelism **SO4.4** Understand vectorization that involves performing multiple operations simultaneously by applying the same operation to elements of a vector or array. **SO4.5** Understanding concurrent execution of multiple threads within a single process.		Computing 4.6 Vectorization 4.7 Multithreading	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Explain how multithreading is important.

ii. Explain how parallel processing speed up the execution of complex computations.

b. Mini Project:

c. Other Activities (Specify):

Understanding these concepts is crucial for designing and optimizing applications for high-performance computing environments.

PC205.5 Student will able to work on CUDA programming that enable them to harness the computational power of GPUs for general-purpose computing tasks.

Approximate Hours

Item	Appx. Hrs.
Cl	5
LI	0
SW	2
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand basic principles of CUDA programming. **SO5.2** Understanding the concept of threads and blocks. **SO5.3** Learn CPU and GPU. **SO5.4** Understanding GPU and CPU data exchange.		**Unit-5 : High Performance Computing with CUDA (9 Lectures)** 5.1 CUDA programming model 5.2 Basic principles of CUDA Programming. 5.3 Concepts of threads 5.4 Concept of blocks 5.5 GPU and CPU data exchange	1. Learn GPU and CPU data exchange.

SW-5 Suggested Sessional Work (SW):

a. Assignments

i. Explain CUDA programming model

ii. Explain threads and clocks.

b. Mini Project:

i. Implement CUDA programming.

c. Other Activities (Specify):

Explain how GPU and CPU data exchange can take place.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
PC205.l Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.	10	2	1	15
PC205.2 Analyze different computer architectures and their applications.	14	2	1	18
PC205.3 Understand modern design structures of Pipelined and Multiprocessors systems.	9	2	1	14
PC205.4 Understand distributed computing architecture and high-performance computing.	7	2	1	15

PC205.5 Student will able to work on CUDA programming that enable them to harness the computational power of GPUs for general-purpose computing tasks.	7	2	1	13
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	
PC205.l	Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.	02	02	01	05
PC205.2	Analyze different computer architectures and their applications.	03	04	02	09
PC205.3	Understand modern design structures of Pipelined and Multiprocessors systems.	03	04	03	10
PC205.4	Understand distributed computing architecture and high-performance computing.	02	07	05	14
PC205.5	Student will able to work on CUDA programming that enable them to harness the computational power of GPUs for general-purpose computing tasks.	03	05	04	12
Total		13	22	15	50

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

The end of semester assessment for modern computer architecture 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 area where HPC is used
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 System & Architecture	M. Morris Mano	Prentice Hall of India	2002
2	Computer Architecture-A quantitative approach	John L. Hennessy and David A Patterson	Morgan Kaufmann/ Elsevier	4th Edition, 2007
3	Computer architecture and organization	Hayes. J.P	McGraw-Hill Companies	1998
4	Parallel Computer Architecture: A Hardware/Software Approach	David Culler and J.P.Singh with Anoop Gupta	Morgan Kaufmann	1998
5	https://onlinecourses.nptel.ac.in/noc20_cs41/preview			
6	https://www.coursera.org/learn/introduction-high-performance-computing#syllabus			

Curriculum Development Team

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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: PC205
Course Title: Modern Computer Architecture

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	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	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3	3
CO2	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3	3
CO3	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3	3
CO4	2	2	3	2	2	2	1	1	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	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	CO-1: Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 Basics 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9.1.10	As mentioned in page numbe r
PO 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO 1,2, 3, 4	CO 2: Analyze different computer architectures and their applications or combinations.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Multi-core Architecture 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8,2.9,2.10,2.11,2.12,2.13,2.14	
PO 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO 1,2, 3, 4	**CO 3:** Understand modern design structures of Pipelined and Multiprocessors systems.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3: Distributed Computing Systems and Concurrency 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	**CO 4:** Understand distributed computing architecture and high-performance computing.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: High Performance Computing (HPC) 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	**CO 5**: Apply CUDA programming that enable them to harness the computational power of GPUs for general-purpose computing tasks.	SO5.1 SO5.2 SO5.3 SO5.4		Unit 5: High Performance Computing with CUDA 5.1,5.2,5.3,5.4,5.5	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Cyber Security] Program

(Revisedason01August2023)

Semester II

Course Code: HS102

Course Title: Design Thinking

Pre- requisite: Strong background in Basic Design Skills, Understanding of Databases, Security & Privacy Basics.

Rationale: Design thinking is an extension of innovation that allows you to design solutions for end users with a single problem statement in mind.

Course Outcomes:

HS102.1: Demonstrate knowledge of An Insight to Learning

HS102.2: Apply Security in Remembering Memory.

HS102.3: Use Emotions: Experience & Expression

HS102.4: Basics of Design Thinking

HS102.5: Being Ingenious & Fixing Problem and Process of Product Design

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)	
HS	HS102	Design Thinking	0	2	0	1	3	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:

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)	Seminar one (SA)	Class Activity any one	Class Attendance (AT)	Total Marks (CA+CT+S		
HS	HS 102	Design Thinking	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.

HS102.1: Demonstrate knowledge of An Insight to Learning

Approximate Hours

Item	AppX Hrs.
CI	0
LI	6
SW	2
SL	1
Total	9

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

SO1.1 Understand the Learning Process **SO1.2** Interpreting	**Unit-1.0** An Insight to Learning 1.1 Understanding the Learning Process 1.2 Kolb's Learning Styles 1.3 Assessing Interpreting.		1.Practice on the Learning Process

HS102.2: Exploring Remembering Memory

Approximate Hours

Item	AppX Hrs.
Cl	0
LI	6
SW	2
SL	1
Total	9

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Memory process **SO2.2** Use retention	**Unit-2.0** Remembering Memory 2.1. Understanding the Memory process, 2.2. Problems in retention 2.3. Memory enhancement techniques.		1. How security is achieved in Memory process

HS102.3: Exploring Security Issues and Access Management in cloud system.

Approximate Hours

Item	Appx. Hrs.
Cl	0
LI	6
SW	2

SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the Emotions	**Unit-3.0** Emotions: Experience & Expression 3.1. Understanding Emotions 3.2. Experience & Expression, 3.3. Assessing Empathy, Application with Peers		1. Analyze Data Security Emotions

HS102.4: Familiarize with Security Management in the Cloud and Privacy Issues.

Approximate Hours

Item	Appx. Hrs.
Cl	0
LI	6
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept and purpose of Design Thinking.	**Unit-4.0** Basics of Design Thinking 4.1. Definition of Design Thinking, Need for Design Thinking, 4.2. Objective of Design Thinking, Concepts & Brainstorming, 4.3. Stages of		1. Compare Design Thinking

	Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test		

HS102.5: Comprehend the use of data visualization.

Approximate Hours

Item	Appx. Hrs.
Cl	0
LI	6
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the Creative thinking process	**Unit-5.0** Being Ingenious & Fixing Problem 5.1Understanding Creative thinking process 5.2Understanding Problem Solving Testing Creative Problem Solving Process of Product Design 5.3 Process of Engineering Product Design Design Thinking Approach Stages of Product Design Examples of best product designs and functions Assignment – Engineering Product Design		1. Compare and analyze Creative thinking process

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+SW+Sl)

HS102.1: Demonstrate knowledge of An Insight to Learning	00	06	02	01	9
HS102.2: Apply Security in Remembering Memory.	00	06	02	01	9
HS102.3: Use Emotions: Experience & Expression	00	06	02	01	9
HS102.4: Basics of Design Thinking	00	06	02	01	9
HS102.5: Being Ingenious & Fixing Problem and Process of Product Design	00	06	02	01	9
Total Hours	00	30	10	02	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	An Insight to Learning	03	02	03	08
CO-2	Remembering Memory	03	01	04	08
CO-3	Emotions, Experience & Expression	02	05	02	10
CO-4	Basics of Design Thinking	02	05	04	08
CO-5	Being Ingenious & Fixing Problem	03	02	03	08

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

The end of semester assessment for design thinking 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	Design Thinking for Innovation Research and Practice	Walter Brenner, Falk Uebernickel	Springer	2016
2	Design your Thinking	Pavan Soni	Penguin Random House India Private Limited	2020
3	Design Thinking for beginners	Kilian Langenfeld	Tim Ong	2019

Curriculum Development Team

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CO-PO Mapping:

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: HS102
Course Title: Design Thinking

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	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
HS102.1: Demonstrate knowledge of An Insight to Learning	3	2	3	3	3	3	1	3	1	1	1	3	2	2	3	2	3
HS102.2: Apply Security in Remembering Memory.	3	3	2	3	2	2	1	2	1	1	1	3	2	3	2	1	3
HS102.3: Use Emotions: Experience & Expression	3	2	3	3	3	2	1	2	1	1	1	3	2	2	2	2	3
HS102.4: Basics of Design Thinking	3	2	3	2	3	2	1	3	1	1	1	3	2	2	3	2	2
HS102.5: Being Ingenious & Fixing Problem and Process of Product Design	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	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	CO1: Demonstrate knowledge of An Insight to Learning.	SO1.1 SO1.2	1.1, 1.2, 1.3		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: Apply Security in Remembering Memory.	SO2.1 SO2.2	2.1, 2.2		
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO: 1,2,3,4	CO3: Use Emotions: Experience & Expression	SO3.1	3.1, 3.2, 3.3		
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO: 1,2,3,4	CO4: Basics of Design Thinking.	SO4.1	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	CO 5: Being Ingenious & Fixing Problem and Process of Product Design	SO5.1	5.1, 5.2, 5.3, 5.4	.	

Semester-II

Course Code: AU302

Course Title: Fundamentals of 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:

AU302. 1: To understand the ancient civilization, Indian Knowledge Systems, Concept of Panch Mahabhuta, Origin of name Bharat Varsha, Ancient Rivers, Ancient Universities and ancient agriculture.

AU302.II: 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.

AU302.III: Student will be able to gain knowledge on Vedic Science, Astronomy, Astrovastu, Vedic Mathematics, Aeronautics, Metallurgy, Nakhatras, Panchang, Concept of Zero, Pi and point etc.

AU302. IV: Understanding on ancient Engineering, Science and Technology, Town Planning, Temple architecture, Chemistry and Metallurgy, Metal manufacturing etc.

AU302. V: 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.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

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	
AU302	IKS	Indian Knowledge System	2		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

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)		
AU302	IKS	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.

IKS. 1. 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, Narmada, Sindhu and Kaveri) SO 1.6. Understand Ancient		**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) 1.6 Agriculture system in ancient India, Ancient Universities: Takshashila	Golden era of ancient India

Agriculture and ancient Universities: Takshashila and Nalanda, Gurukul system		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)

IKS. 2: 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):

IKS. 3: 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 origin, Basic purpose of science of Vyakarana		**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

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):

IKS. 4: 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, Pigments used in Paintings, Fabrics, Potteries and Glass SO 4.5. Understand the Temple Architecture: Khajuraho,		**Unit-4. Engineering, Technology and Architecture** 4.1. Engineering Science and Technology in Vedic and Post Vedic Era 4.2. Town and Home planning, Sthapatyaveda 4.3. Chemistry and Metallurgy as gleaned from archeological artifacts 4.4 Chemistry of Dyes, Pigments used in Paintings, Fabrics, Potteries and Glass 4.5. Temple Architecture:	2. Ancient Science, Astronomy and Vedic Mathematics

Sanchi Stupa, Chonsath Yogini temple SO 4.6. Understand the Mining and manufacture in India of Iron, Copper, Gold from ancient times		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):

IKS. 5: Understand about the Life, Nature and Health

Approximate Hours

Item	Appx. 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 Yogic Science (Patanjali), Ritucharya and Dinacharya SO 5.2. Understand the Traditional system of Indian medicines		**Unit-5. Life, Nature and Health** 5.1.Fundamentals of Ayurveda (Charaka & Shushruta) and Yogic Science (Patanjali), Ritucharya and Dinacharya	1. Concept of Ayurveda and Yoga 2. Traditional system of Indian medicines 3. Ethnobotan

(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		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	y 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)
IKS. 1: To understand Indian Civilization and Indian Knowledge Systems	**6**	**2**	**1**	**9**
IKS. 2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	**6**	**2**	**1**	**9**
IKS. 3: Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	**6**	**2**	**1**	**9**
IKS. 4: Understand the Engineering, Technology and Architecture	**6**	**2**	**1**	**9**

IKS. 5: 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**	**2**	**9**
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**	**3**	**10**
Total		**10**	**26**	**16**	**50**

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

The end of semester assessment for Fundamentals of Indian Knowledge **System** 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: Concept and 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: A Historical 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 Astronomy A 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*	Jain, S.K.	Oxford & IBH	1981

	Ethnobotany		Publishing Company Private Limited, New Delhi	
28	Manual of Ethnobotany	Jain, S.K.	Scientific Publishers, Jodhpur	2010

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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : AU302

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	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
IKS. 1: To understand Indian Civilization and Indian Knowledge Systems	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	2
IKS. 2: 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
IKS. 3: 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
IKS. 4: Understand the Engineering, Technology and Architecture	3	2	3	3	2	3	1	2	2	1	2	3	3	3	2	1
IKS. 5: 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	**IKS. 1:** 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	**IKS. 2:** 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	**IKS. 3:** 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	**IKS. 4:** 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	**IKS. 5:** 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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-III

Course Code: PC-301

Course Title: Design and Analysis of Algorithms

Pre- requisite: Data Structures and

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:

PC-301.1. Demonstrate knowledge of Graph and its applications.
PC-301.2. Apply greedy approach and Huffman coding.
PC-3013. Use various divide and conquer algorithm and recurrence relation
PC-301.4. Familiarize with the dynamic programming approach
PC-301.5. 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)	PC-301	Design and analysis of algorithms	3	2	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	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment5 number3 marks	Class Test2(2 best out of 3)10 markseach CT)	Seminar one(SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC-301	Design and Analysis of Algorithms	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.

PC-301.1: Demonstrate knowledge of Graph and its applications.

Approximate Hours

Item	Appx. Hrs.
Cl	5
LI	8
SW	2
SL	1
Total	16

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 Traversal: Breadth First Traversal	**Unit-1.0** Applications of Graph Search 1.1 Intro Graph Search algorithms 1.2 BFS, Application and example of BFS 1.3 DFS, Application and Example of DFS	1. Discuss terminology related to graph. 2. See applications of graph.

	4. Program to implement Graph Traversal: Depth First Traversal	1.4 Checking if an undirected graph is 2-edge connected 1.5 Checking if a directed graph is strongly connected	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on BFS.
ii. Numerical based on DFS
iii. Numerical based on Graph

PC-301.2: Apply greedy approach and Huffman coding.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	6
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of Greedy approach. **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	**Unit-2.0** Greedy algorithms 2.1. Introduction to the greedy paradigm 2.2. Some Greedy algorithms 2.3. Examples of activity selection 2.4. Examples of deadline scheduling 2.5. fractional knapsack 2.6. Kruskal's	1. Prim's algorithm for minimum spanning trees. 2. Examples where greedy algorithms are not optimal.

	method	algorithm for minimum spanning trees 2.7. Huffman coding	

SW-1 Suggested Sessional Work (SW):

Assignments:

iv. Other algorithms based on Greedy approach.
v. Numerical based on fractional knapsack.
vi. Numerical based on Huffman Coding.

PC-301.3: Use various divide and conquer algorithm and recurrence relation.

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)**
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. Intro to Divide and conquer approach Explain why the divide andconquer paradigm is useful. 3.2. Illustrate the paradigm through integer multiplication. 3.3. Writing recurrence relations and solving them.Various methods to solve recurrence relation -I 3.4. Various methods to solve recurrence relation -II 3.5. Further examples from geometry – domination numberof a set of points,	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.

		3.6. Identifying maximal points, closest pair of points. 3.7. Linear time algorithm for finding the median. 3.8. Randomized divide and conquer algorithms: 3.9. randomizedquicksort and 3.10. selection	

SW-1 Suggested Sessional Work (SW):

Assignments:

vii. Numerical based on Fuzzy logic.
viii. Numerical based on Membership Function.
ix. Numerical based on Genetic algorithm.

PC-3014: Familiarize with the dynamic programming approach.

Approximate Hours

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

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on frames.
ii. Questions based on scripts.
iii. Questions based on formal logic.

PC-301.5: Comprehend the use of concept of computation and network flow.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	04
SW	02
SL	01
Total	21

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. Write a program 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, integrality of maximum flow for integral capacities 5.4. Applications of max flow to maximum bipartite matching, max disjoint paths 5.5. Models of computation, Turing machines 5.6. PRAM model, Brief discussion on other modelsof computation e.g. PRAM model 5.7. Memory Hierarchy 5.8. Notion of polynomial timecomputation 5.9. Polynomial time reductions 5.10. Yes and No	1. Exercises on reductions 2. Exercises on NP-completeness. 3. Problems which areNP-hard but not in NP. 4. Examples of poly time reductions.
		instances of decision problems. Decision vs optimization. 5.11. NP as a class of problems with Yes certificates which can be efficiently checked 5.12. NP-hardness and Cook-Levin theorem (just the statement). 5.13. NP-completeness. 5.14. Examplesof Reductions.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of learning techniques.
ii. Use of Dempster-Shafer Theory of Evidential reasoning

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 Demonstrate knowledge of Graph and its applications.	05	08	02	01	16
CO2. Apply greedy approach and Huffman coding.	07	06	02	01	16
CO3. Use various divide and conquer algorithm and recurrence relation	10	06	02	01	19
CO4. Familiarize with the dynamic programming approach	09	06	02	01	18
CO5. Comprehend the use of concept of computation and network flow.	14	04	02	01	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	
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 Design and Analysis of Algorithms 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:

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 TGoodrich 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

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CO, PO and PSO Mapping

Course Title: B. Tech (CSE) Cyber Security

Course Code: PC-301
Course Title: Design and Analysis of Algorithm

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Computational information	Difficulty Analysis	Drawing / Improvement of Solutions	Accomplish Investigations of Compound Computing Troubles	: Current Implement Procedure	Proficient Principles	Ultimate Education	Mission Administration	Announcement Usefulness	Public & Ecological Alarm	Personality & Group Job	Modernization and Private Enterprise	An ability to enhance the application of knowledge of theory subjects in diverse fields	Develop language proficiency to handle corporate communication demands.	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced
CO.1 Demonstrate knowledge of Graph and its applications.	3	2	3	3	2	1	1	1	1	2	1	3	2	2	3	3
CO2. Apply greedy approach and Huffman coding.	2	3	3	3=2	2	2	1	2	1	2	1	3	2	3	2	3
CO3. Use various divide and conquer algorithm and recurrence relation	2	2	2	3	2	2	2	1	1-2	1	1	3	2	2	2	3
CO4. Familiarize with the dynamic programming approach	2	2	3	2	2	2	1	1	1	1	2	3	2	2	3	2
CO5. Comprehend the use of concept of computation and network flow.	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 (C I)	Self Learning (SL)
PO: 1,2,3,4,5,6,7, 8,9,10,11,12 PSO:1,2,3,4	CO.1 Demonstrate knowledge of Graph and its applications	SO1.1 SO1.2 SO1.3	LI1.1,LI1.2 ,LI1.3,LI1. 4	Unit-1.0 Applications of Graph Search 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	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 Apply greedy approach and Huffman coding	SO2.1 SO2.2 SO2.3	LI2.1,LI2.2 ,LI2.3,	Unit-2 Greedy algorithms 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	CO.3 Use various divide and conquer algorithm and recurrence relation	SO3.1 SO3.2 SO3.3	LI3.1,LI3.2 ,LI3.3,	Unit-3: Divide and Conquer 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.1 1,3.12,3.13	
PO: 1,2,3,4,5,6, 7,8,9,10,11, 12 PSO:1,2,3,4	CO.4 Familiarize with the dynamic programming approach	SO4.1 SO4.2 SO4.3	LI4.1,LI4.2 ,LI4.3,	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	CO.5 Comprehend the use of concept of computation and network flow	SO5.1 SO5.2	LI5.1,LI5.2	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	

AKS University

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SEMESTER -III

Course Code: PC302

Course Title: Database Systems

Pre- requisite: Student should have a basic understanding of fundamental computer knowledge that includes concepts of computer architecture, storage and hardware.

Rationale: Database systems help users share data quickly, effectively, and securely across an organization.

Course Outcome:

PC302.1: Understand the basics of databases and data management.
PC302.2: Understand various theoretical and practical principles involved in the design and use of databases systems with the help of database.
PC302.3: Understand Transaction management.
PC302.4: Design and implement databases for various scenarios.
PC302.5: Design a database scenario for handling big 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)	
Program Core (PC)	PC302	**Database Systems**	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	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	PC302	Database 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.

PC302.1. Understand the basics of databases and data management.

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)
SO1.1 Understand about concept of DBMS **SO1.2** Understand about Data Models **SO1.3** Understand about DBMS Elements **SO1.4** Classification of DBMS. **SO1.5** Understand about concurrency control. **SO1.**6 use of Lock based concurrency control **SO1.7** Learn about Time stamping methods.	LI1.1 Installation process of RDBMS (Oracle, MYSQL). LI1.2 Create a database using database templates.	**Module-1.0** **Introduction**: 1.1 Characteristics and fundamental concepts of Databases 1.2 Types of Data Models and Data Modelling 1.3 Elements of Database Systems. 1.4 Classification and comparison of Database Management Systems (Regular and NoSQL Page). 1.5 concurrency control 1.6 Lock based concurrency control 1.7 Time stamping methods.	1. Learn about data structure and algorithm.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**

i. What do you mean by data models? Explain network, hierarchical and relational model in detail.

ii What do you mean by database? What is the purpose of a database system? Explain.

b. **Mini Project:**

i. Draw the scheme of university database.

c. Other Activities (Specify):

Main problems in using Concurrency

PC302.2 Understand various theoretical and practical principles involved in the design and use of databases systems with the help of database.

Item	Appx. Hrs
Cl	8
LI	3
SW	2
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Structure data. **SO2.2** About relational database **SO2.3** About relational model **SO2.4** Understand about functional Dependencies **SO2.5** use of normalization. **SO2.**6 understand query optimization **SO2.7** understand semi-structured data abstraction. **SO2.**8 about representation of data, and search.	LI 2.1 Create an ER-Diagram for College. LI 2.2 Create a relationship in Employee Database between two tables. LI2.3 Given a relation R (A, B, C, D) and Functional Dependency set FD = {AB → CD, B → C}, determine whether the given R is in 2NF? If not convert it into 2 NF.	**Module-2.0 Structured and semi-structured data management:** 2.1 Structured data. 2.2 Relational databases. 2.3 Relational model 2.4 Functional Dependencies 2.5 normal forms 2.6 algorithms for query optimization 2.7 Semi-structured data, document-databases, semi-structured data abstraction 2.8 Representation, and search.	SL1. Learn about E-R model and how are they represented in an E-R model.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**

i. Explain the various terms of an E-R model and how are they represented in an E-R model.

b. **Mini Project:**

Faculty to follow the transactions and processes of textbooks distributed to the students. Complete an information level design for a database that must satisfy the following constraints and requirements:

- Each student can be enrolled in many courses.
- A given course is proposed by one department, but one department can propose many courses.
- Any course is given by one lecturer.
- Each lecturer belongs to one department.
- At the beginning of the semester, each department sends to the "book unit" a document containing the list of requested books.
- Any student receives one book for each course in which he is enrolled.

Based on the previous requirements, do the following:

A. Define the necessary entities and the attributes for each entity type.
B. Explain the meaning of each relationship defined between the entities.
C. Draw the entity relationship Model.
D. Other Activities (Specify):

Constructor E-R Diagram for registrar office of university which store the data about:

I. Student (Sid, name, program)
II. Course offering (time, secno, room no, year, semester)
III. Instructor (id, name, dept. ,title)
IV. Course (Syllabus,credits,courseno,title)

Each course offering provides the grade to the student who are enrolled with that course. Give the appropriate mapping constraints.

PC302.3. Understand Transaction management.

Item	Appx. Hrs
Cl	8
LI	3
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction	Class room Instruction (CI)	Self-Learning
	(LI)		**(SL)**
SO3.1 Understand about Transaction concept and its state. **SO3.2** Understand about ACID. **SO3.3** Use of serializability **SO3.4** use of Recoverability **SO3.5** Implementation of Isolation. **SO3.6** understand about Testing for serializability.	LI 3.1 Consider the following two transactions and schedule (time goes from top to bottom). Is this schedule conflict-serializable? Explain why or why not **Transaction T0** r0[A] w0[A] r0[B] w0[B] c0 **Transaction T1** r1[A] r1[B] c1 LI 3.2Show how the use of locks without 2PL can lead to a schedule that is NOT conflict serializable. LI3.3 What happens if we use "With NOLOCK" on a table.	**Module-3.0 Transaction Management** 1.1 Transaction concept, transaction state. 1.2 ACID properties 1.3 serializability 1.4 Recoverability 1.5 Implementation of Isolation 1.6 Testing for serializability	1. Various types of Locks in Detail.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. What is system log?
   ii Explain various transaction operations.

b. Mini Project:
   i. Explain Concurrency problems in DBMS Transactions.

c. Other Activities (Specify):
   Explain state of transaction with suitable example.

PC302.4 Design and implement databases for various scenarios.

Item	Appx. Hrs
Cl	9
LI	3
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand about Unstructured text **SO4.2** About information retrieval system **SO4.3** understand about document retrieval and ranking system	LI.4.1. How to Manage unstructured data. LI4.2 What does AI have to do with unstructured data. LI4.3 implement different AI technologies is emerging for handling unstructured data	**Module-4.0 Unstructured Data Management** 4.1 Unstructured text 4.2 Information retrieval systems 4.3 document retrieval and ranking .	1. Source of data 2. About Unstructured text

SW-1 Suggested Sessional Work (SW)

a. Assignments:

i. All businesses have both structured and unstructured data explain it.

b. Mini Project:

i. Why the rapid growth of unstructured data is putting greater pressure on businesses. Explain it.

c. Other Activities (Specify):

Explain the difference between unstructured data and structured data.

PC302.5: Design a database scenario for handling big data

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 Understand about Platforms of big data. **SO5.2** Understand about algorithms for Map-Reduce & Hadoop **SO5.3** Learn about Platforms for Big Graphs **SO5.4** Understand about algorithms for large graphs.	LI.5.1 Describe Big data and use case from selected business domain. LI.5.2 Perform Map reduce analytics using HADOOP. LI.5.3 Develop a map reduce program to find the grade of student LI.5.4 Develop a map reduce program to find maximum electrical consumption in each year.	**Module -5.0 Big Data Management** 5.1 Platforms for Big Data 5.2 algorithms for Map-Reduce & Hadoop 5.3 Platforms for Big Graphs 5.4 algorithms for large graphs	1.Big Data

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. What is Big Data, and where does it come from? How does it work?

Ii Why businesses are using Big Data for competitive advantage.

b. Mini Project:

i. A survey of data partitioning and sampling methods to support big data analysis

c. Other Activities (Specify):

The Impact of Big Data in Healthcare Analytics

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)

PC302.1. Understand the basics of databases and data management.	8	2	2	1	13
PC302.2. Understand various theoretical and practical principles involved in the design and use of databases systems with the help of database.	8	3	2	2	15
PC302.3. Understand Transaction management.	8	3	2	2	15
PC302.4. Design and implement databases for various scenarios.	9	3	2	1	15
PC302.5. Design a database scenario for handling big data.	7	4	1	1	13
Total Hours	40	15	09	7	71

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMC A01. 1	Introduction	03	04	03	10
TMC A01. 2	Structured and semi-structured data management	05	03	02	10
TMC A01. 3	Transaction Management	05	03	02	10
TMC A01. 4	Unstructured Data Management	04	05	01	10
TMC A01.	Big Data Management.	03	05	2	10

5					
Total		20	20	10	50

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

The end of semester assessment for 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. 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	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudharshan	Tata McGraw Hill	2006
2	Database Management Systems	R.P. Mahapatra	Khanna Book Publishing	2016
3	Fundamentals of Database Systems	Elmsari and Navathe	Pearson Education	2013
4	Principles of Database Systems	J. D. Ullman	Galgotia Publications	2004
5	Introduction to Information Retrieval / Christopher Manning	Prabhakar Raghavan, Hinrich Schütze	Oxford University Press India, Noida	2006

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Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PC302

Course Title: 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-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: Understand the basics of databases and data management.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	3	1	2
CO 2: Understand various theoretical and practical principles involved in the design and use of databases systems with the help of database.	1	1	2	2	1	2	3	1	1	1	2	2	2	2	2	1	3
CO 3: Understand Transaction management.	2	2	1	1	1	2	2	1	1	2	1	2	1	1	2	2	2
CO 4: Design and implement databases for various scenarios.	3	2	2	2	3	2	3	1	2	1	2	3	3	3	3	2	2
CO 5: Design a database scenario for handling big data	3	2	3	1	1	3	3	1	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 basics of databases and data management.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7	LI.1.1,LI1.2	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: Understand various theoretical and practical principles involved in the design and use of databases systems with the help of database.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7 SO2.8	LI.2.1,LI2.2,LI2. 3	Unit-2 Structured and semi-structured 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: Understand Transaction management.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	LI3.1,LI3.2,LI3. 3	Unit-3 Transaction Management 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 4: Design a database scenario for handling big data	SO4.1 SO4.2 SO4.3	LI4.1,LI.4.2, LI.4.3	Unit-4 Unstructured Data Management 4.1,4.2,4.3	
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, LI.5.3, LI.5.4	Unit-5 Big Data Management 5.1,5.2,5.3,5.4	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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(Revised as on 01 August 2023)

SEMESTER- III

Course Code: **PC-303**

Course Title: Computer Networks

Pre-requisite: Student should have basic knowledge of Computer fundamentals.

Rationale: A computer network allows for the sharing of resources such as printers, files, and data storage, as well as the ability to communicate with other computers and access the internet.

Course Outcome:

PC303.1. Understand basic computer network technology

PC303.2. Understand the different types of network topologies and protocols

PC303.3. Analyse the different types of network devices and their functions within a network

PC303.4. Analyse the architecture and principles of today's computer networks

PC303.5. Understand the requirements for the future Internet and its impact on the computer network architecture.

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)	
PC	PC303	Computer Networks	4	0	1	1	6	4

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 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	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
PC	PC303	Computer 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.

PC303.1. Understand basic computer network technology.

Item	Appx. Hrs.
Cl	8
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand Internet **SO1.2** Learn about the Network **SO1.3**Understand the core concepts and components	1. Manually configure TCP/ IP parameters. 2. Use various networking commands in cmd prompt.	**Unit 1: Computer Networks and The Internet** 1.1 What is the Internet 1.2 Network edge 1.3 Network core	1. Study about the Internet and other types of Networks.

of Network **SO1.4** Learn about Delay, Loss and throughput in Packet-Switched Networks. **SO1.5**Understand Protocol Layers and their Service Model	3. Study various types of network cables and practically implement the straight-through cable using the clamping tool.	1.4 Delay, Loss and throughput in Packet-Switched Networks 1.5 Protocol Layers and their Service Model	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. Explain Internet and its origin.
   ii Describe Protocol Layer and its service model.

PC303.2. Understand the different types of network topologies and protocols

Item	Appx. Hrs.
Cl	8
LI	
SW	2
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Learn about Principles of Network Applications **SO2.2** Understand the Web, HTTP and FTP **SO2.3** Learn about Email and DNS **SO2.4** Understand Peer-to-Peer applications **SO2.5** Learn about Socket Programming	1. Designing and implementing Class A, B, C Networks. 2. Implementation of file and printer sharing. 3. Study of various LAN topologies and their creation using network devices, Cables and computers.	**Unit 2: Application Layer** 2.1 Principles of Network Applications 2.2 The Web and HTTP; File Transfer: FTP 2.3 Electronic Mail in theInternet; DNS - The Internet's Directory Service 2.4 Peer-to-Peer applications 2.5 Socket	Study about Email and FTP

		Programming – Creating network applications	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Describe the working of Electronic Mail

ii Differentiate between HTTP and FTP.

PC303.3. Analyse the different types of network devices and their functions within a network

Item	Appx. Hrs.
Cl	8
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Learn about Transport-Layer Service **SO3.2** Understand Multiplexing and Demultiplexing **SO3.3** Learn about UDP **SO3.4** Learn about principles of reliable data transfer **SO3.5** Learn about TCP **SO3.6** Learn about Congestion Control	1. Implement DHCP, DNS, HTTP using packet tracer. 2. Enable various modes of switches also provide security into it by using packet Tracer. 3. Write the steps to provide static routing by using packet tracer.	**Unit 3: Transport Layer** 1.1 Introduction and Transport-Layer Service 1.2 Multiplexing and Demultiplexing 1.3 Connectionless Transport: UDP 1.4 Principles of Reliable of Data Transfer 1.5 Connection-Oriented Transport: TCP 1.6 Principles of Congestion Control, TCP Congestion Control	Study about Data Transfer and Transport Layer

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Differentiate between Multiplexing and Demultiplexing.

ii. Describe principles of Congestion Control.

PC303.4. Analyse the architecture and principles of today's computer networks

Item	Appx. Hrs.
Cl	9
LI	0
SW	2
SL	2
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Introduction to Network Layer **SO4.2** Learn about Virtual circuit and datagram networks **SO4.3** Understand about router and Internet Protocol (IP) **SO4.4** Learn about Forwarding and Addressing in the Internet **SO4.5** learn about Routing Algorithms **SO4.6** Understand Broadcast and Multicast Routing	1. Write the steps to provide dynamic (RIP) routing by using packet tracer 2. How to use telnet protocol. 3. To study ARP, RARP protocol using packet tracer.	**Unit 4: Network Layer** 4.1 Introduction to Network Layer 4.2 Virtual circuit and datagram networks 4.3 What is inside a router; Internet Protocol (IP) 4.4 Forwarding and Addressing in the Internet 4.5 Routing Algorithms, Routing in the Internet 4.6 Broadcast and Multicast Routing	Study about Routers and routing in Internet

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Write short note on Broadcast and Multicast.

ii. Explain Addressing in the Internet.

PC303.5. Understand the requirements for the future Internet and its impact on the computer network architecture

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Item	Appx. Hrs.
Cl	7
LI	0
SW	2
SL	2
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Introduction to the Data Link Layer **SO5.2** Understand Error Detection and Correction Techniques **SO5.3** Learn about Multiple Access links and Protocols **SO5.4** Understand Switched local area networks	1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool. 2. Connect the computers in Local Area Network 3. Connecting a Switch	**Unit 5: Data Link Layer** 5.1 Introduction to the link layer 5.2 Error Detection and Correction Techniques 5.3 Multiple Access linksand Protocols 5.4 Switched local area networks.	Study about different types of LANs

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. Elaborate Error Detection and correction Techniques.
   ii. What do you understand by Switched Local Area Networks.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC303.1. Understand basic computer network technology.	8	2	2	12
PC303.2. Understand the different types of network topologies and protocols	8	2	2	12

PC303.3. Analyse the different types of network devices and their functions within a network	8	2	2	12
PC303.4. Analyse the architecture and principles of today's computer networks	9	2	2	13
PC303.5. Understand the requirements for the future Internet and its impact on the computer network architecture	7	2	2	11
Total Hours	40	10	10	60

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC303.1	Understand basic computer network technology	03	04	03	10
PC303.2	Understand the different types of networks topologies and protocols	05	03	02	10
PC303.3	Analyze the different types of networks devices and their functions within a network	05	03	02	10
PC303.4	Analyze the architecture and principles of today's computer networks	04	05	01	10
PC303.5	Understand the requirements for the future Internet and its impact on the computer network architecture	03	05	2	10
Total		20	17	13	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.

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 Networking: A top-down approach	James F. Kurose and Keith W. Ross	Pearson Education	6th edition, 2012
2	Computer Networks	A.S. Tanenbaum	PHI	5th Edition, 2010
3	An Integrated Approach to Computer Networks	Bhavneet Sidhu	Khanna Book Publishing House	2019
4	Data & Computer Communication	William Stallings	PHI	10th Edition 2013
5	Data communications and networking	B.A. Forouzan	TMH	5th Edition, 2012

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: PC303
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-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: Understand basic computer network technology	2	2	3	3	3	1	1	1	1	1	1	3	2	3	3	1	2
CO 2 : Understand the different types of network topologies and protocols	1	3	2	3	2	2	2	1	1	1	1	3	2	2	2	1	3
CO 3: Analyse the different types of network devices and their functions within a network	2	2	2	3	3	2	1	1	1	1	1	3	1	1	2	2	2
CO 4: Analyse the architecture and principles of today's computer networks	1	2	3	2	3	2	1	1	1	2	1	3	3	3	3	2	2
CO 5: Understand the requirements for the future Internet and its impact on the computer network architecture.	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	PC303.1. Understand basic computer network technology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI.1.1,LI1.2,LI3	Unit-1 **Computer Networks and The Internet** 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	PC303.2. Understand the different types of network topologies and protocols	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI.2.1,LI2.2,LI2.3	Unit-2 **Application Layer** 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	PC303.3. Analyse the different types of network devices and their functions within a network	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	LI3.1,LI3.2,LI3.3	Unit-3 **Transport Layer** 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	PC303.4. Analyse the architecture and principles of today's computer networks	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6	LI4.1,LI.4.2,LI4.3	Unit-4 **Network Layer** .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	PC303.5. Understand the requirements for the future Internet and its impact on the computer network architecture	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2,LI5.3	Unit-5 **Data Link Layer** 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) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-III

Course Code: PC304 CYS

Course Title: Cyber Security and Cyber Law

Pre- requisite: Great communication skills.

Rationale: Cyberlaw provides a framework for protecting individuals and organizations from cyber threats, ensuring the privacy and security of digital transactions, and establishing guidelines for ethical and legal conduct in cyberspace.

Course Outcomes:

PC304 CYS.1: Identify Networking and its issues.
PC304 CYS.2: Explain the concepts of Information security, Threats, Vulnerabilities and Impact.
PC304 CYS.3: Evaluate different methods in cryptography.
PC304 CYS.4 Discuss network security issues and Virtual Private Networks.
PC304 CYS.5: Understand cyber security and need cyber-Law.

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)	PC304 CYS	Cyber Security and Cyber Law	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	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 3	Cl a	Seminarr one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC304CYS	Cyber Security and Cyber Law	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) (SA)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC304CYS	Cyber Security and Cyber Law	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.

PC304.1: Demonstrate knowledge of the Cyber Law.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	6
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Analyze and evaluate the cyber security needs of an organization. **SO1.2** Measure the performance and troubleshoot cyber security systems. **SO1.3** Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.	1. Implement Dictionary and Broot Force Attacks. 2. Demonstrate intrusion detection system using any software tools. 3. Demonstrate how to provide secure data storage and secure data transmission.	**Unit-1 Cyber World and Cyber Law** 1.1 The internet and online resources 1.2 Security of information, Digital signature. 1.3 An Overview of Cyber Law: Introduction about the cyber space. 1.4 Regulation of cyber space – introducing cyber law	1. Search online resources 2. Test, train datasets.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. What is information security?
ii. What is Cyber Law?
iii. Explain digital signature.

PC304.2: Applications of Cyber Law.

Approximate Hours

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

ession Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of cyber crime. **SO2.2** Understand types of cyber crime **SO2.3** Demonstrate the Fraud, Hacking.	1. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same	**Unit – 2 An Overview of Cyber Crimes**. 2.1. Defining Crime, Crime in context of Internet 2.2. Actus Rea/Mens Rea, Types of crime in Internet,	1. How Cyber law is used to solve real life problems. 2. Real life 3. examples of

	using appropriate data sets. 2. Write a program to implement KNN model.	2.3. Computing damage in Internet crime. 2.4. An Overview of Indian Penal Law & Cyber Crimes. 2.5. Fraud, Hacking, Mischief 2.6. Defamation, Stalking, Spam.	Cybercrim.

SW-1 Suggested Sessional Work (SW):

Assignments:

iv. Applications of machine learning.
v. Difference between supervised and unsupervised learning.
vi. Compare unsupervised and reinforcement learning.

PC304.3: Use various human rights in Internet.

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)**
SO3.1 Understand the concept of human rights and privacy. **SO3.2** Use various privacy Technical Issues in Cyber Contracts **SO3.3** Apply various Copy Right in Information Technology.	1. Write a program to implement the secure code. 2. Write a program to implement copyright in document. 3. Construct a procedure of copyright in Internet.	Unit-3.0 An Overview of Human Rights Issues in Internet 3.1. Freedom of Expression in Internet. 3.2. Issues of Censorship. 3.3. Support Vector Machine (SVM), 3.4. Hate speech, Sedition, Libel.	1. Compare and analyze all Human Rights.

		3.5. Subversion , Privacy Issues 3.6. Privacy Issues 3.7. Internation al Positions on Free Speech in Internet.	

SW-1 Suggested Sessional Work (SW):

Assignments:

1. Explain Freedom of Expression in Internet.
2. Discuss about censorship.
3. Explain varuiou privacy issues.

PC304.4: Familiarize knowledge of electronic contracts.

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)**
SO4.1 Understand the concept of electronic contract. **SO4.2** Use of electronic contract. **SO4.3** Apply cyber contract.	1. Write a procedure to implement electronic contract. 2. Constructing and demonstrating the security issues of privacy. 3. Constructing and demonstrating the Indian law of contracts. .	**Unit-4.0 An Overview of Electronic Contracts** 4.1. The Indian Law of Contract. 4.2. Constructi on of Electronic Contracts. 4.3. Issues of Security Issues of Privacy Technical Issues in Cyber Contracts.	1. Compare and analyze all Electronic contract.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on electronic contract.
ii. Questions based on cyber contract.

PC304.5: Types of electronic contract and copy right in Information Technology.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	8
SW	2
SL	1
Total	19

Session Outcome s (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the Types of electronic contract. **SO5.2** Demonstrate the use of Copy Right in Information Technology .	1. Demonstrating the Re-Seller and Distributor Agreements Non-Disclosure Agreements 2. Constructing and demonstrating the 3. Source Code Escrow Agreements	**Unit-5.0** **Types of Electronic Contracts and Copy Right in Information Technology** 5.1. Employment Contracts Consultant Agreements Contractor Agreements Sales, 5.2. Re-Seller and Distributor Agreements Non-Disclosure Agreements. 5.3. Software Development & Licensing Agreements Shrink Wrap Contract, Source Code Escrow Agreements. 5.4. Understanding the technology of Software. 5.5. Software - Copyrights vs. Patents debate, Authorship and Assignment Issues 5.6. Commissioned Work and Work for	1. Compare and analyze all Copyrights vs. Patents debate

		Hire, Idea/Expression dichotomy, Copyright in Internet.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of Electronic Contracts.
ii. Use of Copy Right in Information Technology.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC304.1: Demonstrate knowledge of the Cyber Law	08	06	02	01	17
PC304.2: Applications of Cyber Law	09	04	02	01	16
PC304.3: Use various human rights in Internet.	10	06	02	01	19
PC304.4: Familiarize knowledge of electronic contracts.	10	06	02	01	19
PC304.5: Types of electronic contract and copy right in Information Technology.	08	08	02	01	19
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	Cyber World and Cyber Law	03	02	03	08
CO-2	An Overview of Cyber Crimes	03	01	05	09
CO-3	An Overview of Human Rights Issues in Internet	03	07	02	12
CO-4	An Overview of Electronic Contracts	03	05	05	13
CO-5	Types of Electronic Contracts and Copy Right in Information Technology	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Cyber Security and Cyber Law 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:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Cyber law Simplified	Vivek Sood	Tata Mcgraw-Hill Publishing	2021
2	The Information Technology Act, 2005: A Handbook	Sudhir Naib	OUP	3rd Edition 2011
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.	Introduction to Cyber Security	Prof. K. Lal	IIT Madras
2.	Cyber Law	Prof. S. Krishna	IIT Madras

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CO, PO and PSO Mapping

Course Title: B. Tech. [Cyber Security]

Course Code : PC304CYS
Course Title: Cyber Security and Cyber Law

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				
CO1	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3
CO2	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3
CO3	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3
CO4	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2
CO5	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

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: This provides students with a comprehensive understanding of the cyber world and the legal frameworks governing it, preparing them to navigate and address the challenges of the digital age effectively.	SO1.1 SO1.2 SO1.3		Unit-1.0 Cyber World and Cyber Law. 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	CO 2 : This equips students with a thorough understanding of cybercrimes and the relevant legal frameworks in India, preparing them to address and navigate the complexities of cyber law effectively.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 An Overview of Cyber Crimes. 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	CO3 : This provides students with a comprehensive understanding of human rights issues related to the internet, equipping them to critically analyze and engage with these challenges in a global context.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 : An Overview of Human Rights Issues in Internet. 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	CO4: this equips students with a thorough understanding of the legal, security, privacy, and technical aspects of electronic contracts, preparing them to navigate and manage electronic contractual agreements effectively.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 : An Overview of Electronic Contracts 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.0	
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	CO 5: It provides students with a comprehensive understanding of various types of electronic contracts and the complex issues surrounding copyright in information technology, preparing them to navigate and manage legal matters in the digital and technological domains effectively.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit5: Types of Electronic Contracts and Copy Right in Information Technology. 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) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-III

Course Code: PC305

Course Title: Artificial Intelligence

Pre- requisite: To study this Course, a student must have basic knowledge of computers

Rationale: AI can automate routine tasks, analyze data, and improve decision-making

Course Outcomes:

PC305.1. Understand the basic concepts and techniques of Artificial Intelligence.
PC305.2. Apply AI algorithms for solving practical problems
PC305.3. Describe human intelligence and AI
PC305.4. Explain how intelligent system works.
PC305.5. Apply basics of Fuzzy logic and neural networks

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)	PC305	Artificial 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, 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 (ESA)	Total Marks (PRA+ESA)
			Class/HomeAssignments numbe	C l a	Seminarr one	Class Activity any one (CA	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	PC305	Artificial Intelligence	15	20	5	5	5	50	50	100

PC305.1. Understand the basic concepts and techniques of Artificial Intelligence.

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 Understand the Artificial Intelligence and its applications **SO1.2 Explain** Level of models, criteria of success **SO1.3 Discuss** advantages, and limitations of AI **SO1.4 Definition** Impact and Examples of AI **SO1.**5 Explain Advice for a career in AI		**Unit-1 Introduction** 1.1Artificial Intelligence and its applications 1.2 Artificial Intelligence Techniques 1.3 Level of models, criteria of success 1.4 Intelligent Agents, 1.5 Nature of Agents 1.6 Learning Agents. 1.7 AI Techniques 1.8 advantages, and limitations of AI 1.9 Impact and Examples of AI 1.10 Application domains of AI 1.11 The AI Ladder - The Journey for Adopting AI Successfully 1.12 Advice for a career in AI 1.11 Hotbeds of AI Innovation	**1.** Artificial Intelligence Techniques 2. Intelligent Agents, Nature of Agents

SW-1 Suggested Sessional Work (SW):

1. Assignments:

a. Intelligent Agents, Nature of Agents
b. Impact and Examples of AI, Application domains of AI
c. The AI Ladder - The Journey for Adopting AI Successfully

2. Other Activities (Specify): Seminar

PC305.2: Apply AI algorithms for solving practical problems

Approximate Hours

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 To Understand the Problem-solving techniques **SO2.2** To learn heuristic search **SO2.3** To lean about Hill climbing, best first search **SO2.4 Explain** Max Search, Alpha-Beta Pruning **SO2.**5 Explain Additional refinements		Unit 2: **Problem solving techniques** 2.1 State space search, control strategies 2.2 heuristic search, problem characteristics 2.3 production system characteristics, 2.4 Generate and test 2.5 Hill climbing, 2.6 best first search, 2.7 A* search 2.8 Constraint satisfaction problem, 2.9 Mean-end analysis 2.10 Min-Max Search, 2.11 Alpha-Beta Pruning 2.12 Additional refinements, Iterative Deepening	1. State space search, control strategies 2. production system characteristics

SW-2 Suggested Sessional Work (SW):

A. Assignments:

a. Heuristic search, problem characteristics
b. Min-Max Search, Alpha-Beta Pruning
c. Additional refinements

PC305.3: Describe human intelligence and AI

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	2

SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3. To Understand Logic **SO3.2** To learn predicate logic **SO3.3** To understand the Resolution in proportional l o g i c **SO3.4 Explain** unification algorithm **SO3.5** learn about unification algorithm		**Unit3: Logic** 3.1 Propositional logic I 3.2 Propositional logic II 3.3 Propositional logic III 3.4 predicate logic I 3.4 predicate logic II 3.5 Resolution 3.6 Resolution in proportional logic and 3.7 Resolution in predicate logic 3.8 unification algorithm I 3.9 unification algorithm II	1. predicate logic, Resolution 2. Resolution in proportional logic and predicate logic

SW-3 Suggested Sessional Work (SW):

3. Assignments:

a. Resolution in proportional logic and predicatelogic
b. Clause form
c. predicate logic, Resolution

4. Major - Paper I:
Other Activities (Specify):

PC305.4: Explain how intelligent system works

Approximate Hours

Item	AppX Hrs
Cl	17
LI	0
SW	2
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Evaluation of Mapping between facts and representations **SO4.2** Understanding the		**Unit-4: Knowledge Representation schemes and reasoning: -** **4.1** Mapping between facts and representations	**1.** procedural vs declarative knowledge **2.** procedural vs declarative knowledge

Approaches to knowledge representation **SO4.3** To learn Matching, conflict resolution **SO4.4** To lean about statistical reasoning, fuzzy logic Weak and Strong **SO4.**5 **Discuss** conceptual dependency, scripts		4.2 Approaches to knowledge representation 4.3 Procedural vs declarative knowledge 4.5 Forward vs. Backward reasoning 4.6 Matching, 4.7 conflict resolution 4.8 Non- monotonic reasoning, 4.9 Default reasoning 4.10 statistical reasoning, 4.11 fuzzy logic I 4.12 fuzzy logic I 4.13 Weak and Strong filler structures 4.14 semantic nets, 4.15 frame 4.16 conceptual dependency, 4.17 scripts	

SW-4 Suggested Sessional Work (SW):

A. Assignments:

a. Approaches to knowledge representation
b. statistical reasoning, fuzzy logic Weak and Strong filler structures
c. Conceptual dependency, scripts

B. Other Activities (Specify):

PC305.5: Apply basics of Fuzzy logic and neural networks

Approximate Hours

Item	Appx Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 To Understand Logic the Planning problem **SO5.2 Explain** planning graphs **SO5.3 learn** this Analysis of planning approaches **SO5.4** To understand conditional planning		**Unit 5: Planning:** 5.1 The Planning problem 5.2 planning with state space search 5.3 partial order planning 5.4 planning graphs 5.5 planning with propositional logic	1. planning with state space search 2. Analysis of planning approaches

SO5.5 Explain Continuous and Multi Agent planning		5.6 Analysis of planning approaches 5.7 Hierarchical planning 5.8 conditional planning 5.9 Continuous and 5.10 Multi Agent planning	

SW-4 Suggested Sessional Work (SW):

A. Assignments:

a. Continuous and Multi Agent planning
b. Planning with state space search
c. Hierarchical planning

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC305.1: Understand the basic concepts and techniques of Artificial Intelligence.	12	02	01	15
PC305.2: Apply AI algorithms for solving practical problems	12	02	01	15
PC305.3: Describe human intelligence and AI	9	02	01	12
PC305.4: Explain how intelligent system works	17	02	01	20
PC305.5: Apply basics of Fuzzy logic and neural networks	10	02	01	13
Total Hours	60	10	5	65

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction Artificial Intelligence	03	02	03	08
CO-2	Problem solving techniques	03	01	05	09

CO-3	Logic	03	07	02	12
CO-4	Knowledge Representation schemes and reasoning	03	05	05	13
CO-5	Planning	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Artificial Intelligence 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	A Classical Approach to Artificial Intelligence	M.C. Trivedi	Khanna Book Publishing	2019
2	Artificial Intelligence	A modern approach by Stuart Russel	Pearson Education	2010
3	Artificial Intelligence	Rich and Knight	The McGraw Hill	2017

B. Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	An Introduction to Artificial Intelligence	Prof. Mausam	IIT Delhi

2.	Artificial Intelligence	Prof. SudeshnaSarkar	IIT Kharagpur

Curriculum Development Team

Mr. Anurag Tiwari teaching associate, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course Title: **B. Tech. [Cyber Security]**
Course Code: **PC305**
Course Title: **Artificial Intelligence**

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	Problem	Design/develop	Conduct	Utilization of	Engineers and	Environment and	Ethics	Individual and	Communicatio	Project	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmed 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	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3	2
CO2	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3	2
CO3	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3	2
CO4	2	2	3	2	2	2	1	1	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	2	2

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	**PC305.1:** Understand the basic concepts and techniques of Artificial Intelligence.	SO1.1 SO1.2 SO1.3 SO1.4	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	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	**PC305.2**: Apply AI algorithms for solving practical problems	SO2.1 SO2.2 SO2.3 SO2.4	Unit-2 Problem solving techniques 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	**PC305.3:** Describe human intelligence and AI	SO3.1 SO3.2 SO3.3 SO3.4	Unit-3 Logic 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	**PC305.4:** Explain how intelligent system works	SO4.1 SO4.2 SO4.3 SO4.4	Unit-4 Knowledge Representation schemes and reasoning 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13,4.14,4.15,4.15,4.16,4.17	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**PC305.5:** Apply basics of Fuzzy logic and neural networks	SO5.1 SO5.2 SO5.3 SO5.4	Unit-5 Planning 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) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-III

Course Code: OE001

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)	
Program Core (36)	OE001	Internet of Things	3	0	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 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)		
	OE001	Internet of Things	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. Acquire the knowledge of IoT concept and its Architecture

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	2
SL	1
Total	13

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		**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. Learn basics of IoT 2. Design 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.		1.6 Physical design of IoT 1.7 Logical design of IoT 1.8 Application 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	0
SW	2
SL	1
Total	10

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.	.	**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	0
SW	2
SL	1
Total	15

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 and web Sockets. **SO3.5** Concept of Internet Connectivity, Internet based communication, IP addressing in IoT and Media Access Control.	.	**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 Connectivity Principles: 3.9 Internet Connectivity features 3.10 Internet based communication 3.11 IP addressing in IoT 3.12 Media Access Control	1. Designing of Web Connectivity 2. Communication Protocol

CO4. Familiarize and understand the basic Sensor data Communication Protocols.

Approximate Hours

Item	Appx Hours
Cl	10
LI	0
SW	2
SL	1
Total	13

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	.	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	1. How Sensor works 2. Working of wireless sensor networ

IoT **SO4.4** Actuator, Sensor data Communication Protocols **SO4.5** Understanding about the Radio Frequency Identification Technology and Wireless Sensor Network Technology.		4.9 Wireless Sensor Network Technology. 4.10 Examples of IoT	k

CO5. Develop the application skills regarding the Smart City Streetlights control & monitoring

Approximate Hours

Item	Appx Hours
Cl	8
LI	0
SW	2
SL	1
Total	11

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.		**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)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO 1: Acquire the knowledge of IoT concept and its Architecture.	9	2	1	12
CO 2: Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	10	2	1	13
CO 3: Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	12	2	1	15
CO 4: Familiarize and understand the basic Sensor data Communication Protocols.	14	2	1	17
CO 5: Develop the application skills regarding the Smart City Streetlights control & monitoring	15	2	1	18
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
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. 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	"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.
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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.CSE [Cyber Security]
Course Code: OE001

Course Title: Internet of Things

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	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		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		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		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		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		Unit5: IoT Design methodology 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

SEMESTER -III

Course Code: OE002

Course Title: 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 Outcome:

CO1: Understand basics of Robotics.
CO2: Understand the Need of AI in Robotics.
CO3: Apply game playing in AI .
CO4: Apply Robotics fundamentals.
CO5: Apply Robotics and Its 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)	
Elective	OE002	Robotics	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

		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		
Elective	OE002	Robotics	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 basics of Robotics.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	1
SL	1
Total	12

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 & systems **SO1.4** Introduction, the three levels of robot programming **SO1.**5 requirements of a robot programming language **SO1.6** problem specular to robot programming languages **SO1.**7 Learn about the Programming. Testing & debugging & their Tools. .		**Unit-1.0 Introduction**: 1.1 Introduction to Robotics 1.2 Fundamentals of Robotics . 1.3 Robot Kinematics: 1.4 Position Analysis. 1.5 Dynamic Analysis and Forces 1.6 Robot Programming languages & 1.7 systems 1.8 Introduction, the three levels of robot programming 1.9 requirements of a robot programming language 1.10 problem specular to robot programming languages	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 . 2. Experiment with sensor integration, motor control, and programming to enhance your practical skills.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
- Research and present an overview of the history and evolution of robotics.
- Explore various applications of robotics in different industries.

b. Mini Project:
Implement basic control algorithms for movement and obstacle detection

c. Other Activities (Specify):

CO3: Apply game playing in AI .

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand about History, state of the art **SO2.2**Understand 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	LI 2.1 writing and implementing code to control robot movements, respond to sensor inputs, and execute specific tasks, enhancing students' programming proficiency in languages like Python, C++, or specialized robotics languages.	**Unit-1.0 Need of AI in Robotics** 2.1 History, 2.2 state of the art 2.3 Need of AI in Robotics. 2.4 Thinking and acting humanly 2.5 intelligent agents -I 2.6 intelligent agents -II 2.7 structure of agents 2.8 various types of agents	1. learn about Need of AI in Robotics

a. Assignments:

- Design a simple electronic circuit for a robot using components like resistors, capacitors, and transistors.
- Explain the purpose and functionality of each component in the circuit.

b. Mini Project:

- Design a robot that follows a line on the ground using infrared sensors.

c. Other Activities (Specify):

CO4: Apply Robotics fundamentals.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

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 move generator **SO3.4** Understand about game playing strategies **SO3.5**Understand about Problems in game laying.		**Unit-3.0 Game Playing** : 3.1 AI and game playing-I 3.2 AI and game playing-II 3.3 plausible move generator. 3.4 static evaluation move generator 3.5 game playing strategies -I 3.6 game playing strategies -II 3.7 Problems in game playing-I 3.8 Problems in game playing-II	1. learning game playing strategies 2. AI and game playing

SW-1 Suggested Sessional Work (SW):

a. Assignments:
- Write a program to control the movement of a simulated robot in a 2D environment.
- Implement basic algorithms for obstacle avoidance and path planning.

b. Mini Project:
- Experiment with different line-following algorithms to optimize performance.

c. Other Activities (Specify):

CO5: Apply Robotics and Its applications

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	0
SW	1
SL	1
Total	9

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-4.0 Robotics fundamentals** 4.1 Robot Classification-I 4.2 Robot Classification-II 4.3 Robot Specification notation 4.4 kinematic representations and 4.5 transformations 4.6 dynamics techniques 4.7 trajectory planning and control.	1. learn about Robot Classification 2.learn about kinematic representations .

SW-1 Suggested Sessional Work (SW):

a. Assignments:
Choose a specific type of robotic hardware (e.g., wheeled robot, robotic arm) and analyze its components and structure.

b. Mini Project:
i. Construct a simple robotic arm with at least two degrees of freedom.
c. Other Activities (Specify):

3BTech(AI**).5**: At the end of this chapter the student will use Robotics and Its applications

. **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)**
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-Speed of Robot		**Unit-5.0 Robotics and Its applications** 5.1 DDD concept and 5.2 Intelligent robots 5.3 Robot anatomy-Definition 5.4 law of robotics - I 5.5 law of robotics - II 5.6 History and Terminology of Robotics-Accuracy 5.7 repeatability of Robotics-	1. learn law of robotics 2. Pneumatic and Electric system
		5.8 Simple Problems	

		5.9 Specifications of Robot- 5.10 Speed of Robot 5.11 Robot joints and links-Robot classifications-Architectureofrobo ticsystems-RobotDrivesyste ms-Hydraulic 5.12 Pneumatic and Electric system	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Solve kinematic equations for a robotic arm or manipulator.

b. Mini Project:

i. Implement algorithms for identifying and sorting different colored objects.

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 basics of Robotics.	10	1	1	12
CO2: Understand the Need of AI in Robotics.	8	1	1	10
CO3: Apply game playing in AI	8	1	1	10
CO4: Apply Robotics fundamentals.	7	1	1	9
CO5: Apply Robotics and Its applications	12	1	1	14
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	
1	Introduction to Robotics.	03	04	03	10

2	Need of AI in Robotics.	05	03	02	10
3	game playing in AI .	05	02	03	10
4	Robotics fundamentals.	04	04	02	10
5	Robotics and Its applications production and quality of cement.	03	05	2	10
Total		20	15	15	50

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Robotics, Vision and Control: Fundamental Algorithms in MATLAB	Peter Corke	Springer	2011
2	Robotics: Everything You Need to Know About Robotics from Beginner to Expert	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	Packet Publishers	2018

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: OE002

Course Title: 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.
CO1: Understand basics of Robotics.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	3	1	2
CO2: Understand the Need of AI in Robotics.	1	1	2	2	1	2	3	1	1	1	2	2	2	2	2	1	3
CO3: Apply game playing in AI	2	2	1	1	1	2	2	1	1	2	1	2	1	1	2	2	2
CO4: Apply Robotics fundamentals.	3	2	2	2	3	2	3	1	2	1	2	3	3	3	3	2	2
CO5: Apply Robotics and Its applications	3	2	3	1	1	3	3	1	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: **Understand basics of** Robotics.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7		Unit-1 Introduction: 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 the Need of AI in Robotics.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7		Unit-2 Structured and semi-structured 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: **Apply** game playing in AI	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 Transaction Management 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: Apply Robotics fundamentals.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Unstructured Data Management 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, 5	CO5: Apply Robotics and Its applications	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5 Big Data Management 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 Computer Application Science and Information Technology

Department of Computer Science Bachelors in Technology [B.Tech.]

Artificial Intelligence and Data Science [Cyber Security]

(Revised as on 01 August 2023)

Semester III

Course Code: **HSMC(H-102)**

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:

HSMC(H-102)I: To understanding Value Education

HSMC(H-102)II: Students will have the ability to learn about Harmony in the Human Being**.**

HSMC(H-102)III: Student will be able to gain knowledge on Harmony in the Family and Society.

HSMC(H-102)IV: Understanding Harmony in the Nature/Existence.

HSMC(H-102): Student will able to understand about Implications of Holistic Understanding- A Look at Professional Ethics.

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	
HS	HSMC(H-102)	Universal Human Values	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 Universal Human Values 2022-23 onwards

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science Bachelors in Technology [B.Tech.]

Artificial Intelligence and Data Science [Cyber Security]

(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 (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	Class Attendance (AT)	Total Marks (CA+CT+S		
HS	HSMC(H-	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 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.

UHV Module 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		**Module-I Understanding Value Education** 1.2 Self-exploration as the	Human values to become a

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		Process for Value Education 1.2 Continuous Happiness and 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	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):

UHV Module II: Students will have the ability to apply the gained knowledge on Harmony in 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 2.6 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):

UHV Module 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):

UHV Module 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):

UHV Module V: Students will have the ability to apply the gained knowledge in Implications 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):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
UHV Module. I: Student will be able to understand The Value Education	**6**	**2**	**1**	**9**
UHV Module. II: Students will have the ability to apply the knowledge gained about Harmony in the Human Being	**6**	**2**	**1**	**9**
UHV Module. III: Student will be able to understand the Harmony in the Family and Society	**6**	**2**	**1**	**9**
UHV Module. IV: Understand the Harmony in the Nature/Existence	**6**	**2**	**1**	**9**

UHV Module. V: Understand about the Implications 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**	**8**
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.	-

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : HSMC(H-102)
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.
UHV Module. 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
UHV Module. 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
UHV Module. 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
UHV Module. 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
UHV Module. 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

ii. 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	**UHV Module. 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	**UHV Module. 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	**UHV Module. 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	**UHV Module. 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	**UHV Module. 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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (CSE) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: **PC-401**

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:

CS-401.1: Understand models and abstractions: automata as a basic model of computation.
CS-401.2: Student will acquire to represent regular expression and Finite State Automata.
CS-401.3: Student will acquire to represent CFL and Pushdown Automata.
CS-401.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.
CS-401.5: 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	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	**PC-401**	Theory of computation	3	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 ofStudy	CouseCode	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment5 number 3 marks each(CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+ AT)		
PCC	**CS-401**	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.

PC-401.1: Understand models and abstractions: automata as a basic model of computation.

Approximate Hours

Item	Appx Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	13

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

SO1.1: Recall the concepts of alphabet string 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 of Computational Science** 1.1 Definition of Alphabet, Word/String, Language 1.2 Introduction to formal proof 1.3 Additional forms of proof, Inductive proofs 1.4 Chomsky Hierarchy for Formal Languages and Automata 1.5 Finite Automata and its Type 1.6 Deterministic Finite Automata (DFA) 1.7 Non - Deterministic Finite Automata 1.8 Finite Automata with Epsilon transitions. 1.9 Conversion NFA to DFA 1.10 Conversion Epsilon NFA to NFA	1. Study the set theory basics and properties 2. Practice questions on FA

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Chomsky Hierarchy with example.
ii. Practice question of DFA and NFA.
iii. Differentiate among NFA, DFA and epsilon NFA

b. Other Activities (Specify):

Seminar and Tutorial

PC-401.2: Student will acquire to represent regular expression and Finite State Automata.

Approximate Hours

Item	Appx. Hrs
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room 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 method 2.2 Myhill Nerode Minimization 2.3 Regular Expression: Rules and Identities. 2.4 Simplification of Regular Expression using Identities. 2.5 Regular Expression to FA 2.6 FA to Regular Expression Transformation 2.7 Arden's Theorem 2.8 Closure properties of Regular language 2.9 Pumping Lemma for Regular Language	1. Study of different minimization technique. **2.** Application of Finite automata and Regular expression

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Discuss Pumping Lemma with example.
ii. Discuss Minimization technique.

b. Other Activities (Specify):
Seminar and Tutorial

PC-401.3: Student will acquire to represent CFL and Pushdown Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room 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 Simplification of Grammars:	i. Design PDA for different languages. ii. Applications of Derivation trees.
		3.5 Removal of Null Production 3.6 Removal of Unit Productions, Removal of Useless Symbols 3.7 Definition of the Pushdown automata 3.8 Languages accepted by Pushdown Automata 3.9 String/Language Acceptability by PDA 3.10 Comparison between Non-Deterministic PDA and Deterministic PDA 3.11 Equivalence of CFG to PDA 3.12 Equivalence of PDA to CFG 3.13 Pumping Lemma for CFL	

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

PC-401.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.

Approximate Hours

Item	Appx. Hrs.
Cl	07
LI	0
SW	2

SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Design LBA for the Languages **SO4.2** Design Turing Machine for the given 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: Closure Properties of CFL 4.4: Turing Machines 4.5:Universal Turing Machine 4.6:Programming Techniques for TM 4.7: Variations of TM	i. Study different Types of Turing Machine ii. Study of different problems which are undecidable.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Design Turing Machine for the Languages.
ii. Discuss Different types of Turing Machine.

b. Other Activities (Specify):

Seminar and Tutorial

PC-401.5: Students will Link between languages, automata, and decision problems.

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	0
SW	2
SL	1
Total	09

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room 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. SO4. Explain post correspondence problem		**Unit 5: Turing Machine** 5.1 : Halting problem of Turing Machine 5.2 Recursive language and recursively enumerable language	1. Study of P and NP class problems 2. Identify Decidable problems

SO5.5 recognize decidable problems and un- decidable problem.		5.3 A language that is not Recursively Enumerable (RE) 5.4 An undecidable problem that is RE Undecidable problems about Turing Machine 5.5 Post's Correspondence Problem 5.6: P class and NP classes	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i) Give some examples to explain P and NP class problem.
ii) Identify languages which are Recursive.
iii) 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)
PC-401.1: Understand models and abstractions: automata as a basic model of computation.	10	2	1	11
PC-401.2: Student will acquire to represent regular expression and Finite State Automata.	09	2	1	14
PC-401.3: Student will acquire to represent CFL and Pushdown Automata.	13	2	1	11
PC-401.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	07	2	1	10
PC-401.5: Students will Link between languages, automata, and decision problems.	6	2	1	14
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	PC-401.1: Understand models and abstractions: automata as a basic model of computation.	05	02	02	09
CO-2	PC-401.2: Student will acquire to represent regular expression and Finite State Automata.	02	03	05	10
CO-3	PC-401.3: Student will acquire to represent CFL and Pushdown Automata.	02	03	06	11
CO-4	PC-401.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	2	03	05	10
CO-5	PC-401.5: Students will Link between languages, automata, and decision problems.	-	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

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 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
4	Lecture note provided by Dept. of CSE, AKS University, Satna .			

Curriculum Development Team

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Cos, POs and PSOs Mapping

Course Title: 4BTechCSE [Cyber Security]
Course Code: PC-401
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	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.
CS-401.1: Understand models and abstractions: automata as a basic model of computation.	2	3	2	1	1	2	1	1	1	1	1	2	**2**	**2**	2	**1**	**2**
CS-401.2: Student will acquire to represent regular expression and Finite State Automata.	2	2	2	2	1	2	1	1	1	1	1	3	**2**	**3**	2	**1**	**3**
CS-401.3: Student will acquire to represent CFL and Pushdown Automata.	2	3	3	2	1	1	1	1	1	1	1	3	**2**	**3**	2	**2**	**2**
CS-401.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	2	2	2	2	1	2	1	1	1	1	1	3	**2**	**1**	2	**2**	**2**
CS-401.5: Students will Link between languages, automata, and decision problems.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**1**	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, 3, 4, 5	CS-401.1: Understand models and abstractions: automata as a basic model of computation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		**Unit-1. Introduction of Computational Science** 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	CS-401.2: 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CS-401.3: 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CS-401.4: 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CS-401.5: Students will Link between languages, automata, and decision problems.	SO5.1 SO5.2 SO5.3 SO5.4		**Unit 5: Turing Machine** 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) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester IV

Course Code: **PC402**

Course Title: **Software Engineering**

Pre-requisite: Basics knowledge of programming

Rationale: Software engineering is important because it helps create high-quality software that meets user needs and is easy to maintain.

Course Outcomes:

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

PC402.l Students should be familiar with various phases of the software development process, including requirements analysis, design, implementation, testing, deployment, and maintenance.

PC402.2 Learn how to design software systems, considering factors such as modularity, scalability, and maintainability. Understand architectural patterns and their applications.

PC402.3 Develop strong programming skills in relevant languages and frameworks. This includes understanding data structures, algorithms, and design patterns.

PC402.4 Understand the challenges and strategies associated with maintaining and evolving software systems over time. Understand the importance of quality assurance in software development.

PC402.5 Acquire basic project management skills, including estimation, planning, and tracking progress.

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)	PC402	Software Engineering	4	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 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	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	PC402	SOFTWARE 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.

PC402.l Students should be familiar with various phases of the software development process, including requirements analysis, design, implementation, testing, deployment, and maintenance.

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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 the requirement of software engineering. **SO1.2** Understanding standard for software process. **SO1.3** Understanding types of software development models. **SO1.4** Critically evaluate various types of software development models. **SO1.**5 Understand 4th generation models. .	LI1.1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems LI1.2. TO design and implement Electronic Cash Counter system through Class Diagram LI1.3. To design and implement ATM System through Use case Diagram	**Unit-1.0 Introduction and Software Process Models** **(13 Lectures)** **1.1** Software, Software Engineering **1.2** Myths, Software Process, Work Products **1.3** Importance of Software Engineering **1.4** Standard for Software Process **1.5** Waterfall Model **1.6** Prototyping Model, Iterative Enhancement Model **1.7** Spiral Model **1.8** RAD model **1.9** 4th Generation models, Formal Methods **1.10** Agile development model.	1. Learning about various SDLC models.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
i. Critically evaluate spiral model.
ii. Explain Agile development model.

b. Mini Project:
Compare various software development models.

c. Other Activities (Specify):
Find out the characteristics of a good software.

PC402.2 Learn how to design software systems, considering factors such as modularity, scalability, and maintainability. Understand architectural patterns and their applications.

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)
SO2.1 To Understand the need for software requirement specifications. **SO2.2** To learn about requirement verification and validation. **SO2.3** To understand the role of management in software development. **SO2.4** To understand project estimation techniques. **SO2.5** To learn about software configuration management.	LI2.1. To design and implement ATM System through Sequence Diagram. LI2.2. To design and implement ATM System through Collaboration diagram. LI2.3. To design and implement ATM System through State	**Unit-2 Requirement Engineering and Software Project Management (12 Lectures)** 2.1 Software Requirements, Types of Requirements 2.2 Requirement Engineering Cycle. 2.3 Requirements Specification document , Characteristics of Requirements 2.4 Requirement verification and validation 2.5 Role of Management in Software Development 2.6 Project Estimation Techniques, Staffing & Scheduling 2.7 Earned Value Analysis	1. Try to Implement project estimation techniques with an example.

	Chart diagram	2.8 Software Risks, Software Configuration Management 2.9 Software Process and Project metrics.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Prepare a format of software requirement specification.
ii. Explain software process and project matrix.

b. Mini Project:

Estimate a project using COCOMO model.

PC402.3 Develop strong programming skills in relevant languages and frameworks. This includes understanding data structures, algorithms, and design patterns.

Approximate Hours

Item	Appx. Hrs
Cl	7
LI	6
SW	2
SL	1
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 Learning about software design concept. **SO3.2** Understand modular approach of designing. **SO3.3** Differentiate between coupling and cohesion. **SO3.4** Understand object-oriented approach of designing. **SO3.**5 Use coding style and documentation.	LI3.1. To design and implement ATM System through Activity Diagram. LI3.2. To design and implement Component diagram for ATM System LI3.3. To design and implement ATM System through	**Unit-3 Software Design and Coding** **(10 Lectures)** 3.1 Process, Data and Behavioural Modelling Essential Tags 3.2 Design Concepts, Modularity 3.3 Architectural design 3.4 Coupling and Cohesion 3.5 Top-down and bottom-up design 3.6 Object-oriented Analysis, Function-oriented and Object-Oriented Design approach 3.7 Software Design Document, Coding styles and documentation	1. Learning various approaches of software design.

	Deployment diagram.		

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Explain top-down and bottom-up approach of designing.
ii. Evaluate types of coupling.

b. Mini Project:

iii. Create an DFD for any restaurant.

c. Other Activities (Specify):

i. Design and Develop UML diagrams for any Software Project.

PC402.4 Understand the challenges and strategies associated with maintaining and evolving software systems over time. Understand the importance of quality assurance in software development.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding different types of testing approach **SO4.2** Learn about different levels of testing. **SO4.3** Creating test cases for any algorithm. **SO4.4** Understanding the need for SQA. **SO4.5** Understand software quality factors.	LI4.1. To design and write the test cases for ATM System LI4.2. Develop test cases for unit testing and integration testing LI4.3. Develop test cases for various white box and black box testing techniques.	**Unit-4: Testing and Software Quality (15 Lectures)** 4.1 Testing principles & testing strategies 4.2 Black-box and White-box Testing Techniques 4.3 Levels of testing -unit, integration, system, regression 4.4 Test Plan, Test Cases Specification 4.5 Software debugging 4.6 Software Maintenance 4.7 Software Quality Assurance (SQA) 4.8 SQA tasks, Software amplification and removal 4.9 Formal Technical Reviews	1. Differentiate between black box and white box testing. 2. Learn about software quality assurance.

		4.10 Software Quality Factors 4.11 ISO 9126, SEI CMM, CMMI 4.12 Software Reliability, Software Availability	

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

a. Assignments:

i. Write down the types of software maintenance.
ii. Explain the working of SQA.

b. Mini Project:

i. Learn to use version control systems (e.g., Git) to manage source code changes collaboratively.

c. Other Activities (Specify):

Develop the ability to create clear and concise documentation for software projects, including technical specifications, user manuals, and system documentation.

PC402.5 Acquire basic project management skills, including estimation, planning, and tracking progress.

Approximate Hours

Item	Appx. Hrs
Cl	7
LI	6
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the scope of CASE tools. **SO5.2** Understand the need of CASE in SDLC. **SO5.3** Learn about web engineering. **SO5.4** Learn about reverse engineering	LI5.1. Develop DFD model (level-0, level-1 DFD and Data dictionary) of a project LI5.2. : Implementation of COCOMO Model for cost estimation LI5.3. Implementation of CPM & PERT	**Unit-5: Computer Aided Software Engineering and Advanced Topics (10 Lectures)** 5.1 Computer Aided Software Engineering (CASE) and its Scope 5.2 CASE support in Software Life Cycle, Architecture of CASE Environment.	1. Learn CASE Tools.

SO5.5 Understanding the challenges of software engineering.		5.3 Upper CASE and Lower CASE, Exposure to CASE Tools 5.4 Software Process Improvement, Component Based Software Engineering 5.5 Web Engineering and Reverse Engineering	
		5.6 Software Engineering challenges of Big Data 5.7 Mobile Applications	

SW-5 Suggested Sessional Work (SW):

a. **Assignments**
i. Find out challenges in software engineering. How would you try to overcome these challenges?
ii. what is CASE TOOL? Which are the top three open-source case tools in the market and their unique features?

b. **Mini Project:**
i. Implement CASE tools in your project.

c. **Other Activities (Specify):**
Explain reverse engineering.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC402.1 Students should be familiar with various phases of the software development process, including requirements analysis, design, implementation, testing, deployment, and maintenance.	10	6	2	1	16
PC402.2 Learn how to design software systems, considering factors such as modularity, scalability, and maintainability. Understand architectural patterns and their applications.	9	6	2	1	15

PC402.3 Develop strong programming skills in relevant languages and frameworks. This includes understanding data structures, algorithms, and design patterns.	7	6	2	1	13
PC402.4 Understand the challenges and strategies associated with maintaining and evolving software systems over time. Understand the importance of quality assurance in software development.	12	6	2	2	19
PC402.5 Acquire basic project management skills, including estimation, planning, and tracking progress.	7	6	2	1	13
Total Hours	45	15	10	6	76

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC402.1	Students should be familiar with various phases of the software development process, including requirements analysis, design, implementation, testing, deployment, and maintenance.	02	01	01	04
PC402.2	Learn how to design software systems, considering factors such as modularity, scalability, and maintainability. Understand architectural patterns and their applications.	02	04	02	08
PC402.3	Develop strong programming skills in relevant languages and frameworks. This includes understanding data structures, algorithms, and design patterns.	03	05	04	12
PC402.4	Understand the challenges and strategies associated with maintaining and evolving software systems over time. Understand the importance of quality assurance in software development.	02	08	05	15
PC402.5	Acquire basic project management skills, including estimation, planning, and tracking progress.	03	05	03	11

Total	12	23	15	50

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

The end of semester assessment for software 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 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:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Software Engineering-A Practitioners Approach	R. Pressman	McGraw Hill International edition	2004
2	Software Engineering	N.S. Gill	Khanna Publishing Co.	Delhi 2018
3	Software Engineering	Ian Sommerville	Addison-Wesley	2010
4	An Integrated Approach to Software Engineering	Pankaj Jalote	Narosa	2014
5	Fundamentals of Software Engineering	By Rajib Mall	PHI Learning Pvt. Ltd	2014

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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PC402

Course Title: Software Engineering

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	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	3	3	3	2	3	1	1	2	1	3	3	2	2	3	2	3
CO2	2	3	2	3	2	2	1	1	2	3	3	3	2	3	2	3	3
CO3	3	2	2	3	2	2	1	2	3	3	3	3	2	2	2	2	3
CO4	3	2	3	2	2	2	1	2	3	3	3	3	2	2	3	2	2
CO5	2	2	3	2	2	2	1	1	2	1	3	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, 5	CO-1: Students should be familiar with various phases of the software development process, including requirements analysis, design, implementation, testing, deployment, and maintenance.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI1.1,LI1.2,LI1.3	Unit-1.0 **Introduction and software process models** 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
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Learn how to design software systems, considering factors such as modularity, scalability, and maintainability. Understand architectural patterns and their applications.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI2.1,LI2.2,LI2.3	Unit-2 **Requirement Engineering and Software Project Management** 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: Develop strong programming skills in relevant languages and frameworks. This includes understanding data structures, algorithms, and design patterns.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI3.1,LI3.2,LI3.3	Unit-3: **Software Design and Coding** 3.1, 3.2,3.3,3.4,3.5,3.6,3.7	
PO1,2,3,4,5,6,7,8, 9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Understand the challenges and strategies associated with maintaining and evolving software systems over time. Understand the importance of quality assurance in software development.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1,LI4.2,LI4.3	Unit-4: **Testing and Software Quality** 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 7,8,9,10,11,12PSO 1,2, 3, 4, 5	CO5: Acquire basic project management skills, including estimation, planning, and tracking progress.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LI5.1,LI5.2,LI5.3	Unit-5: **Computer Aided Software Engineering and Advanced Topics** 5.1,5.2,5.3,5.4,5.5,5.6,5.7	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: PC-403

Course Title: Applied Cryptography

Pre-requisite: Student should have basic knowledge mathematics and theoretical computer science.

Rationale: This course offers an introduction to the mathematical foundation and primary building blocks of the field of cryptography. In today's interconnected world, it is more important than ever to keep our data safe. The student will learn what techniques are used to keep information secure and confidential, as well as its limitations.

Course Outcomes:

PC-403.1: Students will have the knowledge and skills necessary to understand and apply cryptographic techniques, analyze encryption schemes with perfect secrecy.
PC-403.2: Students will gain the knowledge and skills necessary to understand and apply advanced cryptographic principles.
PC-403.3: Students will acquire the knowledge and skills necessary to understand advanced concepts in asymmetric encryption, analyze different encryption schemes
PC-403.4: Students will be well-equipped to design, implement, and evaluate symmetric encryption solutions tailored to specific security requirements.
PC-403.5: Students will possess advanced knowledge and skills in digital signatures, cryptographic protocols, and network security.

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)	PC-403	Applied Cryptography	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 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)		
PC	PC-403	Applied Cryptography	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)		
PC	PC-403	Applied Cryptography	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.

PC-403.1: Students will have the knowledge and skills necessary to understand and apply cryptographic techniques, analyze encryption schemes with perfect secrecy.

Approximate Hours

Item	Appx. Hrs.
CI	7
LI	4
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Demonstrate Knowledge of Cryptographic History **SO1.2** Apply Probability and Algorithmic Techniques **SO1.3** Implement Classical Cryptography Techniques. **SO1.4** Understand Encryption with Perfect Secrecy. **SO1.5** Evaluate Implementation Trade-offs.	**LI.1.1.** Write a program for encryption. **LI.1.2.** Write a program for polyalphabetic substitution cipher.	**Unit-1.0 Introduction to Cryptography** 1.1 History of cryptography, some background in probability and algorithms. 1.2 Classical cryptography (shift cipher, monoalphabetic substitution cipher, polyalphabetic substitution cipher) 1.3 Encryption with perfect secrecy, one-time pad, 1.4 Implementation aspects, 1.5 Shared secret randomness vs perfect secrecy	1. Learning basics cryptography, encryption and secrecy.

SW-1 Suggested Sessional Work (SW):

b. Assignments:

1. Shift cipher
2. Encryption with perfect secrecy.

c. Mini Project:

Cryptography and Encryption.

d. Other Activities (Specify):

NA

PC-403.2: Students will gain the knowledge and skills necessary to understand and apply advanced

cryptographic principles.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Apply Algorithmic and Complexity Theory. **SO2.2** Understand Modern Cryptography Principles. **SO2.3** Construct Public-Key Cryptosystems. **SO2.4** Evaluate Implementation Trade-offs.	**LI.2.1.** Write a program for shift cipher. **LI.2.2.** Write a program for monoalphabetic substitution cipher. **LI.2.3.** Write a program for polyalphabetic substitution cipher. **LI.2.4.** Write a program for encryption with perfect secrecy. **LI.2.5.** Write a program for calculating probability of function.	**Unit-2.0 Modern Cryptography** 2.1 Some background in algorithms and. 2.2 Complexity theory 2.3 Modern cryptography principles. 2.4 One-way functions 2.5 Trapdoor functions. 2.6 Hard-core bits, 2.7 Construction of a public-key cryptosystem based on general cryptographic primitives, 2.8 Implementation aspects. 2.9 Computational efficiency vs hardness	1. Learning complexity theory and cryptography priciples. .

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Classical cryptography Momentum Based (GD).
2. Encryption with perfect secrecy.

b. Mini Project:

Polyalphabetic substitution cipher.

c. Other Activities (Specify):

NA

PC-403.3: Students will acquire the knowledge and skills necessary to understand advanced concepts in asymmetric encryption, analyze different encryption schemes.

Approximate Hours

Item	Appx. Hrs.
CI	10
LI	8
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Comprehend the Fundamentals of Asymmetric, Malleable, and Homomorphic Encryption. **SO3.2** Analyze Various Homomorphic Encryption Schemes, Including Gentry's Fully Homomorphic Encryption **SO3.3** Understand and Implement Identity-Based Encryption (IBE) **SO3.4** Evaluate the Tradeoffs in Security, Performance, Features, and Trust in Encryption Schemes.	**LI.3.1.** Write a Program for Asymmetric encryption. **LI.3.2.** Write a Program for implementing malleable and homomorphic encryption. **LI.3.3.** Write a Program for demonstrating Cramer-Shoup. **LI.3.4.** Write a Program for identity-based encryption.	**Unit-3.0 Asymmetric encryption** 3.1 Introduction to asymmetric encryption. 3.2 Malleable and homomorphic encryption notion and schemes (e.g., Paillier, brief discussion of various schemes, including Gentry's), 3.3 Additional schemes achieving various security notions in various models, 3.4 Cramer-Shoup. 3.5 Identity-based encryption, 3.6 Implementation aspects. 3.7 Security-performance-features-trust tradeoffs.	1. Learning asymmetric encryption

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Malleable and homomorphic encryption notion.

2. Security-performance-features-trust tradeoffs.

b. Mini Project:

Asymmetric encryption

c. Other Activities (Specify):

NA

PC-403.4: Students will be well-equipped to design, implement, and evaluate symmetric encryption solutions tailored to specific security requirements.

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 Comprehend Block Ciphers and Networks. **SO4.2** Understand Modes of Operation. **SO4.3** Identify Cryptanalysis Attacks. **SO4.4** Evaluate Implementation Tradeoffs.	**LI.4.1** Write a program for implementing Symmetric encryption. **LI.4.2** Write a program for implementing differential, meet-in-the-middle attack.	**Unit-4.0 Symmetric encryption** 4.1 Block ciphers (e.g., DES, Triple-DES, AES) 4.2 Substitution/permutation networks. 4.3 Feistel networks. 4.4 Modes of operations (e.g., ECB, CBC, OFB, Counter). 4.5 Cryptanalysis attacks e.g., exhaustive, linear. 4.6 Differential, meet-in-the-middle attack. 4.7 Key lengths. 4.8 Implementations aspects. 4.9 Security-performance-features tradeoffs.	1. Learning block ciphers (e.g., DES, Triple-DES, AES).

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Introduction to Symmetric encryption
2. Introduction to cryptanalysis attacks

b. Mini Project:

c. Substitution/permutation networks.

d. Other Activities (Specify):

NA.

PC-403.5: **Students will possess advanced knowledge and skills in digital signatures, cryptographic protocols, and network security.**

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	4
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understanding Digital Signatures and Signature Schemes. **SO5.2** Exploring Public-Key Infrastructures (PKI) and Certificates. **SO5.3** Cryptography in Network Security Protocols. **SO5.4** Practical Application and Case Study Analysis.	**LI.5.1.** Write a program to Implementing and Analyzing Digital Signatures. **LI.5.2.** Create and Verify a Digital Signature using Hashed RSA	**Unit-5.0 Digital Signatures** 5.1 Digital Signatures, hashing and signing, Hashed RSA. 5.2 El Gamal and DSA signature schemes, public-key infrastructures, 5.3 Certificates, cryptography in TLS, IPSec and virtual private networks. 5.4 NSA Suite B, application case study 3: secure online purchasing. 5.5 Implementation aspects: trust models, PKI implementation challenges.	1. Learning public-key infrastructures, certificates, cryptography in TLS.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Digital Signatures.
2. Cryptography in TLS.

b. Mini Project:

Secure Online Purchasing System

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)
PC-403.1**:** Students will have the knowledge and skills necessary to understand and apply cryptographic techniques, analyze encryption schemes with perfect secrecy.	7	4	2	1	14
PC-403.2**:** Students will gain the knowledge and skills necessary to understand and apply advanced cryptographic principles.	12	10	2	1	25
PC-403.3: Students will acquire the knowledge and skills necessary to understand advanced concepts in asymmetric encryption, analyze different encryption schemes.	10	8	2	1	21
PC-403.4: Students will be well-equipped to design, implement, and evaluate symmetric encryption solutions tailored to specific	10	4	2	1	17

security requirements.					
PC-403.5: Students will possess advanced knowledge and skills in digital signatures, cryptographic protocols, and network security.	6	4	2	1	13
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	
PC-403.1	Students will be well-equipped with a foundational understanding of cryptography, both from a theoretical and practical perspective, enabling them to tackle complex security challenges.	2	05	01	08
PC-403.2	Students will gain a comprehensive understanding of modern cryptographic techniques and their practical applications.	1	03	05	9
PC-403.3	Students will gain a deep understanding of advanced asymmetric encryption techniques.	1	03	07	11
PC-403.4	Students will gain a deep understanding of symmetric encryption techniques, their design, and their practical applications, equipping them to develop, analyze, and implement secure encryption systems.	1	3	7	11
PC-403.5	Students will gain a deep understanding of digital signatures, public-key infrastructures, and their applications in securing online communications and transactions.	1	05	05	11
Total		6	19	25	50

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

The end of semester assessment for Deep Learning will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Applied Cryptography	B. Schneier	J. Wiley and Sons.	2nd edition, 2020
2	Cryptography and Network Security: Principles and Practice	W. Stallings	Prentice Hall	3rd Edition, 2022

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : PC-403
Course Title: Applied Cryptography

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 well-equipped with a foundational understanding of cryptography, both from a theoretical and practical perspective, enabling them to tackle complex security challenges.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Students will gain a comprehensive understanding of modern cryptographic techniques and their practical applications.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Students will gain a deep understanding of advanced asymmetric encryption techniques**.**	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Students will gain a deep understanding of symmetric encryption techniques, their design, and their practical applications, equipping them to develop, analyze, and implement secure encryption systems.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Students will gain a deep understanding of digital signatures, public-key infrastructures, and their applications in securing online communications and transactions**.**	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High-314

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 well-equipped with a foundational understanding of cryptography, both from a theoretical and practical perspective, enabling them to tackle complex security challenges.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1, LI1.2	Unit-1 Introduction to Deep Learning 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: : Students will gain a comprehensive understanding of modern cryptographic techniques and their practical applications.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1, LI2.2, LI2.3, LI.2.4, LI.2.5	Unit-2 Activation functions and parameters 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: Students will gain a deep understanding of advanced asymmetric encryption techniques.	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1, LI3.2, LI3.3, LI.3.4	Unit-3 Auto-encoders & Regularization 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: Students will gain a deep understanding of symmetric encryption techniques, their design, and their practical applications, equipping them to develop, analyze, and implement secure encryption systems.	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1, LI.4.2	Unit-4 Deep Learning Models 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 gain a deep understanding of digital signatures, public-key infrastructures, and their applications in securing online communications and transactions.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1, LI5.2	Unit-5 Deep Learning Applications 5.1,5.2,5.3,5.4,5.5,5.6	

Semester-IV

Course Code: PC404

Course Title: Operating System

Pre-requisite: Student should have basic knowledge of Computer fundamentals and programming.

Rationale: Operating System manages the computer's memory and processes, as well as all of its software and hardware. It also allows you to communicate with the computer without knowing how to speak the computer's language.

Course Outcome:

PC404.1. Understand the basics of an operating systems and its major components
PC404.2. Create and/or modify concurrent programs
PC404.3. Understand Memory Management and Data Management
PC404.4. Apply security as well as recovery features in the design of algorithm
PC404.5. Understand and implement shell programming

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)	
PC	PC404	Operating System	3	2	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 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 (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)
PC	PC404	Operating System	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)		
PC	PC404	Operating System	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.

PC404.1. Understand the basics of an operating systems and its major components.

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 Computer and Operating system **SO1.2** Learn about the Batch system, multiprogramming, multiprocessing operating system **SO1.3** Understand Multi user, time sharing, personal system **SO1.4** Learn about Parallel system, real time system, simple monitors. **SO1.5** Understand system architecture and its components **SO1.6** Understand Operating system services, system calls, system programs, system structure **SO1.7** Understand the approaches to OS design and implementation: Microkernel, Layered, Kernel Approach	LI1.1. Write a program (using fork() and/or exec() commands) where parent and Child executes a) same program, same code. b) same program, different code. c) before terminating, the parent waits for the child to finish its task. LI1.2. 2. Write a program to report the behavior of the Linux kernel including kernel Version, CPU type, and model. (CPU information) LI1.3. 3. Write a program to print file details including owner access permissions, File access time, where the file name is given as an argument.	**Module 1: Concepts of Operating System** 1.1 Computer system overview, concept of an operating system 1.2 Batch system, multiprogramming, multiprocessing 1.3 Multi user, time sharing, personal system 1.4 Parallel system, real time system, simple monitors 1.5 general system architecture, System components 1.6 Operating system services, system calls,system programs, system structure 1.7 Approaches to OS design and 1.8 implementation: Microkernel,	1. Study about different types of Operating Systems.

		Layered, 1.9 Kernel Approach	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Batch system, Multiprogramming, Multiprocessing, Multi user, Time sharing operating system.

ii. Describe System architecture and its components.

PC404.2. Create and/or modify concurrent programs

Item	Appx. Hrs
Cl	9
LI	6
SW	2
SL	1
Total	19

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Learn about the concept of process, process states, process state transitions **SO2.2** Understand the Process control block, operations on processes **SO2.3** Learn about Threads, concurrent processes, mutual exclusion and synchronization **SO2.4** Understand the principles of deadlocks, integrated deadlocks strategy **SO2.5** Learn about Scheduling levels, scheduling criteria	LI2.1. Write a program to report the behavior of the Linux kernel including information on configured memory, amount of free and used memory. (memory information) LI2.2. Write	**Module 2: Processes and Threads** 2.1 Concept of process, process states, process state transitions 2.2 Process control block, operations on processes 2.3 Threads, concurrent processes, mutual exclusion and synchronization 2.4 Principles of deadlocks, integrated deadlocks strategy 2.5 Scheduling levels,	Study about processes and threads

SO2.6 Learn about inter process synchronization, Inter process communication Socket Programming **SO2.7** Learn about Linux, IPC Mechanism, Remote procedure calls **SO2.8** Learn about RPC exception handling, security issues	a program to copy files using system calls. LI2.3. Write a program to implement the FCFS scheduling algorithm.	scheduling criteria 2.6 Inter process synchronization, Inter process communication 2.7 Linux, IPC Mechanism, Remote procedure calls 2.8 RPC exception handling, 2.9 security issues	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Draw and describe Process Control Block
ii Explain concurrent process.

PC404.3. Understand Memory Management and Data Management

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 Learn about Logical and physical address space **SO3.2** Understand Storage allocation and management techniques **SO3.3** Learn about Swapping concepts of multi programming, paging **SO3.4** Learn about Segmentation, virtual storage management	LI3.1. Write a program to implement the Round Robin scheduling algorithm. LI3.2. 8 Write a program to implement	**Module-3.0 Memory Management and Data Management** 3.1. Logical and physical address space 3.2. Storage allocation and management techniques 3.3. Swapping concepts of multi programming,	Study about memory allocation.

strategies **SO3.5** Learn about Demand paging, page replacement algorithm **SO3.6** Learn about Thrashing, File organization, record blocking, access method **SO3.7** Learn about Directory structure, protection file system structure, allocation methods	the SJF scheduling algorithm. LI3.3. 9 Write a program to implement a non-preemptive priority-based scheduling Algorithm.	paging 3.4. Segmentation, virtual storage management strategies 3.5. Demand paging, page replacement algorithm 3.6. Thrashing, File organization, record blocking, access method 3.7. Directory structure, protection file system structure, allocation methods 3.8. Free space management, directory implementation, disk structure, disk scheduling 3.9. Disk management, buffering, swap space management, RAID levels	
SO3.8 Learn about Free space management, directory implementation, disk structure, disk scheduling **SO3.9** Learn about Disk management, buffering, swap space management, RAID levels			

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Describe Page replacement algorithm.

ii. Differentiate between Logical and Physical address space.

PC404.4. Apply security as well as recovery features in the design of algorithm

Item	Appx. Hrs
Cl	9

LI	6
SW	2
SL	2
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Learn about types of Threats in OS **SO4.2** Learn about Basic OS Security Mechanisms **SO4.3** Understanding the Threats: Malware Taxonomy: Viruses, Worms, Rootkits **SO4.4** Learn about Defense: An Overview, Logging, Auditing, and Recovery **SO4.5** learn about OS-level Memory Protection	LI4.1. Write a program to implement a pre-emptive priority-based Scheduling Algorithm. LI4.2. 11 Write a program to calculate the sum of n numbers using the thread library. LI4.3. 12 Write a program to implement first-fit, best-fit, and worst-fit allocation strategies	**Module-4.0 OS Security** 4.1 Types of Threats in OS 4.2 Basic OS Security Mechanisms 4.3 Understanding the Threats: Malware Taxonomy: 4.4 Viruses, Worms, 4.5 Rootkits 4.6 Defense: An Overview, Logging, 4.7 Auditing, and Recovery 4.8 OS-level 4.9 Memory Protection	1. Study about latest malwares

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Write short note on OS-level Memory Protection.

ii. Differentiate between Viruses, Worms, Rootkits.

PC404.5. Understand and implement shell programming

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

SW-5 Suggested Sessional Work (SW):

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
O5.1 Introduction to the Linux/Unix OS design and architecture **SO5.2** Understand Unix shell, Unix operating system services, user perspective **SO5.3** Learn about Representation of files in Unix system processes and their structure, input-outputsystem **SO5.4** Understand Memory management in Unix **SO5.5** Understand Processes: fork, wait, exec, exit, kill, getpid, brk, nice, sleep,trace **SO5.6** Understand Files: open, close, read, write, lseek, stat, sync **SO5.7** Understand Directories: mkdir, rmdir, link, unlink, mount,umount users + **SO5.8** Understand Security: chown, chmod, getuid, setuid **SO5.9** Understand Inter process communication: signals, pipe, Networking: socket, accept, snd, recv,	LI5.1. To study of Basic UNIX Commands and various UNIX editors such as vi, ed, ex and EMACS LI5.2. To write C Programs using the following system calls of UNIX operating system fork, exec,getpid, exit, wait, close, stat, opendir, readdir. LI5.3. To write C programs to simulate UNIX commands like cp, ls,	**Module -5.0 Case Studies and OS Abstractions** 5.1 Linux/Unix OS design and architecture 5.2 Unix shell, Unix operating system services, user perspective 5.3 Representation of files in Unix system processes and their structure, input-output system 5.4 Memory management in Unix 5.5 Processes: fork, wait, exec, exit, kill, getpid, brk, nice, sleep,trace 5.6 Files: open, close, read, write, lseek, stat, sync 5.7 Directories: mkdir, rmdir, link, unlink, mount,umount users + 5.8 Security: chown, chmod, getuid, setuid 5.9 Inter process communication: signals, pipe,	Study about Linux/Unix OS design and architecture

connect	grep	Networking: socket, accept, snd, recv, connect	

a. Assignments:

i. Describe Linux/Unix OS design and architecture.

ii. Elaborate Memory management in Unix.

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)
PC404.1. Understand the basics of an operating systems and its major components	9	6	2	2	12
PC404.2. Create and/or modify concurrent programs	9	6	2	2	12
PC404.3. Understand Memory Management and Data Management	9	6	2	2	12
PC404.4. Apply security as well as recovery features in the design of algorithm	9	6	2	2	12
PC404.5. Understand and implement shell programming	9	6	2	2	12
Total Hours	45	30	10	10	60

Suggestion for End Semester Assessment-

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC404.1	Understand the basics of an operating systems and its major components	03	04	03	10

PC404.2	Create and/or modify concurrent programs	05	03	02	10
PC404.3	Understand Memory Management and	05	03	02	10
	Data Management				
PC404.4	Apply security as well as recovery features in the design of algorithm	04	05	01	10
PC404.5	Understand and implement shell programming	03	05	2	10
Total		20	17	13	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 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	Operating system	Galvin & Silberschatz	John Willey	7th Edition, 2004
2	Operating Systems-A Concept Based Approach	Dhamdhare	TMH	2006
3	Operating systems Internals and design principles	William Stallings	Pearson Education	2012
4	Operating Systems –A Design Oriented Approach	Crowley	TMH	2001
5	Operating systems Design and Implementation	Andrew S. Tanenbaum	Pearson Education	2009

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: PC404
Course Title: Operating System

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 basics of an operating systems and its major components	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Create and/or modify concurrent programs	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Understand Memory Management and Data Management	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Apply security as well as recovery features in the design of algorithm	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Understand and implement shell programming	-	-	-	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 basics of an operating systems and its major components	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7		Module-1 Concepts of Operating System 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 :** Create and/or modify concurrent programs	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6 SO2.7 SO2.8		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,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 3:** Understand Memory Management and Data Management	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7 SO3.8 SO3.9		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,	

PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 4:** Apply security as well as recovery features in the design of algorithm	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Dictionaries and Dictionary Accumulation, Functions/Methods: 4.1,4.2,4.3,4.4,4.5	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 5:** Understand and implement shell programming	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7 SO5.8 SO5.9		Unit-5 File Handling and Memory Management: 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) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: HS401

Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Pre- requisite: Student should have basic knowledge of PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Rationale: This course will help students both in their personal and desired professional life. The other purposes of personality development through life enlightenment skills.

Course Outcomes:

HS401.1: A student will be able to describe the Introduction to Holistic development of personality
HS401.2: A student will be able to discuss the introduction Approach to day-to-day work and duties
HS401.3: A student will be able to interpret Statements of basic knowledge.

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)	HS401	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	2	0	1	1	30	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 ofStudy	CouseCode	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment(ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment5 number 3 marks each	Class Test2 (2 best out of 3) 10 markseach (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PC	HS401	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	10	10	10	10	10	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.

HS401**. 1: A student will be able to describe the Introduction to Holistic development of personality**

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 Student will able to Understand the wisdom **SO1.2** Student will able to Describe the The concept of pride & heroism **SO1.3** Student will able to Describe virtue	.	**Unit-1.0** Introduction to **Holistic Development of personality** 1.1 Introduction to Verses-19,20,21,22 (wisdom) 1.2 Introduction to Verses-19,20,21,22 (wisdom) 1.3 Introduction to Verses-19,20,21,22 (wisdom) 1.4 Introduction to Verses-29,31,32 (pride & heroism) 1.5 Introduction to Verses-29,31,32 (pride & heroism) 1.6 Introduction to Verses-29,31,32 (pride & heroism) 1.7 Introduction to Verses-26,28,63,65 (virtue) 1.8 Introduction to Verses-26,28,63,65 (virtue) 1.9 Introduction to Verses-	Introduction to **Holistic Development of personality** • 2- The concept of wisdom

		26,28,63,65 (virtue) 1.10 Introduction to Verses- 52,53,59 1.11 Introduction to Verses- 52,53,59 1.12 Introduction to Verses- 52,53,59 1.13 Introduction to Verses- 71,73,75,78 1.14 Introduction to Verses- 71,73,75,78 1.15 Introduction to Verses- 71,73,75,78	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
i. Concept of Holistic Development of personality
b. Mini Project:
i. Flow diagram of Twenty-five entities of personality development

Other Activities (Specify): reed the all concepts of personality development

HS401.2: A student will be able to discuss the introduction Approach to day-to-day work and duties.

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)**
SO2.1 Student will able to Understand the introduction Approach to day-to-day work and duties **SO2.2** Student will able to	.	Unit-2 introduction Approach to day-to-day work and duties 2.1 Introduction of Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48 2.2 Introduction of	1- introduction Approach to day-to-day work and duties 2- karma yoga

Understand the Concept of karma yoga **SO2.3** Student will able to understand the Values and ethics in gita **SO2.4** Student will able to understand the Self control **SO2.**5 Student will able to lean about the result of works		Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48 2.3 Introduction of Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48 2.4 Introduction of Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48 2.5 introduction of Chapter 3-Verses 13, 21, 27, 35, 2.6 introduction of Chapter 3-Verses 13, 21, 27, 35, 2.7 introduction of Chapter 3-Verses 13, 21, 27, 35, 2.8 introduction of Chapter 3-Verses 13, 21, 27, 35, 2.9 introduction of Verses 5,13,17, 23, 35 2.10 introduction of Verses 5,13,17, 23, 35 2.11 introduction of Verses 5,13,17, 23, 35 2.12 introduction of Verses 5,13,17, 23, 35 2.13 introduction of Chapter 18-Verses 45, 46, 48. 2.14 introduction of Chapter 18-Verses 45, 46, 48. 2.15 introduction of Chapter 18-Verses 45, 46, 48.	

SW-2 Suggested Sessional Work (SW):

Assignments: The Concept Approach to day-to-day work and duties
Karma yoga

HS401.3: A student will be able to interpret Statements of basic knowledge

Approximate Hours

A K S University

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(Revised as on 01 August 2023)

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)**
SO3.1 Student will able to understand the **Statements of basic knowledge** **SO3.2** A student will be able to explain the control mind persons sthitapragya **SO3.3 A Student will be able to Understand the** Concept of Bhakti yoga **SO3.4 A student will be able to explain the** Personality of Role model **So3.4 A student will be able to explain the gyan yog** SO4.5 A student will be able to explain the result of gyan yoga	.	**Unit-3 : introduction of Statements of basic knowledge** **3.**1 Introduction Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 **3.**2 Introduction Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 **3.**3 Introduction Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 **3.**4 Introduction Chapter 12 - Verses 13, 14, 15, 16,17, 18 3.5 Introduction Chapter 12 -Verses 13, 14, 15, 16,17, 18 3.6 Introduction Chapter 12 -Verses 13, 14, 15, 16,17, 18 3.7 • Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, 3.8 • Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-	1- Concept of Bhakti yoga 2- Sthitapra gya

		Verses 36,37,42, 3.9 • Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, 3.10 Chapter 4-Verses 18, 38,39 3.11 Chapter 4-Verses 18, 38,39 3.12 Chapter 4-Verses 18, 38,39 3.13 Chapter18 – Verses 37,38,63 3.14 Chapter18 – Verses 37,38,63 3.15 Chapter18 – Verses 37,38,63	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

iii. Introduction to Sthiti pragya
iv. Concept of Bhakti Yog

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
HS401.1: A student will be able to describe the Introduction to Holistic development of personality .	10	1	1	**12**
HS401**.2:** A student will be able to discuss the introduction Approach to day-to-day work and duties	10	1	1	**12**
HS401.3: A student will be able to interpret Statements of basic knowledge	10	1	1	12
Total Hours	30	03	03	**36**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Neetisatakam-Holistic development of personality	17	16	00	33
CO-2	Approach to day-to-day work and duties.	17	16	00	33
CO-3	Statements of basic knowledge.	17	17	00	34
Total		51	49	00	100

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

The end of semester assessment for PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS 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 cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources) Brainstorming

Curriculum Development Team

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Cos,POs and PSOs Mapping

Course Title: BTech (CSE) Cyber Security

Course Code: HS401

Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Outcomes	Program Outcome											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
	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 : A student will be able to describe the Introduction to Holistic development of personality	1	2	2	2	1	2	2	3	2	3	1	3
CO 2 : A student will be able to discuss the introduction Approach to day to day work and duties	1	1	2	2	2	2	2	3	2	3	1	3
CO3 : 101.3: A student will be able to interpret Statements of basic knowledge	1	1	1	1	1	1	1	3	2	1	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 7,8,9,10,11,12,13,14,15	CO-1: **A student will be able to describe the Introduction to Holistic development of personality**	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.0 Neetisatakam-Holistic development of personality 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 mentionedin page number
PO 1,2,3,4,5,6 7,8,9,10,11,12,13,14,15	CO 2 : **A student will be able to discuss the introduction Approach to day to day work and duties**	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Approach to day to day work and duties. 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 7,8,9,10,11,12,13,`14,15,	CO3 : **: A student will be able to interpret Statements of basic knowledge.**	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 : Statements of basic knowledge. 3.1, 3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12,3.13,3.14,3.15	

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A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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

(Revised as on 01 August 2023)

IV-SEMESTERS

Course Code: EEC401

Course Title: 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: -

EEC401.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
EEC401.2: - The student will be able to implement the project plan and manage the project.
EEC401.3: - 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)	
Program Core (PCC)	EEC401	Minor Project	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: -

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 (l i f e l o n g learning)
- Skill to manage the real- l i f e 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-l i f e 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- l i f e 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 *(Cyber Security)*
Course Code: EEC401
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-IV

Course Code: AU202

Course Title: Environmental Science

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:

AU202.1: To understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era.
AU202**.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.
AU202**.3:** To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.
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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)	AU202	Environmental Science	2	0	1	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.
ote: 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)
PCC	AU 202	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.

AU202**.1:** 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	15
LI	0
SW	2
SL	1
Total	18

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 1.3 Importance of Environmental studies 1.4 Components of Environment: 1.5 Atmosphere, 1.6 Hydrosphere, 1.7 Lithosphere, and 1.8 Biosphere. 1.9 Brief account of Natural Resources and 1.10 associated problems 1.11 Land Resource 1.12 Water Resource 1.13 Energy Resource 1.14 Concept of Sustainability and 1.15 Sustainable Development	i. What is environmental Science? ii. What are resources?

SW-1 Suggested Sessional Work (SW):

iv. **Assignments:**

1. Write the definition and causes of soil erosion.
2. Define desertification and write its causes.
3. Describe structure of atmosphere.
4. Explain lithosphere.

AU202**.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.

Approximate Hours

Item	Appx. Hrs
Cl	15
LI	0
SW	2
SL	1
Total	18

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 Introduction 2.2 Major Biomes: Tropical, 2.3 Temperate, 2.4 Forest, 2.5 Grassland, 2.6 Desert, 2.7 Tundra, 2.8 Wetland, 2.9 Estuarine and 2.10 Marine 2.11 Ecosystem: Structure 2.12 Ecosystem: Function and 2.13 Ecosystem: types 2.14 their Preservation & Restoration 2.15 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.

AU202**.3:** To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.

Approximate Hours

Item	Appx. Hrs
Cl	15
LI	0
SW	2
SL	1
Total	18

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 Introduction 3.2 Pollution: Types, 3.3 Control measures, 3.4 Management and 3.5 associated problems. 3.6 Environmental Law and Legislation: 3.7 Protection and conservation Acts. 3.8 International Agreement & Program 3.9 Environmental Movements, 3.10 communication and 3.11 public awareness Program. 3.12 National and 3.13 International organizations related to environment conservation and monitoring. 3.14 Role of information technology in environment and 3.15 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)
AU202.**1:** To understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era.	15	2	1	18
AU202.**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.	15	2	1	18
AU202.**3:** To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	15	2	1	18
Total Hours	45	6	6	54

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	01	01	05
CO-2	**Biomes, Ecosystem and Biodiversity**	02	06	02	10
CO-3	**Environmental Pollution, Management and** Social **Issues**	03	07	05	15
Total		8	14	8	30

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

The end of semester assessment for Environmental Education 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

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering

COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : AU202
Course Title: Environmental Education

Course Outcomes	Program Outcomes											Program Specific Outcome				
	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
	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 understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era	1	2	2	3	2	3	2	2	1	3	3	2	3	3	1	2
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	1	2	2	1	2	3	2	1	1	2	3	2	2	2	1	3
CO 3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	2	1	1	1	2	3	2	1	2	1	3	1	1	2	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	AU202**.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		**Unit-1 Environment and Natural Resources:** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15	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	AU202**.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		**Unit-2 Biomes, Ecosystem and Biodiversity** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13,2.14,2.15	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	AU202**.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		**Unit-3: Environmental Pollution, Management and Social Issues**: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12,3.13,3.14,3.15	

SEMESTER V

Course Code: **PC501**

Course Title: **Data and Visual Analytics in AI**

Pre- requisite: Student should have knowledge of analyzing and visualizing big data to provide organizations with insights for data-driven decision making. Python programming and data visualization are required

Rationale: Visualization is central to advanced analytics for similar reasons. When a data scientist is writing advanced predictive analytics or machine learning (ML) algorithms, it becomes important to visualize the outputs to monitor results and ensure that models are performing as intended. This is because visualizations of complex algorithms are generally easier to interpret than numerical outputs.

Course Outcomes:

PC501.1: Understand the basics of graphics and data visualization.
PC501.2: Understand graphics pipeline and graphical perception.
PC501.3: Understand graphical designing.
PC501.4: Design and implement multidimensional data.
PC501.5: Design collaborative visual analytics.

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 (PC)	PC501	Data and Visual Analytics in AI	3	2	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 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	tal 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)
P C	**PC501**	**Data and Visual Analytics in AI**	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)		
P C	**PC 501**	**Data and Visual Analytics in AI**	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.

PC501.1: Understand the basics of graphics and data visualization.

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 about data for graphics **SO1.2** Understand about Design principles **SO1.3** Understand about Value for visualization **SO1.4** Understand about Categorical, time series **SO1.5** Understand about statistical data graphics **SO1.6** Use of Visualization Tools	LI1.1 Loading different types of datasets using Python. LI1.2 Write a program to create a data frame from dictionary. LI1.3 Write a script to handle missing values using the suitable methods.	**Unit 1.0 Introduction (9 Lectures)** 1.1 Data for Graphics. 1.2 Design principles 1.3 Value for visualization 1.4 Categorical 1.5 Time series 1.6 statistical data graphics I 1.7 statistical data graphics II 1.8 Introduction to Visualization Tools I 1.9 Introduction to Visualization Tools II	1. Learn about design principles and visualization tools

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Discuss about designing principles for data analytics.

ii. Explain categorical Data with examples.

iii. Discuss about various data visualization tools.

PC501.2 Understand graphics pipeline and graphical perception

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)
SO2.1 Understand Graphics pipeline. **SO2.2** Able to understand Primitives: vertices, edges, triangles **SO2.3** Able to understand Model transforms: translations **SO2.4** Understand about rotations, scaling, View transform **SO2.5** Use of Perspective transform, window transform	LI2.1 Create a Python script for visualizing the given data. LI2.2 Write a script to filter the data. LI2.3 Write a Python module to implement Linear Regression model.	**Unit 2.0 Graphics Pipeline and Aesthetics and Perception (10 Lectures)** 2.1 Primitives: vertices edges and triangles 2.2 Model transforms 2.3 Translations 2.4 Rotations 2.5 scaling 2.6 View transform, Perspective transform, window transform 2.7 Graphical Perception Theory 2.8 Experimentation, and the Application 2.9 Graphical Integrity, Layering and Separation 2.10 Color and Information, Using Space	SL1. Learn about Model transforms: translations, rotations and scaling.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Perspective transform and window transform.

b. Mini Project:

i. Suppose we want to design a database related to your university to help the different departments in the faculty to follow the transactions and processes of textbooks distributed to the students. Complete an information level design for a database that must satisfy the following constraints and requirements:

- Each student can be enrolled in many courses.
- A given course is proposed by one department, but one department can propose many courses.
- Any course is given by one lecturer.
- Each lecturer belongs to one department.
- At the beginning of the semester, each department sends to the "book unit" a document containing the list of requested books.
- Any student receives one book for each course in which he is enrolled.

Based on the previous requirements, do the following:

A. Define the Layering and Separation.

B. Explain the Color and Information.

C. Write Python script for implementing Model transforms.

c. Other Activities (Specify):

Write Python Script for Layering and Separation.

PC501.3. Understand graphical designing.

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 Understand about Visual Display of Quantitative Information **SO3.2** Understand Basic Data-Ink Maximization. **SO3.3** Use Graphical Design **SO3.4** Use of Exploratory Data Analysis **SO3.5** Implementation Heat Map	LI 3.1 Write Python script implementing Machine Learning with Scikit Learn LI3.2 Write a script to implement of	**Unit-3.0 Visualization Design (9 Lectures)** 1.1 Visual Display of Quantitative Information I 1.2 Visual Display of Quantitative Information II	1. Write Python script for generating heat map.

	Logistic regression. LI3.3 Write a program to implement Decision tree for classification.	1.3 Data-Ink Maximization I 1.4 Data-Ink Maximization II 1.5 Graphical Design I 1.6 Graphical Design II 1.7 Exploratory Data Analysis. 1.8 Heat Map I 1.9 Heat Map II	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. What is Data-Ink Maximization.

ii. Explain Visual Display of Quantitative Information.

b. Mini Project:

i. Explain Exploratory Data Analysis.

c. Other Activities (Specify):

Explain Graphical Design.

PC501.4 Design and implement multidimensional data.

Approximate Hours

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

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand about Query, Analysis and Visualization of Multi-Dimensional Relational Databases SO4.2 Understand Interactive Exploration, tSNE SO4.3 Understand about Interactive Dynamics for Visual Analysis, Visual Queries SO4.4 Understand about Finding Patterns in Time Series	LI4.1. Write Python script to Create Visualization of Multi-Dimensional Relational Databases. LI4.2 Write a Python module to implement of	**Unit-4.0 Multidimensional Data and Interaction (9 Lectures)** 4.1 Query, Analysis and Visualization of Multi-Dimensional Relational Databases. 4.2 Interactive Exploration, tSNE I 4.3 Interactive Exploration, tSNE II	1. Study about Interactive Dynamics for Visual Analysis 2. Explain About Trend visualization, Animation, Dashboard

Data SO4.5 Apply Trend visualization, Animation, Dashboard, Visual Storytelling	Naive Bayes classifier algorithm. LI4.3 Write a Python script to implement PCA for dimensionality reduction.	4.4 Interactive Dynamics for Visual Analysis I 4.5 Interactive Dynamics for Visual Analysis II 4.6 Visual Queries, Finding Patterns in Time Series Data I 4.7 Visual Queries, Finding Patterns in Time Series Data II 4.8 Trend visualization, Animation, Dashboard, Visual Storytelling I 4.9 Trend visualization, Animation, Dashboard, Visual Storytelling II	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Explain about Visual Queries.

b. Mini Project:

i. Write Python script for Finding Patterns in Time Series Data.

c. Other Activities (Specify):

Explain the Animation, Dashboard, Visual Storytelling.

PC501.5: Design collaborative visual analytics.

Approximate Hours

Item	Appx. Hrs
Cl	8
LI	6
SW	1
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand about Graph Visualization and Navigation **SO5.2** Understand about Online Social Networks **SO5.3** Learn about Social Data Analysis **SO5.4** Understand about Collaborative Visual Analytics **SO5.**4 Understand about Text, Map, Geospatial data	LI5.1 Write a Python script to implement Implementing K-means Clustering. LI5.2 Write a Python script to implement Implementing Hierarchical Clustering. LI5.3 Write a Python script to implement Random Forest.	**Unit 5.0 Collaboration (8 Lectures)** 5.1 Graph Visualization and Navigation. I 5.2 Graph Visualization and Navigation. II 5.3 Online Social Networks 5.4 Social Data Analysis. I 5.5 Social Data Analysis. II 5.6 Collaborative Visual Analytics 5.7 Text, Map, Geospatial data. I 5.8 Text, Map, Geospatial data. II	1. Write Python script to implement Map using Geospatial data

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. What is Graph Visualization and Navigation?

ii. Explain about Social Data Analysis.

b. Mini Project:

i. A survey of Online Social Networks.

c. Other Activities (Specify):

The Impact of Collaborative Visual Analytics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
PC501.1. Introduction	9	2	1	12
PC501.2. Graphics Pipeline and Aesthetics and Perception	10	2	1	13
PC501.3. Visualization Design	9	2	1	12

PC501.4. Multidimensional Data and Interaction.	9	1	2	12
PC501.5. Collaboration	8	1	1	10
Total Hours	45	8	6	59

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC501.1	Introduction	03	04	03	10
PC501.2	Graphics Pipeline and Aesthetics and Perception	05	03	02	10
PC501.3	Visualization Design	05	03	02	10
PC501.4	Multidimensional Data and Interaction	04	05	01	10
PC501.5	Collaboration	03	05	2	10
Total		20	17	13	50

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

The end of semester assessment for Data and Visual Analytics in **AI** 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:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	The Visual Display of Quantitative Information	E. Tufte	Graphics Press	2nd Edition, 2001
2	Beginner's Guide for Data Analysis using R Programming	Jeeva Jose	Khanna Publishing	2019
3	Data Visualization Handbook	J. Koponen, J. Hildén	CRC Press	2019
4	The Book of Trees: Visualizing Branches of Knowledge	M. Lima	Princeton Architectural Press	2014
5	Handbook of Graph Drawing and Visualization	R. Tamassia	CRC Press	2013
6	Interactive Data Visualization for the Web	S. Murray	O'Reilly	2nd Edition, 2017

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PC501

Course Title: Data and Visual Analytics in AI

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	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	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	2	3	3	3	2	1	2	1	1	1	3	2	3	2	2	3
CO4	3	2	3	2	3	2	1	3	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

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: Understand the basics of graphics and data visualization.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	LI1.1, LI1.2, LI1.3	Unit-1.0 **Introduction** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	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: Understand graphics pipeline and graphical perception.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI2.1, LI2.2, LI2.3	Unit-2 **Graphics Pipeline and Aesthetics and Perception** 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	CO3: Understand graphical designing.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI3.1, LI3.2, LI3.3	Unit-3: **Visualization Design**. 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	CO4: Design and implement multidimensional data.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1, LI4.2, LI4.3	Unit-4: **Multidimensional Data and Interaction** 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	CO 5: Design collaborative visual analytics.	SO5.1 SO5.2 SO5.3 SO5.4	LI5.1, LI5.2, LI5.3	Unit5: **Collaboration.** 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. (Cyber Security] Program

SEMESTER V

Course Code: **PC502**

Course Title: **Identity and Access Management**

Pre- requisite: To study this Course, a student must have basic understanding of cybersecurity.

Rationale: Helps businesses to maintain optimal data security by ensuring the appropriate users get access to only the information essential to their role.

Course Outcomes:

PC502.1 Students will be well-equipped to manage and enhance identity and access management systems within any enterprise, ensuring robust security and efficient operations.

PC502.2 Comprehensive skills in navigating user interfaces, using CLI, managing access controls, and effectively utilizing LDAP for enterprise identity and access management.

PC502.3 Students will be equipped with the knowledge and skills necessary to effectively implement, manage, and secure Single Sign-On solutions.

PC502.4 Students will gain comprehensive knowledge and practical skills in implementing and managing federated identity solutions.

PC502.5 Students will acquire the knowledge and skills necessary to implement MFA solutions, manage identity lifecycles effectively.

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 (PC)	PC502	**Identity and Access Management**	3	0	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	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 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	**PC502**	Identity and Access Management	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.

PC502.1 : Students will be well-equipped to manage and enhance identity and access management systems within any enterprise, ensuring robust security and efficient operations.

Approximate Hours

Item	Appx. Hrs
Cl	08
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Understand IAM Fundamentals **SO1.2** Identify Organizational Identities **SO1.3** Review IAM Concepts **SO1.4** Implement RBAM Strategies **SO1.**5 Develop IAM Models		**Unit-1 Introduction to IAM** 1.1 Introduction to IAM. 1.2 Enterprise or Organizational Identities. 1.3 Electronics and non-electronics Identities. 1.4 Review of Identity and Access Management. 1.5 Theory & Practice. 1.6 Role Based Access Management. 1.7 Modeling Enterprise Identity. 1.8 Access Management Systems	**1.** Explain the Enterprise or Organizational Identities. 2. Explain Access Managem ent Systems

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain Role Based Access Management.
ii. Electronics and non-electronics Identities.

b. Other Activities (Specify): Seminar

PC502.2: Analyze and discuss the effects of electronic communication on our language

.

Approximate Hours

Item	Appx. Hrs
Cl	06
LI	0
SW	2
SL	2
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Master User Interface Navigation **SO2.2** To learn Command Line Proficiency **SO2.3** To lean Design Access Control Strategies		**Unit2: User interface and Directories (6 Lectures)** 1.1 Navigating the user interface.	1. Explain Using the command line interface (CLI). 2. Explain Ldap Concepts & Architecture.

SO2.4 Understand LDAP Fundamentals **SO2.5** Analyze LDAP Architecture		2.2 Using the command line interface (CLI). 2.3 Access management. 2.4 Introduction To Ldap. 2.5 Ldap Concepts & Architecture. 2.6 Ldap Replication.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Navigating the user interface.

ii. Access management, Introduction to Ldap.**PC503.3: Students will be equipped with the knowledge and skills necessary to effectively implement, manage, and secure Single Sign-On solutions.**

Approximate Hours

Item	Appx. Hrs
Cl	4
LI	0
SW	2
SL	2
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 To Understand SSO Fundamentals. **SO3.2** Design Access Control Policies. **SO3.3** Implement Password Management Solutions. **SO3.4** Implement Password Management Solutions. **SO3.5** Integrate SSO with Access Control and Password Management.		**Unit3: Single Sign-On (SSO) Concepts and Methods** **(7 Lectures)** 3.1 Single Sign-On Techniques, 3.2 Access Control 3.3 Password Management 3.4 Introduction to Single Sign on Methods	1. Single Sign-On Techniques. 2. Password Management.

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**
i. Single Sign-On Techniques.
ii. Access Control.
iii. Password Management.

PC503.4 : Students will gain comprehensive knowledge and practical skills in implementing and managing federated identity solutions.

Approximate Hours

Item	Appx. Hrs
Cl	3
LI	0
SW	1
SL	2
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Understand Federation Fundamentals **SO4.2** Compare Federation Protocols **SO4.3** Deploy Federation Solutions **SO4.4** Understand GRC Principles **SO4.5** Establish Governance Frameworks		**Unit-4 : Introduction to Federation** **(8 Lectures)** **4.1** Federation Overview **4.2** Federation Protocols **4.3** Governance Risk and Compliance	**1.** Machine Translation Approaches **2.** Application of NLG

SW-4 Suggested Sessional Work (SW):
a. Assignments:
i. Explain the Federation Protocols.
ii. Explain Governance Risk and Compliance.
b. Other Activities (Specify): Seminar

PC503.5 : Students will acquire the knowledge and skills necessary to implement MFA solutions, manage identity lifecycles effectively.

Approximate Hours

Item	Appx. Hrs
Cl	9
LI	0
SW	1
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Understand MFA Fundamentals and History. **SO5.**2 Implement Auditing and Reporting. **SO5.** Manage Identity and User Provisioning. **SO5.4** Explore Identity Manager Solutions. **SO5.5 Develop** IAM Governance Frameworks.		**Unit 5: Identity Management and Provisioning (9 Lectures)** 5.1 Multi Factor authentication (Mfa) 5.2 Origin of Mfa 5.3 Introduction to Auditing & Reporting 5.4 Identity Management 5.5 User Provisioning 5.6 Introduction To Identity Manager 5.7 Identity Manager Structure 5.8 Identity Manager Components 5.9 Identity & Access Management Governance	1. Explain Multi Factor authentication (Mfa), 2. Define Access Management Governance

SW-5 Suggested Sessional Work (SW):

a. **Assignments:**

x. Explain Identity Management

xi. Explain User Provisioning.

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: Grasp core IAM principles and its importance in securing organizational assets.	08	02	02	12
CO2 Students will be able to effectively navigate and utilize identity and access management (IAM) user interfaces.	10	02	02	14
CO3: Students will be able to implement Single Sign-On (SSO) techniques and understand various SSO methods to streamline authentication processes across multiple applications	10	02	02	14
CO4: Students will be able to understand the fundamentals of federation in identity and access management (IAM) for secure cross-organizational identity sharing.	8	01	02	11

CO5: Students will have a thorough understanding of Multi-Factor Authentication (MFA).	9	01	01	11
Total Hours	45	08	09	58

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Grasp core IAM principles and its importance in securing organizational assets.	03	02	03	08
CO-2	Students will be able to effectively navigate and utilize identity and access management (IAM) user interfaces.	03	01	05	09
CO-3	Students will be able to implement Single Sign-On (SSO) techniques and understand various SSO methods to streamline authentication processes across multiple applications	03	07	02	12
CO-4	Students will be able to understand the fundamentals of federation in identity and access management (IAM) for secure cross-organizational identity sharing.	03	05	05	13
CO-5	Students will have a thorough understanding of Multi-Factor Authentication (MFA).	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Identity and Access Management 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 company where NPL is implemented
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials
9. CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
10. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Identity & Access Management: A Systems Engineering Approach	Omondi Orondo	BPB Publication	3rd Edition, 2021

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Identity and Access Management	Prof. Gyan Sharma	IIT Kanpur

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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

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PC502

Course Title: Identity and Access 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	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	2	3	1	1	1	1	1	3	2	2	3	2	3
CO2	3	3	2	2	3	2	1	2	1	1	1	3	2	3	2	1	3
CO3	3	2	3	3	3	2	1	2	1	1	1	3	2	3	2	2	3
CO4	2	3	3	3	3	2	1	3	1	1	1	3	2	2	3	2	2
CO5	2	2	3	3	2	2	1	1	1	1	1	3	2	2	3	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	CO1 Grasp core IAM principles and its importance in securing organizational assets.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 **Introduction to IAM** 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	CO2 Students will be able to effectively navigate and utilize identity and access management (IAM) user interfaces.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 **User interface and Directories** 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	CO3: Students will be able to implement Single Sign-On (SSO) techniques and understand various SSO methods to streamline authentication processes across multiple applications.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3**: Single Sign-On (SSO) Concepts and Methods** 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	CO4: Students will be able to understand the fundamentals of federation in identity and access management (IAM) for secure cross-organizational identity sharing.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: **Introduction to Federation** 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 a0 PSO: 1,2,3,4	CO5:Students will have a thorough understanding of Multi-Factor Authentication (MFA).	SO5.1 SO5.2 SO5.3 SO5.4		Unit5: **Identity Management and Provisioning** 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) [Cyber Security] Program

Course Code: PC-503

Course Title: Introduction To IT Security Auditing

Pre-requisite: Student should have basic knowledge of Security and database

Rationale: Statistical Thinking for Data Science boosts the discovery of new and unexpected insights From data.

Course Outcomes:

CO1	Understand the difference between security metrics and audits
CO2	Knowledge on vulnerability management and information security assessment
CO3	Know the Information Security Audit Tasks, Reports and Post Auditing Actions
CO4	Implement latest trend of computer security technologies
CO5	Design an organization's security benchmark

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)	CSE(Cyber)- PC-503	Introduction To IT Security Auditing	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	PC - 503	Vulnerability Assessment & Penetration Testing	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 difference between security metrics and audits

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Define Networks **SO1.2** Recognizing the gray areas in security **SO1.3** Understand Security Assessment and Penetration Testing.		**Unit 1:** 1.1. Infrastructure and Networks. 1.2. Communication Routes. 1.3. Information Security. 1.4. Methodologies (Black-box,	1. Learn Networks engineering

SO1.4 Discuss Social Engineering Attacks **SO1.5 understand** defending against social engineering attacks .		White-box, Grey-box), 1.5. Phases of Information 1.6. Security Audit 1.7. Strategies, 1.8. Ethics of Information Security 1.9. Auditor etc. Maintain Healthy, 1.10. Safe & Secure 1.11. Working environment (NOS 9003) 1.12. Case Study	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss about different social engineering attacks

b. Presentation

CO2. Knowledge on vulnerability management and information security assessment.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand Physical Penetration Attacks: SO2.2 Understand Insider Attacks: SO2.3 To Explain Exploiting Client-Side Vulnerabilities with Meta sploit, SO2.4 To Explain Penetration Testing with Meta sploit's	.	**Unit-2:** Information Security Governance. 2.1.Cybersecurity Roles and Responsibilities. 2.2. Security Frameworks. 2.3.Security Organization Goals. 2.4. & Objectives, Cybersecurity Policy and Standards. 2.5. Cyber and Legal/ Regulatory Requirements 2.6.Cybersecurity and Social Media . 2.7.Seccurity 2.8. Information Asset Classification. 2.9. Cybersecurity Insurance. 2.10. Cybersecurity Risk Assessment, Cybersecurity . 2.11. Awareness Training & Education, Social Media – Risk and Control, Third-Party Assessment, Service Providers, 2.12. Supply Chain Risk Management, Performance Measurement, Pre-audit checklist, Information Gathering, Vulnerability Analysis.	1. learn different types of Insider Attacks: 1.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write about numerical data?

b. Presentation

CO3. Know the Information Security Audit Tasks, Reports and Post Auditing Actions

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 To understand Managing a Penetration Test SO3.2 know the Basic Linux Exploits: SO3.3 To understand Windows Exploits: SO3.4 Understanding Windows Memory Protections		**Unit3:** External Security Audit. 3.1.Internal Network. 3.2. Security Audit. 3.3. Firewall Security Audit. 3.4. IDS Security Auditing. 3.5. Social Engineering. 3.6.Security Auditing. 3.7.Web Application. 3.8.Security Auditing, Information Security 3.9. Audit Deliverables & Writing Report, 3.10. Result Analysis, 3.11. Post Auditing Actions, 3.12. Report Retention etc.	I. Learn about**.** Basic Linux Exploits:

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain Exception Handling (SEH),

b. Presentation

CO4. Implement latest trend of computer security technologies**.**

Approximate Hours

Item	App X Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand Web Application Security Vulnerabilities: **SO4.2** Explain the Injection vulnerabilities, **SO4.3** understand the Cross-site scripting vulnerabilities. **SO4.4** To Understand the Principles of Vulnerability Analysis	.	**Unit-4 :** Concepts and Definitions: 4.1 Threat and Vulnerability 4.2 Management, Enterprise 4.3 Identity 4.4 Access Management, 4.5 Configuration ‘ 4.6 Management 4.7 Asset management 4.8 Change anagement, 4.9 Patch Management, 4.10 Network Security 4.11 Cybersecurity Operations 4.12 Case study	i. Draw a different graphs to fitted models

SW-4 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write the Principles Vulnerability Analysis?

b. Presentation

1. Pictorial representation of Passive Analysis

CO5. Design an organization’s security benchmark

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2

SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1To Understand Security check Exploits: **SO5.2** Discuss combining models and data in a forecasting problem **SO5.3** To Explain Information Technology to exploit, **SO5.4** To Understand Latest Trends in Cryptography Technology,		**Unit5:** 5.1. Security check parameters 5.2. Build and Deploy/Secure Authorization 5.3. . Process for Information Technology. 5.4. Incident Management, Client Endpoint Protection. 5.5. Application Security, Data Backup and Recovery 5.6. Security Compliance, Cryptography Network security technologies 5.7. Firewall and Network Security 5.8. technologies, 5.9. Security Incident & Event Management (SIEM), 5.10. Wireless Technology, Cloud Computing, 5.11. Mobile Security, Internet of Things (IoT), 5.12. Virtualization Security, Industrial Control Systems (ICS)	I. Learn Malware.

SW-5Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain in detail about Collecting Malware and Initial Analysis

b. Presentation:

c. Other Activities (Specify): Group discussion of important topics.

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. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.	12	2	1	**15**
CO2. Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.	12	2	1	**15**
CO3. Manage and report penetration tests effectively and Develop and execute Linux And Windows exploits, bypassing memory protections.	12	2	1	**15**
CO4. Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.	12	2	1	**15**
CO5. Evaluate and protect against client-side browser exploits.	12	2	1	**15**
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

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	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment 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	Gray Hat Hacking The Ethical Hackers Hand book	Allen Harper, Stephen Sims, Michael Baucom	Tata McGraw-Hill.	2022
2	The Web Application Hacker's Handbook	DafyddSuttard,Marcuspinto,	Wiley Publishing	2023

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering *(Cyber Security)*

Course Code: PC-503

Course Title: Introduction To IT Security Auditing

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 difference between security metrics and audits.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Knowledge on vulnerability management and information security assessment.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3 Know the Information Security Audit Tasks, Reports and Post Auditing Actions.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO4: Implement latest trend of computer security technologies.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
CO5Design an organization's security benchmark.	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	CO1. Understand the difference between security metrics and audits.	SO1.1 SO1.2 SO1.3 SO1.4		Unit1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,8,9,10,11,12	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: Knowledge on vulnerability management and information security assessment.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,8,9,10,11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3 Know the Information Security Audit Tasks, Reports and Post Auditing Actions.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,10,11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Implement latest trend of computer security technologies.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5Design an organization's security benchmark**.**	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,12	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

Semester-V

Course Code: **PC504**

Course Title: Ethical Hacking

Pre- requisite: Student should have good knowledge of analytical skills, programming language and ability to understand complex algorithm.

Rationale: Gain a solid understanding of foundational cybersecurity concepts, including network security, operating system security, and application security. Familiarize participants with the development and implementation of security policies, as well as compliance standards and frameworks relevant to ethical hacking

Course Outcomes: After completion of course, students will able to

PC502.1 Understand the basic concepts of Ethical Hacking.
PC502.2 Understand the data collection.
PC502.3 Understand the concept of scanning.
PC502.4 Evaluate the impact of social Engineering.
PC502.5 Apply AI techniques to any application domain.

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)	
OE	PC504	Ethical Hacking	3	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 of teacher 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) [Cyber Security] Program

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)		
OE	PC504	Ethical Hacking	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.

PC502.1 Understand the basic concepts of Ethical Hacking.

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)
SO1.1 Understand the concept of ethical hacking **SO1.2** Explanation of various terminologies of ethical hacking. **SO1.3** Understand non technical explanation of Ethical Hacking. .	LI1. Learn to scan networks to identify active hosts, open ports, and services running on them LI1. Enumerate system details and services, such as users, shares, and applications, to gather more information about the target	**Unit-1.0 Introduction to Ethical Hacking** **1.1** Understanding definition and role of ethical Hacking. **1.2** Overview of ethical Hacking.. **1.3** Learning various terminologies of ethical Hacking. **1.4** What do we need to establish an Ethical Hacking Company. **1.5** What are the different types of hackers **1.6** Five phases of hacking **1.7** Scope of Ethical Hacking **1.8** Understanding use of Ethical Hacking in various application domain.	1. Understand how to manipulate and prepare data for Ethical Hacking.

SW-1 Suggested Sessional Work (SW):

1) Assignments:

i) Explore the application of ethical hacking in data processing.

ii**)** Explore the societal impacts and ethical considerations of ethical hacking.

2) Mini Project:

Other Activities (Specify):

Write a short essay or create a presentation discussing the ethical considerations in Ethical Hacking.

PC502.2 Understand the data collection

Approximate Hours

Item	AppX Hrs
Cl	14
LI	6
SW	2
SL	1
Total	23

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 To Understand the work flow in ethical hacking projects. **SO2.2** To learn data cleaning, preprocessing, exploring and analyzing. **SO2.3** How to select an ethical hacking project for your company. **SO2.4** Learn technical tools for ethical hacking.	**LI2.1** Perform vulnerability assessments and analyze weaknesses in systems, software, and configurations. **LI2.2**. Exploit vulnerabilities to gain unauthorized access, escalate privileges, or execute code on target systems. **LI2.3** Employ various techniques to crack passwords, such as brute force attacks, dictionary attacks, and rainbow table attacks..	**Unit-2 Information Gathering** **2.1** Footprinting **2.2** Advance google hacking techniques **2.3** Website Footprinting **2.4** Website Mirroring **2.5** Manual Mirroring **2.6** wget **2.7** HTTrack **2.8** Web Scrapping **2.9** web archiving services **2.10** Proxy servers **2.11** Content Delivery Networks **2.12** Email Footprinting. **2.13** whois Lookup **2.14** DNS Footprinting	i. Understand the organization's goal and challenges for Cyber security projects.

SW-2 Suggested Sessional Work (SW):

a. Assignments:
i. Explore the legal and ethical considerations surrounding ethical hacking.
ii. Conduct network reconnaissance using tools such as Nmap or Wireshark to discover hosts, open ports, and services.
Mini Project:
b. Set up a simulated network environment using virtualization software such as VMware or VirtualBox. The environment should include multiple virtual machines representing different components of a typical network, including servers, workstations, routers, and firewalls.
c. Other Activities (Specify):

PC502.3 Understand the concept of scanning

Approximate Hours

Item	AppX Hrs
Cl	10
LI	6
SW	2
SL	1
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 Identify open ports, services, and vulnerabilities in target systems. **SO3.2** Perform network scanning using tools like Nmap and Nessus. **SO3.** Enumerate hosts, users, and network resources to gather additional information.	**LI 3.1**. Use Nmap to scan the target organization's network for open ports, services, and operating systems. **LI 3.2** Enumerate the discovered hosts and services to gather additional information, such as user accounts, network shares, and installed software versions. **LI 3.3** Perform security assessments of web applications using tools like Burp Suite or OWASP ZAP.	**Unit-3** : **Scanning** 3.1 Network Scanning 3.2 Host Discovery techniques 3.3 Ping sweep 3.4 ARP scanning 3.5 TCP SYN scan 3.6 TCP Connect Scan 3.7 UDP scan 3.8 ICMP Echo request scan 3.9 DNS enumeration Scan 3.10 sort scanning techniques. 3.11 OS discovery. 3.12 banner Grabbing 3.13 Packet fragmentation. 3.14 source Routing	i. Clearly outline the goals of the ethical hacking. ii.Explore the motivation behind ethical hacking.

		3.15 address spoofing.Oovervie w of network scanning tools. **3.17**. Port Scanning	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Identify and assess vulnerabilities in a target system or network using automated vulnerability scanning tools like Nessus or OpenVAS.

ii. Prioritize vulnerabilities based on severity and potential impact on the system's security.

b. **Mini Project:**

Utilize scanning tools such as Nmap or Nessus to scan the network for open ports, services, and potential vulnerabilities. Perform enumeration to gather information about the target systems, including user accounts, network shares, and installed software.

Other Activities (Specify):

PC502.4 4 Evaluate the impact of social Engineering.

Approximate Hours

Item	AppX Hrs
Cl	17
LI	6
SW	4
SL	1
Total	22

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO4.1 To understand realistic view of social engineering. **SO4.2** Understanding the Phishing. **SO4.3** Understanding adversarial attacks on AI. **SO4.4** Understand adverse uses of social engineering.	**LI 4.1** Perform social engineering attacks, such as phishing or pretexting, to gather sensitive information or gain unauthorized access to systems.. **LI 4.2** Conduct	**Unit-4 :** Social Engineering **4.1** social engineering. **4.2** Types of social engineering. **4.3** Phishing. **4.4** Email Phishing **4.5** Spear Phishing **4.6** Vishing(voice phising) **4.7** Smishing(SMS phishing) 4.8 Clone phishing,	**i**. Practice social engineering techniques in a controlled environment, such as simulated social engineering engagements or capture the flag (CTF) .

SO4.5 Impact of phishing on employment.	physical security assessments of the target organization's premises, including building entry points, access controls, and surveillance systems.. **LI4.3** Propose recommendations for improving social engineering awareness and physical security measures.	Whaling **4.8** Pharming **4.9** Search engine phishing **4.10** Phishing tools. **4.11** Sniffing **4.12** Session Hijacking. **4.13** **P**hysical security assessments and penetration testing. **4.14** Mitigating social engineering and physical security risks. **4.15** Introduction to cryptography and encryption techniques. **4.16.** Secure communication protocols and cryptographic algorithms.1 **4.17** Secure communication protocols and cryptographic algorithms.2	**i.** Familiarize yourself with social engineering frameworks and models, such as the Social Engineering Framework (SEF), the Open Source Security Testing Methodology Manual (OSSTMM), and the Social-Engineer Toolkit (SET).

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Plan and execute a social engineering simulation to assess the effectiveness of security awareness training within the organization.
ii. Develop targeted phishing emails or phone calls to gauge employees' susceptibility to social engineering attacks.

b. Mini Project:

Analyze the results of the scans to identify potential security vulnerabilities in the target systems. This may include common vulnerabilities such as outdated software versions, misconfigured services, weak passwords, and missing security patches.

c. Other Activities (Specify):

Power Point Presentation on adverse uses of Ethical hacking.

PC502.5 Apply Legal and Regulatory Compliance

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)
SO5.1 Understand wireless network security principles and vulnerabilities. **SO5.2** Understand legal frameworks and regulations related to cybersecurity. . **SO5.3** Learn about compliance requirements for protecting sensitive data.	**LI.5.1** Practice exploiting common vulnerabilities such as SQL injection, cross-site scripting (XSS), or weak authentication mechanisms in a controlled environment. **LI 5.** Gain unauthorized access to target systems and escalate privileges to demonstrate the impact of successful exploitation**.** **LI 5.3** Conduct post-exploitation activities, such as lateral movement and data exfiltration, to simulate real-world cyber attacks.	**Unit5: Legal and Regulatory Compliance.** **5.1** Understanding legal frameworks and regulations related to cybersecurity. **5.2** Compliance requirements for protecting sensitive data and information assets **5.3** Ethical considerations in cybersecurity and professional conduct. **5.4** Wireless Network Security **5.5** Overview of wireless network security principles. **5.6** Common wireless security vulnerabilities and attacks. **5.7** Secure configuration and management of wireless networks. **5.8** Overview of incident response procedures and protocols. **5.9** Digital forensics principles and methodologies. **5.10** Conducting incident response investigations and preserving digital evidence.	1. Learn about ethical guidelines, codes of conduct, and laws governing social engineering practices in different jurisdictions.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Conduct a wireless security assessment by performing a wireless network scan and

analyzing the security configurations of wireless access points.

ii. Understand legal frameworks and regulations related to cybersecurity.

b. Mini Project:

Document the entire process, including the methodology, findings, and recommendations for improving the security of the network environment. Prepare a comprehensive report detailing the vulnerabilities discovered, their potential impact, and proposed remediation measures.

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)
PC502.1 Understand the basic concepts of Ethical Hacking	8	3	1	12
PC502.2 Understand the data collection	14	4	1	19
PC502.3 Understand the concept of scanning	10	3	1	14
PC502.4 Evaluate the impact of social Engineering.	17	5	1	23
PC502.5 Apply Legal and Regulatory Compliance	10	3	1	14
Total Hours	59	18	5	82

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Understand the basic concepts of Ethical Hacking.	03	01	01	05
CO-2	Understand the data collection.	02	06	02	10
CO-3	Understand the concept of scanning.	03	07	05	15
CO-4	Evaluate the impact of social Engineering.	02	08	05	15
CO-5	Apply Legal and Regulatory Compliance	03	02	-	05
Total		13	24	13	50

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

The end of semester assessment for AI for everyone 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. Case study on AI domain
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	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws	Dafydd Stuttard and Marcus Pinto	Wiley	2011
2	Hacking: The Art of Exploitation	Jon Erickson	No Starch Press	2008
3	Penetration Testing: A Hands-On Introduction to Hacking	Georgia Weidman	No Starch Press	2014

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code : PC504
Course Title: Ethical Hacking

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 concepts of Ethical Hacking.	1	1	2	2	3	2	3	2	3	1	3	2	2	3	3	1	2
CO 2 Understand the data collection.	1	1	2	2	2	2	3	2	1	1	3	2	2	2	2	1	3
CO 3: Understand the concept of scanning.	2	1	1	1	1	2	2	2	1	2	1	2	2	1	3	3	2
CO 4: Evaluate the impact of social Engineering..	3	2	2	1	3	2	3	2	2	1	2	3	2	3	3	2	2
CO 5: Apply Legal and Regulatory Compliance.	-	-	-	1	1	3	3	3	1	1	1	2	2	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 concepts of Ethical Hacking.	SO1.1 SO1.2 SO1.3	LI1.1 LI1.2 LI1.3	Unit-1 1 Introduction to Ethical Hacking 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 Understand the data collection	SO2.1 SO2.2 SO2.3 SO2.4	LI2.1 LI2.2 LI2.3	Unit-2 Information Gathering . 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Understand the concept of scanning	SO3.1 SO3.2 SO3.3	LI3.1 LI3.2 LI3.3	Unit-3 Scanning 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: Evaluate the impact of social Engineering	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1 LI4.2 LI4.3	Unit-4 Social Engineering 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13,4.14,4.15,4.16,4.17	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	Apply Legal and Regulatory Compliance	SO5.1 SO5.2 SO5.3	LI5.1 LI5.2 LI5.3	Unit-5 Legal and Regulatory Compliance. domain.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)

FIFTH SEMESTERS

Course Code: EEC501

Course Title: 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: -

EEC501.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
EEC501.2: - The student will be able to implement the project plan and manage the project.
EEC501.3: - 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)	
Program Core (PCC)	EEC501	Minor Project	0	5	0	1	4	6

INTRODUCTION TO PROJECT WORK

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 inclassroom 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 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 [Cyber Security]

Course Code: EEC50

Course Title: Project-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.				
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.				

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science Bachelors in Technology [B.Tech.]

Artificial Intelligence and Data Science [Cyber Security] Program

(Revised as on 01 August 2023)

Semester V

Course Code: AU301

Course Title: **Indian Constitution**

Pre-requisite: N/A

Rationale: Understanding of the constitutional framework, rights, duties, and institutions that define India's democracy. It provides the necessary knowledge to become informed citizens and professionals in fields related to law, politics, public administration, and more.

Course Outcomes:

CO1: Demonstrate a comprehensive understanding of the nature and characteristics of the Indian Constitution, including its historical background, key principles, evaluate the concepts of federalism and unitary form of government in the Indian context, assessing their advantages, disadvantages, and implications for governance and power distribution.

CO2: Examine the provisions and significance of citizenship and fundamental rights in the Indian Constitution, and critically analyze their role in safeguarding individual liberties, promoting equality, and ensuring social justice.

CO3: Recognize the role that the Directive Principles of State Policy play in providing a framework for government action; examine the complex interactions that shape the constitutional ethos between fundamental rights and directive principles; and recognize the role that fundamental duties play in promoting civic engagement and fortifying the basis of a just and inclusive society.

CO4: Understand the structure and functioning of the Union Executive, Legislature, and Judiciary, including the roles and powers of the President, Vice President, Council of Ministers, and the Supreme Court, and assess their significance in the Indian system of governance.

CO5: Analyze the structure and functioning of the State Executive, Legislature, and Judiciary, including the roles and functions of the Governor, State Legislature (Vidhan Sabha and Vidhan Parishad), and High Court, and assess their significance in the state-level governance and legal system.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	PI	SA	SL	Total Study Hours (CI+PI+SW+SL)	
Audit Course	AU301	Indian Constitution	3	0	1	1	5	3

Legend: CI: Class room Instruction (Includes different instructional strategies. .Lecture (L) and Tutorial (T) and others).

PI: Practical Instruction
SA: Sessional assignment.
SL: Self Learning,
C: Credits.

Note: SA & SL have 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 15 marks (CA)	Class Test 1 10 marks (CT)	Presentation (P)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+P+CAT+AT)	**(ESA)**	(PRA+ESA)
Audit Course	AU301	Indian Constitution	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), Practical Instruction (PI), Sessional Assignment (SA), 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 a comprehensive understanding of the nature and characteristics of the Indian Constitution, including its historical background, key principles, evaluate the concepts of

federalism and unitary form of government in the Indian context, assessing their advantages, disadvantages, and implications for governance and power distribution.

Approximate Hours

Item	Appx. Hrs
Cl	10
PI	00
SW	01
SL	01
Total	**12**

Session Outcomes (SOs)	**Practical Instruction (PI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand background, meaning, definition, nature and fundamental features of constitution. **SO1.2** Understand Types of Constitution. **SO1.3** Understand Types of Government. **SO1.4**Understand Characteristics of federalism. **SO1.5** Understand the concepts of federalism. .	.	**Unit-1. Introduction of Constitution (10 Lectures)** 1.1 Historical Evolution of Constitutions 1.2 Concept and Meaning of Constitution 1.3 Definition and Nature of Constitution 1.4 Fundamental Features of a Constitution 1.5 Preamble and its Significance 1.6 Written and unwritten Constitution 1.7 Rigid Constitution vs. Flexible Constitution 1.8 Codified Constitution vs. Uncodified Constitution 1.9 Characteristics of a Good Constitution, Democracy: Types and Principles 1.10 Monarchy: Absolute vs. Constitutional	1. Remembering the Preamble of the Constitution.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Importance of Preamble.

ii. Is Indian Constitution federal or unitary?

CO2: Examine the provisions and significance of citizenship and fundamental rights in the Indian Constitution, and critically analyze their role in safeguarding individual liberties, promoting equality, and ensuring social justice.

Approximate Hours

Item	Appx. Hrs
Cl	9
PI	00
SW	01
SL	00
Total	**10**

Session Outcomes (SOs)	**Practical Instruction (PI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO2.1 To understand the citizenship. **SO2.2** To understand the essential elements of state. **SO2.3** To learn about fundamental rights.	.	**Unit-2. Citizenship Fundamental Rights (9 Lectures)** 1.1 Definition and Concept of Citizenship 1.2 Different Types of Citizenship Dual Citizenship: Advantages and Disadvantages 1.3 Definition and Concept of a State 1.4 Sovereignty: Meaning and Significance 1.5 Government: Structure and Functions 1.6 Definition and	

		Significance of Fundamental Rights 1.7 Historical Evolution of Fundamental Rights 1.8 Constitutional Safeguards for Fundamental Rights 1.9 Limitations on Fundamental Rights for Public Interest.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. How to acquire citizenship?

ii. Constitutional remedies available for violation of fundamental rights.

CO3: Recognize the role that the Directive Principles of State Policy play in providing a framework for government action; examine the complex interactions that shape the constitutional ethos between fundamental rights and directive principles; and recognize the role that fundamental duties play in promoting civic engagement and fortifying the basis of a just and inclusive society.

Approximate Hours

Item	Appx. Hrs
Cl	09
PI	00
SW	02
SL	00
Total	**11**

Session Outcomes (SOs)	**Practical Instruction (PI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO3.1 Comprehend the significance of Directive Principles of State Policy in shaping government actions, enabling them to recognize their role as a framework for achieving a just and welfare state.	.	**Unit-3: Fundamental duties and directive principles of state policy.** **(9 Lectures)** 1.1 Definition and Purpose of Directive Principles, Categories of Directive Principles	

SO3. Analyze the intricate interactions between fundamental rights and directive principles to appreciate how these constitutional elements work in tandem to establish a harmonious constitutional ethos that balances individual liberties with the welfare of society. **SO3.3** Recognize the importance of fundamental duties as a means of promoting civic engagement and social responsibility, strengthening the foundational principles of a just and inclusive society in the context of Indian democracy. **SO3.4** Develop the capacity to critically assess how the interplay between directive principles, fundamental rights, and fundamental duties influences government policies, legal decisions, and social outcomes in India, and how these factors collectively contribute to the nation's progress and well-being.		(e.g., social, economic, political) 1.2 Relationship between Directive Principles and Fundamental Rights 1.3 Legal and Judicial Perspectives on the Interplay 1.4 Objectives and Significance of Fundamental Duties 1.5 Correlation between Fundamental Duties and Rights 1.6 Enforcement Mechanisms and Legal Implications 1.7 Civic Education and Awareness of Fundamental Duties 1.8 Fundamental Duties as the Foundation of a Just Society 1.9 Ensuring Inclusivity through the Fulfillment of Fundamental Duties	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Directive Principles and Policy Implementation.
ii. Balancing Fundamental Rights and Directive Principles

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech Computer Science & Engineering [Artificial Intelligence] Program

CO4: Understand the structure and functioning of the Union Executive, Legislature, and Judiciary, including the roles and powers of the President, Vice President, Council of Ministers, and the Supreme Court, and assess their significance in the Indian system of governance.

Approximate Hours

Item	Appx. Hrs
Cl	08
PI	00
SW	02
SL	00
Total	**10**

Session Outcomes (SOs)	**Practical Instruction (PI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO4.1 Describe the roles, powers, and functions of the President and Vice President of India in the Union Executive. **SO4.2** Distinguish between the Lok Sabha and Rajya Sabha as the two houses of the Indian Parliament. **SO4.3** Explain the jurisdiction and powers of the Supreme Court of India in interpreting and upholding the Constitution. **SO4.4** Recognize how the Union Executive, Legislature, and Judiciary are interconnected and provide checks and balances on one another.	.	**Unit-4: Union executive, legislature and judiciary** **(8 Lectures)** 4.1 Constitutional, emergency and executive powers of the President 4.2 Role of the Vice President in the Union Executive 4.3 Composition and Membership of Lok Sabha and Rajya Sabha 4.4 Composition and Membership of Legislative Powers of Lok Sabha 4.5 Legislative Powers of Rajya Sabha 4.6 Representation of States in Rajya Sabha 4.7 Original Jurisdiction of the Supreme Court 4.8 Appellate Jurisdiction of the Supreme Court.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. The roles, powers, and functions of the President and Vice President of India in the Union Executive.

ii. Supreme Court of India in interpreting and upholding the Constitution.

CO5: Analyze the structure and functioning of the State Executive, Legislature, and Judiciary, including the roles and functions of the Governor, State Legislature (Vidhan Sabha and Vidhan Parishad), and High Court, and assess their significance in the state-level governance and legal system.

Approximate Hours

Item	Appx. Hrs
Cl	09
PI	00
SW	02
SL	01
Total	**12**

Session Outcomes (SOs)	**Practical Instruction (PI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO5.1 Describe the role and powers of the Governor in the state executive and assess the relationship between the Governor and the Chief Minister. **SO5.2** Differentiate between the Vidhan Sabha and Vidhan Parishad as the two houses of the state legislature. **SO5.3** Examine the jurisdiction and functions of the High Court in the state judiciary, including its role as a guardian of the state's legal system.		**Unit 5: State Executive, Legislature and judiciary (9 Lectures)** 1.1 Constitutional Powers of the Governor 1.2 Executive Functions of the Governor 1.3 Discretionary Powers vs. Constitutional Duties 1.4 Composition and Membership of Vidhan Sabha 1.5 Power of Judicial Review in State Matters 1.6 Composition and Membership of Vidhan Parishad	**1.** High Court in the state judiciary.

SO5.4 Recognize how the State Executive, Legislature, and Judiciary in each state interact and provide checks and balances on one another.		1.7 Legislative Powers of Vidhan Sabha and Vidhan Parishad 1.8 Representation of Local Authorities in Vidhan Parishad 1.9 State Executive Oversight by the Legislature	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Role and powers of the Governor in the state executive.

ii. Vidhan Sabha and Vidhan Parishad.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Sessional Assignment (SA)	Self Learning (SL)	Total hour (CL+SA+SL)
CO1: Demonstrate a comprehensive understanding of the nature and characteristics of the Indian Constitution, including its historical background, key principles, evaluate the concepts of federalism and unitary form of government in the Indian context, assessing their advantages, disadvantages, and implications for governance and power distribution.	10	01	01	**12**
CO2: Examine the provisions and significance of citizenship and fundamental rights in the Indian Constitution, and critically analyze their role in safeguarding individual liberties, promoting equality, and ensuring social justice.	9	01	00	**10**
CO3: Recognise the role that the Directive Principles of State Policy play in providing a framework for government action; examine the complex interactions that shape the constitutional ethos between fundamental rights and	9	02	00	**11**

directive principles; and recognise the role that fundamental duties play in promoting civic engagement and fortifying the basis of a just and inclusive society.				
CO4: Understand the structure and functioning of the Union Executive, Legislature, and Judiciary, including the roles and powers of the President, Vice President, Council of Ministers, and the Supreme Court, and assess them significance in the Indian system of governance.	8	02	00	**10**
CO5: Analyze the structure and functioning of the State Executive, Legislature, and Judiciary, including the roles and functions of the Governor, State Legislature (Vidhan Sabha and Vidhan Parishad), and High Court, and assess their significance in the state-level governance and legal system.	09	02	01	**12**
Total Hours	**45**	**08**	**02**	**55**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Demonstrate a comprehensive understanding of the nature and characteristics of the Indian Constitution, including its historical background, key principles, evaluate the concepts of federalism and unitary form of government in the Indian context, assessing their advantages, disadvantages, and implications for governance and power distribution.	03	04	03	10

CO-2	Examine the provisions and significance of citizenship and fundamental rights in the Indian Constitution, and critically analyze their role in safeguarding individual liberties, promoting equality, and ensuring social justice.	05	03	02	10
CO-3	Recognize the role that the Directive Principles of State Policy play in providing a framework for government action; examine the complex interactions that shape the constitutional ethos between fundamental rights and directive principles; and recognise the role that fundamental duties play in promoting civic engagement and fortifying the basis of a just and inclusive society.	05	03	02	10
CO-4	Understand the structure and functioning of the Union Executive, Legislature, and Judiciary, including the roles and powers of the President, Vice President, Council of Ministers, and the Supreme Court, and assess their significance in the Indian system of governance.	04	05	01	10
CO-5	Analyze the structure and functioning of the State Executive, Legislature, and Judiciary, including the roles and functions of the Governor, State Legislature (Vidhan Sabha and Vidhan Parishad), and High Court, and assess their significance in the state-level governance and legal system.	03	05	02	10
Total		20	17	13	50

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

The end of semester assessment for Indian Constitution will be held with written examination of 50 marks.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture.
2. Tutorial.
3. Case Method.
4. Group Discussion.
5. Moot court.
6. Visit to court.
7. Demonstration
8. Online sources.
9. Brainstorming.

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Constitution of India	V.N. Shukla	Wdhawa and company.	Revised edition 21 edition 2020
2	Constitutional law of India	J.N. Pandey	Central law agency	2022
3	Constitutional law of India	D.D. Basu	Central law agency	2020
4	Constitution of India	M.P. Jain	Wdhawa and company.	2018
5	Constitution of India (Vols. 3)	H.M. Seervai	Wdhawa and company.	2018
6	Constitutional law of India	Kailash Ra	Central law publication	2023
9	Lecture notes provided by Dept. of Law, AKS University, Satna.			

Curriculum Development Team

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CO, PO and PSO Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security] **Course Code:** AU301

Course Title: Indian Constitution

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	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	1	2	1	2	1	1	1	3	2	2	1	3	2	2	2	2	2
CO2	1	1	2	2	1	1	1	3	2	2	1	3	2	2	2	1	2
CO3	1	1	1	2	1	1	1	3	1	1	1	3	2	1	2	2	2
CO4	1	2	1	2	1	2	1	3	1	1	1	3	2	2	1	2	2
CO5	1	1	1	2	2	2	1	3	1	1	1	3	2	2	1	2	2

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Practical Instruction(PI)	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: Demonstrate a comprehensive understanding of the nature and characteristics of the Indian Constitution, including its historical background, key principles, evaluate the concepts of federalism and unitary form of government in the Indian context, assessing their advantages, disadvantages, and implications for governance and power distribution	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 **Introduction of Constitution** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As Mentioned in Page no.above
PO: 1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO2: Examine the provisions and significance of citizenship and fundamental rights in the Indian Constitution, and critically analyze their rolein safeguarding individual liberties, promoting equality, and ensuring social justice.	SO2.1 SO2.2 SO2.3		Unit-2 **Citizenship Fundamental Rights** 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	CO3: Recognize the role that the Directive Principles of State Policy play in providing a framework for government action; examine the complex interactions that shape the constitutional ethos between fundamental rights and directive principles; and recognise the role that fundamental duties play in promoting civic engagement and fortifying the basis of a just and inclusive society.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3: **Fundamental duties and directive principles of state policy.** 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	CO4: Understand the structure and functioning of the Union Executive, Legislature, and Judiciary, including the roles and powers of the President, Vice President, Council of Ministers, and the Supreme Court, and assess their significance in the Indian system of governance.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4: **Union executive, legislature and judiciary** 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	CO 5: Analyze the structure and functioning of the State Executive, Legislature, and Judiciary, including the roles and functions of the Governor, State Legislature (Vidhan Sabha and Vidhan Parishad), and High Court, and assess their significance in the state-level governance and legal system.	SO5.1 SO5.2 SO5.3 SO5.4		Unit5: **State Executive, Legislature and judiciary** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,2.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

SEMESTER VI

Course Code: PC601

Course Title: Cloud Security

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:

PC601.1: Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.

PC601.2: Describe a methodology for orchestrating a cloud ecosystem.

PC601.3: Understand how cloud computing changes the traditional enterprise security considerations compared to on premise.

PC601.4: Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities.

PC601.5: Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures.

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)	PC601	Cloud Security	3	2	2	1	8	4

Legend: CI: Classroom Instruction(Includes different instructiona lstrategiesi.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.

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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 (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+C AT+AT)		
ES	PC601	Problem Solving and 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)		
ES	PC601	Cloud Security	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.

PC601**.1: Student will apply OOP principles.**

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Approximate Hours

Item	Appx. Hrs.
Cl	09
LI	0
SW	2
SL	0
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1. Introduction to Security Concepts		**Unit-1 Introduction to Security Concepts** **1.9** Confidentiality, privacy, integrity, **1.10.**Authentication, non-repudiation, availability, access control **1.11.**defence in depth, least privilege, how these concepts **1.12.**apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. **1.13.**User authentication in the cloud; **1.14.**Cryptographic Systems-Symmetric cryptography, stream ciphers, **1.15.** block ciphers, modes of operation, **1.16.**public-key cryptography, hashing, digital signatures,	

		public-key infrastructures, key management, **1.17.**X.509 certificates, OpenSSL.	

SW-1 Suggested Sessional Work (SW):

3) Assignments:

1. Explain public-key infrastructures and key management.
2. Describe the importance of PaaS, IaaS and SaaS.

PC601**.2: Describe a methodology for orchestrating a cloud ecosystem**

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	2
SL	0
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. creating Multi-Tenancy Issues		**Unit-2 Multi-Tenancy Issues** 1.1. Isolation of users/VMs from each other. 1.2. How the cloud provider can provide this; Virtualization System Security Issues- e.g. ESX and ESXI Security, ESX file system security, 1.3. storage considerations, backup and recovery; 1.4. Virtualization System Vulnerabilities- Management	1.

		1.5. console vulnerabilities, management 1.6. server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, 1.7. hypervisor vulnerabilities, hypervisor escape vulnerabilities, 1.8. configuration issues, malware(botnets etc).	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1) Explain public-key infrastructures and key management.
2) Describe the importance of PaaS, IaaS and SaaS

PC601**.3: Understand how cloud computing changes the traditional enterprise security considerations compared to on premise.**

Approximate Hours

Item	Appx. Hrs.
Cl	4
LI	0
SW	2
SL	0
Total	6

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 **Virtualization System-Specific Attacks**		**Unit-3 : Virtualization System-Specific Attacks** 1.1. Guest hopping, attacks on the VM (delete the VM, 1.2. attack on the control of the VM,code or file injection into	

		the virtualized file structure), 1.3. VM migration attack 1.4. ,hyper jacking.	

SW-3 Suggested Sessional Work (SW):

c. Assignments:

1) Explain public-key infrastructures and key management.
2) Describe the importance of PaaS, IaaS and SaaS

PC601**.4: Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities**

Approximate Hours

Item	Appx. Hrs.
Cl	5
LI	0
SW	2
SL	0
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 technologies For Virtualization-Based Security Enhancement:	.	**Unit-4 :** 4.1 IBM security virtual server protection 4.2 virtualization-based sandboxing; 4.3 Storage Security-HIDPS, 4.4 log management, Data Loss Prevention.	

		4.5 Location of the Perimeter	

SW-4 Suggested Sessional Work(SW):

d. Assignments:

1) Explain public-key infrastructures and key management.

2) Describe the importance of PaaS, IaaS and SaaS

PC601**.5**: **Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures**

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	0
SW	2
SL	0
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO.1 Legal And Compliance Issues:		**Unit 5: Legal And Compliance Issues:** 4.1 Responsibility, ownership of data 4.2 right to penetration test, local law where data is held, 4.3 examination of modern Security Standards (e.g. PCIDSS), 4.4 how standards deal with cloud services and virtualization,	

		4.5 compliance for the cloud provider vs. 4.6 compliance for the customer.	

SW-5 Suggested Sessional Work (SW):

d. Assignments:

1) Explain public-key infrastructures and key management.

2) Describe the importance of PaaS, IaaS and SaaS

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)
ES 101.1**:** At the end of this chapter the Student will Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors	7	4	2	1	14
ES 101.2**:**At the end of this chapter the Student will Describe a methodology for orchestrating a cloud ecosystem	12	10	2	1	25
ES 101.3:At the end of this chapter the Student will learn how cloud computing changes the traditional enterprise security considerations compared to on premise	10	8	2	1	21
ES 101.4: At the end of this chapter the Student will Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities.	10	4	2	1	17

ES101.5: Student will learn Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures.	6	4	2	1	13
Total Hours	45	30	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table(ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC503.1	Student will Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.	02	05	01	08
PC503.2	Student will Describe a methodology for orchestrating a cloud ecosystem	02	03	05	10
PC5033	Student will learn how to handle exceptions.	02	03	07	12
PC503.4	Student will Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities.	1	3	7	11
PC503.5	Student will learn Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures.	1	05	05	11
Total		8	19	25	52

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

The end of semester assessment for Introduction to Cloud Security will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Cloud Security	Ronald L. Krutz, Russell Dean Vines	House	2010
2	Cloud Security and Privacy	Tim Mather, Subra Kumaraswamy		2009, 1 edition

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Artificial Intelligence & Data Science]

Course Code: PC503

Course Title: Introduction to Cloud 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: Student will Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Student will Describe a methodology for orchestrating a cloud ecosystem	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Student will Understand how cloud computing changes the traditional enterprise security considerations compared to on premise	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Student will Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Student will learn Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures.	-	-	-	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: Student will Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1,LI1.2	Unit-1 cloud security architectures from the perspectives of: providers 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 : Student will Describe a methodology for orchestrating a cloud ecosystem.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI2.3,LI.2.4,LI.2.5	Unit-2 methodology for orchestrating a cloud ecosystem. 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: Student will Understand how cloud computing changes the traditional enterprise security considerations compared to on premise	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3,LI.3.4	Unit-3 Student will Understand how cloud computing changes the traditional enterprise security considerations 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: Student will Analyze the impact of multi-tenancy on cloud security and devise strategies for effectively isolating users and virtual machines to mitigate potential vulnerabilities..	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2	Unit-4 Student will Analyze the impact of multi-tenancy on cloud security 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: Student will learn Assess virtualization-specific attacks and deploy security technologies to safeguard virtualized environments, including server protection, sandboxing, and storage security measures.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2	Unit- Student will learn Assess virtualization-specific attacks 5 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) [Artificial Intelligence and Data Science] Program

Semester-VI

Course Code: PEC CS-602

Course Title: Vulnerability Assessment & Penetration Testing

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. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.
CO2. Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.
CO3. Manage and report penetration tests effectively and develop and execute Linux and Windows exploits, bypassing memory protections.
CO4. Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.
CO5. Evaluate and protect against client-side browser exploits.

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)	PC-602	Vulnerability Assessment & Penetration Testing	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	Course Title	Scheme of Assessment (Marks)

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Artificial Intelligence and Data Science] Program

	Code		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	PC-602	Vulnerability Assessment & Penetration Testing	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. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Define Ethical Hacking **SO1.2** Recognizing the gray areas in security **SO1.3** Understand Vulnerability		**Unit 1:** Introduction Ethics of Ethical Hacking: 1. Why you need to understand your enemy's tactics, 2. Recognizing the gray	2. Learn Feature engineering

Assessment and Penetration Testing. **SO1.4** Discuss Social Engineering Attacks **SO1.5 understand** defending against social engineering attacks .		areas in security 3. Vulnerability Assessment 4. and Penetration Testing. 5. Penetration Testing and Tools: 6. Social Engineering Attacks: 7. How asocial engineering attack works, 8. conducting a social engineering attack, 9. common attacks used in penetration testing, 10. preparing yourself for face-to-face attacks, 11. defending against social engineering attacks 12. Case Study	

SW-1 Suggested Sessional Work (SW):

c. Assignments:

(ii) Discuss about different social engineering attacks

d. Presentation

CO2. Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand Physical Penetration Attacks: SO2.2 Understand Insider Attacks: SO2.3 To Explain Exploiting Client Side Vulnerabilities with Meta sploit, SO2.4 To Explain Penetration Testing with Meta sploit's	.	**Unit-2:** Physical Penetration Attacks: 2. Why a physical penetration is important, 3. conducting a physical 4. Penetration, 5. Common ways into a building, 6. Defending against physical penetrations. 7. Insider Attacks: 8. Conducting an insider attack 9. Defending against insider attacks. 10. Metasploit: The Big Picture Getting Metasploit, Using the Metasploit 11. Console to Launch Exploits, 12. Exploiting Client Side Vulnerabilities with Metasploit, 13. Penetration Testing with Meta sploit's Meterpreter, Automating and Scripting Metasploit ,Going Further with Metasploit	14. learn different types of Insider Attacks: 2.

SW-2 Suggested Seasonal Work (SW):

c. Assignments:

(i) Write about numerical data?

d. Presentation

CO3. Manage and report penetration tests effectively and Develop and execute Linux and Windows exploits, bypassing memory protections.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0

SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 To understand Managing a Penetration Test SO3.2 know the Basic Linux Exploits: SO3.3 To understand Windows Exploits: SO3.4 Understanding Windows Memory Protections		**Unit3:** Managing a Penetration Test: 1. Planning a penetration test, 2. Structuring a penetration test, 3. execution of a penetration test, 4. information sharing during a penetration test, 5. reporting the results of a Penetration Test. Basic Linux Exploits: Stack Operations, Buffer Overflows, 6. Local Buffer Overflow Exploits, 7. And Exploit Development Process. 8. Windows Exploits: Compiling and Debugging Windows Programs, 9. Writing Windows Exploits, 10. Understanding Structured Exception Handling (SEH), 11. Understanding Windows Memory Protections (XPSP3,Vista,7andServer2008), 12. Bypassing Windows Memory Protections.	II. Learn about**.** Basic Linux Exploits:

SW-2 Suggested Seasonal Work (SW):

c. Assignments:

(i) Explain Exception Handling (SEH),

d. Presentation

CO4. Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.

Approximate Hours

Item	App X Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand Web Application Security Vulnerabilities: **SO4.2** Explain the Injection vulnerabilities, **SO4.3** understand the Cross-site scripting vulnerabilities. **SO4.4** To Understand the Principles of Vulnerability Analysis	.	**Unit-4 :** Web Application Security Vulnerabilities: 2. Overview of top web application security vulnerabilities, 3. Injection vulnerabilities, 4. cross-Site scripting vulnerabilities, 5. the rest of the OWASP 6. Top Ten SQL Injection vulnerabilities, 7. Cross-site scripting vulnerabilities. 8. Vulnerability Analysis: 9. Passive Analysis, 10. Source Code Analysis 11. Binary Analysis 12. Learn by example 13. Case study	ii. Draw a different graph to fitted models

SW-4 Suggested Seasonal Work (SW):

c. Assignments:

(i) Write the Principles Vulnerability Analysis?

d. Presentation

14. Pictorial representation of Passive Analysis

CO5. Evaluate and protect against client-side browser exploits.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0

SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1To Understand Client-Side Browser Exploits: **SO5.2** Discuss combining models and data in a forecasting problem **SO5.3** To Explain heap spray to exploit, **SO5.4** To Understand Latest Trends in Honey net Technology,		**Unit5:** Client-Side Browser Exploits: 1. Why client-side vulnerabilities are interesting, 2. Internet explorer security 3. concepts, history of client- side exploits and latest trends, 4. Finding new browser-based vulnerabilities 5. heap spray to exploit, 6. Protecting yourself from client side exploit. 7. Malware Analysis: Collecting Malware and Initial Analysis: 8. Malware, 9. Latest Trends in Honey net Technology, 10. Catching Malware: Setting the Trap, 11. Initial Analysis of Malware. 12. Case study	II. Learn Malware.

SW-5Suggested Seasonal Work (SW):

d. Assignments:

(i) Explain in detail about Collecting Malware and Initial Analysis

e. Presentation:

f. Other Activities (Specify): Group discussion of important topics.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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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. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.	12	2	1	**15**
CO2. Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.	12	2	1	**15**
CO3. Manage and report penetration tests effectively and develop and execute Linux And Windows exploits, bypassing memory protections.	12	2	1	**15**
CO4. Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.	12	2	1	**15**
CO5. Evaluate and protect against client-side browser exploits.	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	
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	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment 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:

B. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Gray Hat Hacking The Ethical Hackers Hand book	Allen Harper, Stephen Sims, Michael Baucom	Tata McGraw-Hill.	2022
2	The Web Application Hacker's Handbook	DafyddSuttard,Marcuspinto,	Wiley Publishing	2023

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering *(Cyber Security)*
Course Code: PC602
Course Title: Vulnerability Assessment & Penetration Testing

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. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2. Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3. Manage and report penetration tests effectively and develop and execute Linux and Windows exploits, bypassing memory protections.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO4. Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
CO5. Evaluate and protect against client-side browser exploits.	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	CO1. Evaluate the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools.	SO1.1 SO1.2 SO1.3 SO1.4		Unit1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,8,9,10,11,12	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.** Analyze and defend against social engineering, physical penetration, and insider attacks using automating penetration testing processes.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,8,9,10,11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3**. Manage and report penetration tests effectively and Develop and execute Linux And Windows exploits, bypassing memory protections.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,10,11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4.** Analyze and mitigate web application security vulnerabilities and Conduct vulnerability analysis.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5.** Evaluate and protect against client-side browser exploits.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,12	

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(Revised as on 01 August 2023)

SEMESTER - VI

Course Code:	**PEC01**
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 dataAnalytics 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	**PEC01**	**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 (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	PEC01	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	PEC01	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.

- *Mini Project:*

i. N/A

- *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 Introductionto Streams Concepts: Stream Data Model and Architecture 4.2 Stream Computing 4.3 SamplingData in a Stream: Filtering Streams 4.4 Counting Distinct Elements ina Stream. 4.5 EstimatingMoments, Counting Oneness in a Window 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	1. Source of data

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.

Mini **Project**:

i. Why the rapid growth of unstructured data is putting greater pressure on businesses. Explain it.

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)**
O5.1 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	**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.	1.Big Data

	program to find the grades of students.	5.8 Analytics using Statistical packages 5.9 Industry challenges and application of Analytics	

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):

ii. 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

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9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B. Tech. Computer Science & Engineering (Cyber Secuity)

Course Code: PEC-01

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	

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: **PEC02**

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)	PEC02	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	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment(ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activityany 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

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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 02	Elective 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	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	**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	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

to understand vector spaces in pattern recognition. **SO1.5** Apply eigenvalues and eigenvectors for feature extraction in pattern recognition.	compute eigenvalues and eigenvectors of image datasets, demonstrating their significance in feature extraction and pattern representation.	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.	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.
Cl	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	1. Implement a K-Means Clustering Algorithm for Unsupervised Learning in Pattern Recognition 2. Apply Fisher Discriminant Analysis and Principal Component Analysis for Dimension	**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	1. Explore fundamental concepts of pattern recognition, including Bayesian and decision theory.

clustering, such as K-means and hierarchical methods, in unsupervised learning scenarios.	Reduction in Pattern Recognition.	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.	

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 problemstatement and diverse applications of feature selection. **SO3.**3. Implement the Branch and Bound algorithm for efficientfeature selection. **SO3.**4. Evaluate the	1. Implement basic patternrecognition concepts, including feature selection, extraction, and problemstatement analysis. 2. Apply andcompare feature selection methods like Branch and Bound, Sequential Forward andBackward Selection, utilizing Cauchy Schwartz inequality and FeatureSelection	**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 therelevance andpractical usesof Cauchy-Schwarz inequality in the context of Feature Selection and Extraction in Pattern Recognition.

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.	Criteria functions for Probabilistic Separability and Interclass Distance.		

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.
Cl	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.	1. Implement low-level recognition methods by extracting features from images and assess their impact on pattern recognition accuracy. 2. Explore mid-	**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	1. Explore foundational concepts of human visual recognition, from low-level features to high-level reasoning, through online resources and academic papers.

SO4.5. Evaluate applications of egocentric vision, human-in-the-loop systems, and 3D scene understanding in interactive visual systems.	level abstraction techniques by performing image segmentation, and analyze their role in enhancing scene understanding within the context of pattern recognition.	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.	

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)**

SO5.1. 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 data patterns.	**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.

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

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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-02
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

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	

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Semester - V

Course Code:	PEC03
Course Title:	Web Engineering & Technology
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.

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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- 03	Web Engineering	3	2	2	2	9	4

Legend: **CI:** Class room 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 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+C AT+AT)		
PE	PEC-03	Web 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.

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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 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. .	LI1.1 Design web pages for your college 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.)	**Unit-1.0 Topics Basics of 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	1. Learning various 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). LI5.4 Write a PHP program to print first ten Fibonacci numbers.	**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.

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.

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)

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

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COs, POs and PSOs Mapping

Program: B.Tech (Computer Science & Engineering)

Course Code: PEC- 03
Course Title: Web Engineering & 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	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	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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

Semester-VI

Course Code: PEC04

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 thesoftware 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-04	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.

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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-04	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-04	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

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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 thesoftware 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:

1. Discuss the significance of project monitoring and control in software project management.
2. 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

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8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering

CO, PO and PSO Mapping

Course Title: B. Tech. (CSE-Cyber Security)

Course Code: PEC- 04
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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-VI

Course Code: PC603

Course Title : Digital Forensic

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:

PC603.1: Demonstrate the use of computer forensics tools and appropriate skills, knowledge to perform various Investigations.

PC603.2: Analyze digital devices to establish user activity.

PC603.3: Research the development of new devices and technologies and how current digital forensics Methods will apply to them.

PC603.4: Gain insight knowledge to understand attack profiles, investigation tools and techniques.

PC603: Gain ability to perform Critical analysis of data to identify evidence.

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)	PC603	Digital Forensic	3	0	2	1	6	4

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.

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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 (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	PC603	Natural Language Processing	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.

PC603**.1: Understand the basic concept of Computer Forensic, roles and responsibilities of Forensic Investigator, Forensic Investigation Process, Pre & Post investigation Phase.**

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	-
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Understand the Fundamentals of Computer Forensics. **SO1.2.** Understand Digital Evidence. **SO1.3.** Understand Forensic Readiness **SO1.4.** Understand the Forensic Investigation Process **SO1.5.** Understand Pre & Post Investigation Process		**Unit-1** **1.1 Computer Forensics Fundamentals** **1.10** Understand the Fundamentals of Computer Forensics. **1.11** Digital Evidence **1.12** Understand Forensic Readiness **1.13** Identify the Roles and Responsibilities of a Forensic Investigator **1.14** Understand Legal Compliance in Computer Forensics **1.2 Computer Forensics Investigation Process** **1.1** Understand the Forensic Investigation Process and its Importance, **1.2** Forensic Investigation Process - Pre-investigation Phase, **1.3** Forensic Investigation Process - Investigation Phase, **1.4** Forensic Investigation Process - Post-investigation Phase	1. Learn about various Forensics. 2. Learn type of Evidence

SW-1 Suggested Sessional Work (SW):

4) Assignments:

2. Explain Computer Forensics.
3. Explain legal compliance in computer forensics.

5) Other Activities (Specify):

NA

PC603**.2: Acquire knowledge regarding the File systems, booting process of various OS, Data Acquisition and Duplication.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1. To Understand the File Systems **SO2.2.** Understand booting process. **SO2.3.** Understand Data Acquisition Fundamentals **SO2.4.** Apply Data Acquisition Methodology		**Unit-2** **2.1** **Understanding Hard Disks and File Systems** 3.1. Describe Different Types of Disk Drives and their Characteristics, 3.2. Explain the Logical Structure of a Disk, 3.3. Understand Booting Process of Windows, 3.4. Linux and Mac Operating system 3.5. Understand Various File Systems of Windows 3.6. Linux and mac Operating Systems and Examine the File System **2.2** **Data Acquisition and Duplication** 2.1 Understand Data Acquisition Fundamentals, 2.2 Discuss Different Types of Data Acquisition, 2.3 Determine the Data Acquisition Format, 2.4 Understand Data	2. Booting process of various os

		Acquisition Methodology 2.5 Understand Anti-forensics and its Techniques 2.6 Discuss Anti-forensics Countermeasures	

SW-2 Suggested Sessional Work(SW):

b. Assignments:

1. Discuss Different Types of Data Acquisition.
2. Explain the Logical Structure of a Disk.

c. Other Activities(Specify):

NA

PC603**.3: Gain an understanding of the various Volatile and Non-Volatile Information, Examine Windows Files and Metadata, Identify Indicators of Compromise (IoCs)**

Approximate Hours

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

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1. To Understand the Volatile & Non-Volatile Information **SO3.2.** Analyze File system Images Using The Sleuth Kit, **SO3.3.** Apply Network Forensics **SO3.4.** Examine Cache, Cookie, and History Recorded in Web Browsers		**Unit-3 :** **Windows, Linux and Network Forensics** 3.16 Collect Volatile and Non-Volatile Information, 3.17 Perform Windows Memory and Registry Analysis 3.18 Examine Cache, Cookie, and History Recorded in Web Browsers 3.19 Examine Windows Files and Metadata 3.20 Understand Volatile and Non-Volatile Data in Linux	1. network forensics tools

		3.21 Analyze File system Images Using The Sleuth Kit, 3.22 Understand Mac Forensics, 3.23 Demonstrate Memory Forensics, 3.24 Understand Network Forensics Fundamentals, Understand Event Correlation Concepts and Types 3.25 Identify Indicators of Compromise (IoCs) from Network Logs and Investigate Network Traffic	

SW-3 Suggested Sessional Work(SW):

d. Assignments:

1. Demonstrate Memory Forensics
2. Explain Network Forensics Fundamentals.

e. Other Activities(Specify):

NA

PC603**.4: Familiarize with a concise overview of the Investigation.**

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Understand Web Application Forensics **SO4.2.** Understand IIS and Apache Web Server Logs **SO4.3.** Understand the Dark Web, **SO4.4.** Understand Dark Web Forensics		**Unit-4 : Investigation** 4.1 Understand Web Application Forensics 4.2 Understand IIS and Apache Web Server Logs, 4.3 Investigating Web Attacks on Windows-based Servers, 4.4 Detect and Investigate Various Attacks on Web	i. Read different types of Forensic Investigation

		Applications, 4.5 Understand the Dark Web, Understand Dark Web Forensics, 4.6 Perform Tor Browser Forensics, Understand Email Basics, 4.7 Understand Email Crime Investigation and its Steps	

SW-4 Suggested Sessional Work(SW):

e. Assignments:

1. Detect and Investigate Various Attacks on Web Applications
2. Explain Dark Web Forensics.

f. Other Activities(Specify):

NA.

PC603.5: **Comprehend the functions of Malware Forensics**

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	-
SW	2
SL	1
Total	13

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

SO5.1 Understanding Malware **SO5.2** Perform Static Malware Analysis, **SO5.3** Perform System Behavior Analysis and Perform Network Behavior Analysis		**Unit 5: Malware Forensics** 5.1 Understand Malware 5.2 its Components and Distribution Methods 5.3 Understand Malware Forensics Fundamentals and Recognize Types of Malware Analysis, 5.4 Perform Static Malware Analysis, 5.5 Analyze Suspicious Word Documents 5.6 Perform Dynamic Malware Analysis 5.7 Perform System Behavior Analysis and Perform Network Behavior Analysis	1. Types of malware

SW-5 Suggested Sessional Work (SW):

e. Assignments:

Analyze Suspicious Word Documents.

f. 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)
PC603.1**:** At the end of this chapter the student will know the basic concept of Computer forensics & it's Process.	9	-	2	1	12
PC603.2**:**At the end of this chapter the student will know file systems & Data Acquisition and Duplication	12	-	2	1	15
PC603.3:At the end of this chapter the student will describe	10	-	2	1	13

the network forensics.					
PC603.4: At the end of this chapter the student will know Investigation.	07	-	2	1	10
PC603.5: At the end of this chapter the student will know Malware Forensics.	07	-	2	1	10
Total Hours	45	-	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table(ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PC6031.1	Understand the basic concept of Computer Forensic, roles and responsibilities of Forensic Investigator, Forensic Investigation Process, Pre & Post investigation Phase.	02	05	01	08
PC603.2	Acquire knowledge regarding the File systems, booting process of various OS, Data Acquisition and Duplication.	02	03	05	10
PC603.3	Gain an understanding of the various Volatile and Non-Volatile Information, Examine Windows Files and Metadata, Identify Indicators of Compromise (IoCs)	02	03	07	12
PC603.4	Familiarize with a concise overview of the Investigation.	1	3	7	10
PC603.5	Comprehend the functions of Malware Forensics.	1	05	05	10
Total		13	26	13	50

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

The end of semester assessment for Problem Solving and Programming will be held with written examination of 50 marks.

Suggested Learning Resources:

b. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Information Warfare and Security	Addison-Wesley	Editors Dorothy E.	1999
2	Blackstone's Statutes on IT and E-Commerce	C. Stoll	Khanna Publishing House	

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]
Course Code: PC603
Course Title: Digital Forensic

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: Demonstrate the use of computer forensics tools and appropriate skills, knowledge to perform various Investigations.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2 : Analyze digital devices to establish user activity.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Research the development of new devices and technologies and how current digital forensics Methods will apply to them.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Gain insight knowledge to understand attack profiles, investigation tools and techniques.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Gain ability to perform Critical analysis of data to identify evidence.	-	-	-	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: Demonstrate the use of computer forensics tools and appropriate skills, knowledge to perform various Investigations.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 Computer Forensics Fundamentals 1.1,1.2,1.3,1.4,1.5 Computer Forensics Investigation Process 1.1,1.2,1.3,1.4	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 : Analyze digital devices to establish user activity.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Understanding Hard Disks and File Systems 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: Research the development of new devices and technologies and how current digital forensics Methods will apply to them..	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Windows, Linux and Network Forensics 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: Gain insight knowledge to understand attack profiles, investigation tools and techniques.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Investigation: 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, 5	CO 5: Gain ability to perform Critical analysis of data to identify evidence.	SO5.1 SO5.2 SO5.3		Unit-5 Malware Forensics 5.1,5.2,5.3,5.4,5.5,5.6,5.7	

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Faculty of Engineering and Technology

Department of Computer Science & Engineering

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

(Revised as on 01 August 2023)

SEMESTERS-VI

Course Code: EEC-601

Course Title: Evaluation of Internship-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: -

EEC-601.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
EEC-601.2: - The student will be able to implement the project plan and manage the project.
EEC-601.3: - 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)	
Program Core (PCC)	EEC-601	Internship	0	5	0	1	4	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 (l i f e l o n g learning)
- Skill to manage the real- l i f e 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-l i f e 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- l i f e 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 *(Cyber Security)*
Course Code: EEC-601
Course Title: Internship

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.	-	-	-	

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: PC701

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)	
Program Core (PCC)	PC701	Java Programming	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 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 (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	PC-701	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-701	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 Constructors **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 BorderLayout, FlowLayout.	**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.

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. 10. Handling Database Queries. 11. Overview of Collection Framework. 12. Exploring Collection Classes. 13. Implementing JDBC Architecture.	1. Use of Database Connectivity. 2. 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 ofthis 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 Classesin 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 thestudent will know AWT	11	2	3	2	18
CO5: At the end of thischapter the student willknow.	17	2	3	2	24
Total Hours	60	13	15	10	98

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Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	PEC-EIV01: At the end of this chapter the student will explain the core concept of java programming.	03	04	03	10
CO2	PEC-EIV02: At the end of this chapter the student will use Objects and Classes in programs.	05	03	02	10
CO3	PEC-EIV03: At the end of this chapter the student will describe the Exception Handling.	05	02	03	10
CO4	PEC-EIV04: At the end of this chapter the student will know AWT	04	04	02	10
CO5	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)
1. 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

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering-Cyber Security

Course Code: PC701

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	

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Semester-VII

Course Code: PEC05

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)	
PCC	PEC05	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 Elective	PEC05	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 applyvarious computational intelligence techniques effectively.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	0
SW	1
SL	1
Total	11

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Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (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 odels. **SO1.3** Comprehension of Multilayer Networks: Students will understand the architecture and functioning of multilayer networks, including feedforwardand 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. **SO1.5** Application of Computational Intelligence		**Unit-1.0 Introduction** 1 Introduction Lecture: Begin with an engaging introduction to 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 understand the breadth of the field. 3 Visual Aid Presentation: Utilize visual aids such as diagrams and charts toillustrate 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	1. Explore various resources such as online courses, textbooks, tutorials, documentation, and forums related to the topic you want to learn. Choose resources that suit your learning style and preferences. 2. Take advantage of the vast array of online resources available for self-learning, including video tutorials, interactive courses, blogs, and forums.

Techniques: Studentswill be able to apply computational intelligence techniques to solve simple problems and analyze their effectiveness.		to identify patterns andcorrelations. 5 Group Activity: Divide students into groups and assign eachgroup a specific computational intelligence model. Have them research and prepare a presentation discussingthe model's architecture, working principles, and applications. 6 Hands-on Lab Session:Organize a hands-on lab session where students can experiment with building simple neuralnetworks using software tools or programming languages like Python. 7 Guest Lecture: Invite aguest 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 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		**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.

of membership functions, fuzzyfication, rule-based design,			
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 ffsprings: Studentswill 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.		**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. 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.	1. User define e functio n and built in functio n 2. Multiple types of varibal es

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 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. 3.4 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. 3.5 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.

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)

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, 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.		**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 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.	1. Independently research and understand advanced topics in

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 odels 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.		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 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	rough set theory and Hidden Markov Models by exploring, online resources, and practical examples..

		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 settheory 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"

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		**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	1. Simple project to demonstrate GUI Bases scripts. **2.** Tkinter module, overview.

algorithms behind swarm intelligence techniques, exploring their strengths, 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.		implement the algorithm and analyze its performance, discussing strategies for parameter tuning and problem-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. 5.7 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"

c. 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 develop adept problem-solving skills using computational intelligence methods.	9	0	1	1	11

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

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	Edition &Year
1	"Computational Intelligence: Concepts toImplementations"	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 andDerong Liu	2017
4	"Ant Colony Optimizationand Swarm Intelligence: 8th International Conference"	Marco Dorigo, Mauro Birattari, and ChristianBlum	2012

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COs, POs and PSOs Mapping

Program: BTech (Computer Science & Engineering)Course Code: PEC 05

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-SolvingSkills: 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 analyticalabilities 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: Graduateswill 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 Researchand 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: PEC06

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)	
Program Core (PCC)	PEC -06	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)

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-06	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 Koilpillai	Pearson Education	First Edition, 2013

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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

Program: B. Tech. (Computer Science & Engineering)

Course Code: PEC06

Course Title: Wireless and Mobile 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	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	

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Semester-VII

Course Code: PEC07

Course Title: Security Intelligence

Pre-requisite: Student should have basic knowledge of Cyber Security.

Rationale: **This course starts with need of cyber intelligence, its various types and applications. You will understand network defensive tactics, define network access control and use network-monitoring tools. You will understand data protection risks and explore mobile endpoint protection. Finally, you will recognize various scanning technologies, application security vulnerabilities and threat intelligence platforms.**

Course Outcomes:

PEC07.1: Understand the basic concept of Cyber Intelligence, Intelligence cycle and Operational Security.

PEC07.2: Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.

PEC07.3: Acquire knowledge regarding to targeting and Digital Forensics.

PEC07.4: Understand the concept of collaboration capability and security service.

PEC07.5: Understand the concept of Capability Maturity and TIPs.

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)	PEC07	Security Intelligence	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.

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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 (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	23CSH -335	Security 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.

PEC07.1: Understand the basic concept of Cyber Intelligence, Intelligence cycle and Operational Security

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. Understand types of intelligence. **SO1.2.** Developing a strategic cyber intelligence capability **SO1.3.**Understand Cyber intel program roles	**LI.1.1.** Identify a recent cyber incident and describe the intelligence cycle steps Involved. **LI.1.2.** Create a report outlining each phase of the intelligence cycle as it applies to the selected incident. **LI.1.3.** Conduct a risk assessment for a hypothetical business scenario.	**Unit-1 Need for Cyber Intelligence:** 1.1. Introduction of Cyber Intelligence 1.2. The application of intelligence in the military. **1.3.** types of intelligence, **1.4.** Intelligence drives operations, 1.5. Understanding the maneuver warfare mentality, Intelligence cycle 1.6. Introduction to the intelligence cycle, **1.7.** Developing a strategic cyber intelligence capability, **Introduction to Operational Security** 1.8. OPSEC applicability in a business environment, **1.9.** Cyber intel program roles	3. Different types of intelligence 4. Operational Security

SW-1 Suggested Sessional Work (SW):

6) Assignments:

4. Explain types of intelligence.
5. Explain Cyber Intel program roles.

7) Mini Project:

i.

8) Other Activities (Specify):

NA

PEC07.2: Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	6
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. To Understand the Cyber Kill Chain **SO2.2.** To Understand types of Active Defense **SO2.3.** Use Active Defense **SO2.4** Use of threat hunting tools	**LI.2.1.** Analyze a cyber-attack case study using the Cyber Kill Chain model. **LI.2.2.** Map each phase of the attack to the corresponding step in the Cyber Kill Chain. **LI.2.3.** Implement a basic honeypot to detect potential attackers.	**Unit-2 An introduction to Active Defense:** 5.1. Understanding the Cyber Kill Chain, 5.2. General principles of Active Defense, 5.3. Enticement and entrapment in Active Defense, 5.4. Types of Active Defense, 5.5. An application of tactical level Active Defense, **Cyber Threat Hunting** 2.6. Proactive threat hunting methodologies 2.7. Use of threat hunting tools 2.8. Case studies on successful threat hunting operations	3. Learn about Active Defense 4. Cyber Threat Hunting

SW-2 Suggested Sessional Work (SW):

d. Assignments:

3. Explain Types of Active Defense.

4. Explain Proactive threat hunting methodologies.

e. Mini Project:

f. Other Activities(Specify):
NA

PEC07.3: Acquire knowledge regarding to targeting and Digital Forensics.

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	6
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. To Understand the F3EAD process **SO3.2.** To Understanding threat intelligence **SO3.3.** Apply Capability Maturity Model **SO3.4.** Apply Tools and techniques for digital forensics	**LI.3.1.** Choose a cyber-threat scenario and apply the F3EAD process. **LI.3.2.** Document each step and provide recommendations for improvement. **LI.3.3.** Assess an organization's threat intelligence capabilities using the maturity model.	**Unit-3 : Understanding targeting:** 3.26The F3EAD process, 3.27 3EAD in practice, 3.28 3EAD and the Cyber Kill Chain, 3.29 nderstanding threat intelligence, 3.30 apability Maturity Model – threat intelligence overview. **Digital Forensics** 3.31 undamentals of digital forensics 3.32 ools and techniques for digital forensics 3.33	ii. F3EAD process v. Threat intelligence

		egal and ethical considerations in digital forensics	

SW-3 Suggested Sessional Work (SW):

f. Assignments:

2. Explain F3EAD and the Cyber Kill Chain.
2. Explain Tools and techniques for digital forensics

g. Mini Project:

h. Other Activities(Specify):

NA

PEC07.4: Understand the concept of collaboration capability and security service.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	6
SW	2
SL	1
Total	19

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Understand the Purpose of collaboration capability **SO4.2.** Apply Security Configuration Management **SO4.3.** Implementing and managing SIEM	**LI.4.1.** Develop a strategic collaboration plan for a multi-agency cyber defense initiative. **LI.4.2.**Design a SOC layout and integration plan for a mid-sized enterprise. **LI.4.3.**Simulate a security incident and demonstrate how the SOC would respond.	**Unit-4 : Purpose of collaboration capability:** 4.8 Collaboration at the Strategic Level, 4.9 Collaboration at the Tactical Level, 4.10 Collaboration at the Operational Level, **Core security service:** 4.4 basics, 4.5 Security Operations Center, 4.6 Security Configuration Management, 4.7 Integrating cyber	ii. security service iii. Collaboration capability

		intel from different services, **Security Information and Event Management (SIEM)** 4.8 Overview of SIEM systems 4.9 Implementing and managing SIEM 4.10 Correlation and analysis of security events	

SW-4 Suggested Sessional Work (SW):

g. Assignments:

3. Explain Collaboration at the Tactical Level.
4. Explain Implementing and managing SIEM.

h. Mini Project:

Analysis of security events.

i. Other Activities(Specify):

NA.

PEC07.5: Understand the concept of Capability Maturity and TIPs.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	6
SW	2
SL	1
Total	19

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

SO5.1 Understanding the InfoSec and cyber intel, **SO5.2** Importance of security awareness, **SO5.3** Use of Capability Maturity Model **SO5.4** Evaluating the effectiveness of TIPs	**LI.5.1.** Create a security awareness-training module for employees. **LI.5.2.** Conduct a network traffic analysis to identify and report on anomalies. **LI.5.3.** Perform a maturity assessment of an organization's active defense measures.	**Unit 5: Capability Maturity Model:** 5.1 InfoSec and cyber intel, 5.2 Collaboration + Capability = Active Defense, 5.3 Capability Maturity Model – security awareness, 5.4 Baselines and anomalies **Regulatory and Compliance Issues** 5.5 Overview of major cybersecurity regulations (e.g., GDPR, HIPAA, CCPA) 5.6 Compliance management 5.7 The role of audits in cybersecurity **Threat Intelligence Platforms (TIPs)** 5.8 Overview of TIPs 5.9 Integrating TIPs into security operations 5.10 Evaluating the effectiveness of TIPs	1. Capability Maturity Model 2. GDPR, HIPAA, CCPA

SW-5 Suggested Sessional Work (SW):

g. Assignments:

The role of audits in cybersecurity.

h. Mini Project:

Evaluate the effectiveness of TIPs

i. Other Activities(Specify):

NA.

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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)
PEC07.1**:** At the end of this chapter, the student will know the basic concept of Cyber Intelligence.	9	6	2	1	18
PEC07.2**:** At the end of this chapter, the student will Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.	8	6	2	1	17
PEC07.3: At the end of this chapter, the student will describe the targeting and Digital Forensics.	8	6	2	1	17
PEC07.4: At the end of this chapter, the student will know collaboration capability and security service.	10	6	2	1	19
PEC07.5: At the end of this chapter, the student will know concept of Capability Maturity and TIPs.	10	6	2	1	19
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	
1	Understand the basic concept of Cyber Intelligence, Intelligence cycle and Operational Security.	02	05	01	08
2	Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.	02	03	05	10

3	Acquire knowledge regarding to targeting and Digital Forensics.	02	03	07	12
4	Understand the concept of collaboration capability and security service.	1	3	7	10
5	Understand the concept of Capability Maturity and TIPs.	1	05	05	10
Total		13	26	13	50

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

The end of semester assessment for Problem Solving and Programming will be held with written examination of 50 marks.

Suggested Learning Resources:

c. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Practical Cyber Intelligence: How action-based intelligence can be an effective response to incidents	Wilson Bautista	Packt Publishing	2018
2	Security Intelligence: A Practitioner's Guide to Solving Enterprise Security Challenges	Qing Li, Gregory Clark	Wiley	2015

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [*Cyber Security***]**
Course Code: *PECO7*
Course Title: Security 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: Understand the basic concept of Cyber Intelligence, Intelligence cycle and Operational Security.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Acquire knowledge regarding to targeting and Digital Forensics.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Understand the concept of collaboration capability and security service.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Understand the concept of Capability Maturity and TIPs.	-	-	-	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 Cyber Intelligence, Intelligence cycle and Operational Security.	SO1.1 SO1.2 SO1.3	LI.1.1,LI1.2, LI1.3	Unit-1 Need for Cyber 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: Acquire knowledge regarding to Active Defense and Cyber Threat Hunting.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI2.3	Unit-2 An introduction to Active Defense 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: Acquire knowledge regarding to targeting and Digital Forensics.	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3	Unit-3 Understanding targeting 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: Understand the concept of collaboration capability and security service.	SO4.1 SO4.2 SO4.3	LI4.1,LI.4.2, LI.4.3	Unit-4 Purpose of collaboration capability 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 concept of Capability Maturity and TIPs.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2, LI5.3	Unit-5 Capability Maturity Model 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10	

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Semester-VII

Course Code: **PEC-08**

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)	
Program Core (PCC)	**PEC-08**	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 differentinstructional 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-08	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-08	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.

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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 Window, Form Designer, Form Layout **SO1.8.** Discuss about Introduction to	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 Designer, Form Layout, Immediate Window ASP & 1.8 ASP & HTML Forms, Introduction	1. Learn about concept of .net programming.

VB.NET and C# Applications		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 **SO2.3.** Demonstrate the use of Arrays and Dynamic Arrays **SO2.4** Discuss about Operators. Procedures **SO2.5**. Discuss about ExceptionHandling **SO2.6**. Discuss about Using ResumeNext	1. Write a program to implementMDI. 2. Implementationof dialog boxes. 3. Write C# program to implement operator overloading.	**Unit-2 Visual Basic .NET Language:** 2.1 Operators, Conditionals. 2.2 Loops, Statements, Variables, Data Types 2.3 Arrays and Dynamic 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	1. Practice the .Net programming with different topics.

and Resume Line **SO2.7**. Discuss about Using On Errorgoto **SO2.8**. Discuss about Showing and Hiding Forms, Working with Multiple Forms **SO2.9**. Discuss about Multiple Document Interface (MDI) Applications		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 ListBoxes, SO3.5 Discuss about the Combo Boxes, andPicture Boxes SO3.6 Discuss about the Scroll Bars, Splitters,Track Bars, Pickers, SO3.7 Discuss about the Notify Icons, ToolTips, and Timers, SO3.8 Discuss about the Menus, Built-in Dialog Boxes, and Printing, Image Lists, SO3.9 Discuss about theTree 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 PictureBoxes. 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 TabControls.	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):

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		4.10 Web Services	

Services **SO4.10.** Discuss about web services.			

SW-4 Suggested Sessional Work (SW):

Assignments:

1. Discuss web form controls.
2. Define validation controls.
3. Define web services.

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)
O5.1. Understand the concept of Data Access with ADO.NET: Server Explorer Data Adaptorsand 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	1. Make a texteditor (IDE) using Rich Textbox Control. 2. How design master webpage in own website. How to implement Calendar Control.	**Unit 5: Data Access withADO.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	1. learn through practically database connectivity and use in software development

Jet Database, Relational Databases **SO5.6.** Discuss about Binding Controlsto Databases -- Simple Binding, Complex Binding **SO5.7.** Discuss about Navigating in Datasets, Data Forms. HandlingDatabases in Code. **SO5.8.** Discuss about Database Access in Web Applications		Complex Binding, 5.7 Navigating in Datasets, Data Forms. Handling Databases in Code. 5.8. Database Access in Web Applications	

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

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & EngineeringCourse Code: PEC-08

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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech(Cyber Security) Program

Semester-VII

Course Code: OEC01

Course Title: Security Assessment and Risk Analysis

Pre- requisite: Cyber security fundamentals.

Rationale: Cyber security risk management guides a growing number of IT decisions. Cyber securities risks continue to have critical impacts on overall IT risk modeling, assessment and mitigation. The goal ofthis course is to teach students the risk management framework with both qualitative and quantitative assessment methods that concentrate on the information security (IS) aspect of IT risks. The relationship between the IT risk and business value will be discussed through several industry case studies.

Course Outcomes:

OEC01.1: Design information security risk management framework and methodologies.

OEC01.2+: Identify and modeling information security risks

OEC01.3: Judge the difference between qualitative and quantitative risk assessment methods

OEC01.4: Articulate information security risks as business consequences

OEC01.5: Comprehend the use of Auditing.

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)	OEC01	Security Assessment and risk Analysis.	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 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**	**Total Marks** (PRA+ESA)
			Class/Home Assignment 5 number	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**(ESA)**	
PCC	OEC01	Security Assessment and risk Analysis.	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.

OEC101.1: Design information security risk management framework and methodologies

Approximate Hours

Item	AppX

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	Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 To audit the c/c++ or Python code using RATS code checking tool. . **SO1.2** Implement Flawfinder stand-alone script to check for calls to know potentially vulnerable libraryfunction calls	.	**Unit-1.Introduction** 1.1 what is risk and risk management: 1.2 risk assessment 1.3 monitoring and review 1.4 cyberspace 1.5 cyber system 1.6 What is cyber security. 1.7 how does cyber security relate to information security, 1.8 how does cyber security relate to critical infrastructure protection 1.9 how does cyber security relate to safety	3. Search different types of risks.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on Cyber space.
ii. Collect all the information of cyber security.

OEC012: Identify and modeling information security risks.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Implement FindBugs standalone GUI application,or Eclipse plugin for loading custom rules set **SO2.2** Implement pychecker stand-alone script to find bugs in the code.		**Unit-2.0 Cyber Risk** 2.1. What is cyber risk. 2.2. communication and consultation of cyber risk, 2.3. cyber risk assessment, 2.4. monitoring and review of cyber risk 2.5. Context establishment 2.6. context, goals and objectives 2.7. target of assessment, 2.8 interface to cyberspace and attack surface 2.9 focus and assumption, assets, scale and risk evaluation criteria	1. Work on the different cyber risk m onitoring system.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Explain different interface of cyberspace.
ii. Access scale and risk evaluation criteria.

OEC01.3: Judge the difference between qualitative and quantitative risk assessment methods.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Installation of splunk and study basic working as to stores data in its index and therefore separate database required		**Unit-3.0** Risk Identification. 3.1. Risk identification techniques 3.2. malicious risks, 3.3. non-maliciousrisks, 3.4. risk analysis, 3.5. threat analysis, 3.6. Vulnerability analysis 3.7. likelihood of incidents 3.8. consequences of incidents 3.9. Risk analysis techniques	1. Compare and analyze all malicious risks.

SW-1 Suggested Sessional Work (SW):

Assignments:

iii. Work on malicious attacks.
iv. Work on vulnerability analysis.

OEC01.4: Articulate information security risks as business consequences

Approximate Hours

Item	AppX Hrs
Cl	9
LI	0
SW	1

SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Implement splunk to discovers useful information automatically without searching manually .		**Unit-4.0 Risk evaluation** 4.1. Risk evaluation, 4.2. consolidation of risk analysis results, 4.3. Evaluation of risk analysis 4.4. risk aggregation 4.5. Risk grouping 4.6. Risk treatment identification 4.7. risk acceptance 4.8. Two-factor measure 4.9. Three factor measure.	1. Compare and analyze all risk treatment identification.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Work on risk treatment analysis.
ii. Evaluate the risk analysis.

OEC01.5: Comprehend the use of auditing

Approximate Hours

Item	AppX Hrs
Cl	9
LI	0
SW	01
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Implement splunk to converts log data into Visual graphs and reports to simplify analysis, reportingand troubleshooting		**Unit-5.0 Scales** 5.1. which measure to use for cyber risk 5.2. many-factor measure 5.3. classification of scales, 5.4. qualitative versus quantitative risk assessment, 5.5. scale for liklihood 5.6. scale for consequence 5.7. what scale to use for cyber risk 5.8. Defining information security metrics 5.9 What is an IT security assessment, what is an IT security audit, what is compliance, how does and audit differs from assessment,case study: Enron, WorldCom, TJX Credit Card Breach	1. Compare and analyze all Security audits.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of hidden removal techniques.
ii. Use of Painter's algorithm.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
OEC01.1: Design information security risk management framework and methodologies	09	01	01	11
OEC01.2: Identify and modeling information security risks	09	01	01	11
OEC01.3: Judge the difference between qualitative and quantitative risk assessment methods	09	01	01	11
OEC01.4: Articulate information security risks as business consequences	09	01	01	11
OEC01-5: Comprehend the use of auditing.	09	01	01	11
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	Introduction	03	02	03	08
CO-2	Cyber Risk	03	01	05	09
CO-3	Risk identification	03	07	02	12
CO-4	Risk Evaluation	03	05	05	13
CO-5	Scales	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Introduction to Portland cement 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:

9. Improved Lecture
10. Tutorial
11. Case Method
12. Group Discussion
13. Role Play
14. Visit to IT Industry
15. Demonstration
16. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
17. Brainstorming

Suggested Learning Resources:

C. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Cyber-Risk Management	AtleRefsdal, Bj¢rnarSolhaug KetilSt¢len	Springer	1st edition, 2015.
2	Auditing IT Infrastructures for Compliance	Marty M. Weiss and Michael G. Solomon	Jones & Bartlett Learning	1st Edition 2010
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

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COs, POs and PSOs Mapping

Program: B. Tech (Cyber Security)
Course Code: OEC01
Course Title: Security Assessment and risk Analysis

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 Design information security risk management	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	2	**3**	**3**	**1**	**2**

framework and methodologies																	
CO 2 : Identify and modeling information security risks	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO 3: Judge the difference between qualitative and quantitative risk assessment methods	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO 4: : Articulate information security risks as business consequences	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO 5: Comprehend the use of auditing.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Mapping

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: Design information security risk management framework and methodologies	SO1.1 SO1.2		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 : Identify and modeling information security risks	SO2.1 SO2.2		Unit-2 Cyber Risk 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: Judge the difference between qualitative and quantitative risk assessment methods	SO3.1		Unit-3 Risk Identification 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: Articulate information security risks as business consequences	SO4.1		Unit-4 Risk Evaluation 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: Comprehend the use of auditing.	SO5.1		Unit-5 Scales 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: OEC02

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)	
Program Core (PCC)	OEC-02	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)

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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)		
PCC	OEC-02	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 Frameworks available 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 ExpressFrameworks.

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

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COs, POs and PSOs Mapping

Program: B. Tech. (Computer Science & Engineering)

Course Code: OEC-02

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	

AKS University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. Computer Science & Engineering Program

(Revisedason01August2023)

VII SEMESTER

Course Code: BSC-701

Course Title: Biology

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)	
Program Core (PCC)	BSC 701	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 andfeedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment(ESA)	Total Marks
			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 701	Biology	15	20	5	5	5	50	50	100

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Curriculum of B.Tech. Computer Science & Engineering Program

(Revisedason01August2023)

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 1.7 Cell theory 1.8 Discuss how biological observations of 18th Century that lead to major discoveries. 1.9 Understanding Binomial system of nomenclature	1.1 : Importance of Biology in engineering 1.2 Discuss how biological observations of 18th Century that lead to major discoveries

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

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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. 4.5 : Analyze the how does an enzyme catalyze reactions?	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.

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

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(Revisedason01August2023)

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

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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 701

Course Title: Biology

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 -701
Course Title: Biology

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,

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VII SEMESTERS

Course Code: EEC-701

Course Title: Capstone Project (Part 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)	
Program Core (PCC)	EEC701	Major Project-I	0	5	0	1	4	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: -

4. 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 *(Cyber Security)*
Course Code: EEC701
Course Title: Major 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.				
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.				

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Semester-VIII

Course Code: PEC09

Course Title: Blockchain Technology

Pre-requisite: Student should have basic knowledge of security and cryptography.

Rationale: Data security skills can help people develop more skills and build a promising career.

Course Outcomes:

CO1: To understand the Blockchain Technology landscape.
CO2: Able to apply the concept of Cryptocurrencies and Bitcoin.
CO3: Recognize different types of threats and be able to apply cryptographic techniques to counterattack.
CO4: To understand how to build & test compelling blockchain applications using the Ethereum Blockchain.
CO5: To implement security algorithms to make a secure Blockchain ecosystem.

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)	PEC09	Blockchain Technology	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 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:

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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	23CSH-201	Blockchain	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 the Blockchain Technology landscape.

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 basics of blockchain technology. **SO1.2** Understanding distributed ledger technology. **SO1.3** Understanding permissioned ledger and shared ledger. **SO1.4** Understanding consensus mechanism. **SO1.5** Understanding decentralization using blockchain.		**Unit-1 Introduction to Blockchain Technology** 1.1 The growth of blockchain technology, 1.2 Distributed systems, The history of blockchain and Bitcoin, Electronic cash, Blockchain, Peer-to-peer, 1.3 Distributed ledger, Cryptographically-secure, Append-only, Updateable via consensus, Generic elements of a blockchain, 1.4 How blockchain works, How blockchain accumulates blocks, Benefits and limitations of blockchain, Tiers of blockchain technology, Features of a blockchain, Types of blockchain, 1.5 Distributed ledgers, Distributed Ledger Technology, Public blockchains, Private blockchains, Semiprivate blockchains, Sidechains, Permissioned ledger, Shared ledger,	5. Learning basics of blockchain technology

		1.6 Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, 1.7Consensus, Consensus mechanism, Types of consensus mechanisms, Consensus in blockchain, CAP theorem and blockchain 1.8 Decentralization using blockchain, Methods of decentralization, Routes to decentralization, 1.9 Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.	

SW-1 Suggested Sessional Work (SW):

9) Assignments:

6. Public Blockchain
7. Private Blockchain

10) Mini Project:

Smart Contacts

11) Other Activities (Specify):

NA

CO2: Able to apply the concept of Cryptocurrencies and Bitcoin.

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 crowdfunding and prediction markets. **SO2.2** Understanding blockchain ecosystem. **SO2.3** Understanding Turing Virtual Machine. **SO2.4** Understanding distributed censorship resistant. **SO2.5** Understanding digital art.		**Unit-2 Blockchain 2.0** & **3.0** 2.1 Contracts, Financial Services, Crowdfunding, Bitcoin Prediction Markets, 2.2 Smart Property, Smart Contracts, Blockchain 2.0 Protocol Projects, Wallet Development Projects, 2.3Blockchain Development Platforms and APIs, 2.4Blockchain Ecosystem: Decentralized Storage, Communication, and Computation, 2.5 Ethereum: Turing-Complete Virtual Machine 2.6 Blockchain Technology Is a New and Highly Effective Model for Organizing Activity, 2.7 Distributed Censorship-Resistant Organizational Models, 2.8 Namecoin: Decentralized Domain Name System, Digital Identity Verification, 2.9 Digital Art: Blockchain Attestation Services (Notary,	5. Learning various versions of blockchain.

		Intellectual Property Protection)	

SW-2 Suggested Sessional Work (SW):

g. Assignments:

5. Smart Property
6. Smart Contacts

h. Mini Project:

Wallet Development Project

i. Other Activities (Specify):

NA

CO3: Recognize different types of threats and be able to apply cryptographic techniques to counterattack.

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 basics of bitcoin transactions. **SO3.2** Understanding bitcoin mining. **SO3.3** Understanding orphan transactions. **SO3.4** Understanding extended bitcoin network. **SO3.5** Understanding simplified payment verification.		**Unit-3 Satoshi's Bitcoin** 3.1 What Is Bitcoin? History of Bitcoin, Bitcoin Uses, Users, and Their Stories, Getting Started. 3.2 How Bitcoin Works: Transactions, Blocks, Mining, and the Blockchain, Bitcoin Transactions, constructing a Transaction, 3.3 Bitcoin Mining, Mining Transactions in Blocks, Spending the Transaction.	v.Learning basics of bitcoin.

		3.4 Introduction, Bitcoin Addresses, Implementing Keys and Addresses in Python, Wallets, Advanced Keys and Addresses. 3.5 Introduction, Transaction Lifecycle, Transaction Structure, Transaction Outputs and Inputs, 3.6 Transaction Chaining and Orphan Transactions, 3.7 Transaction Scripts and Script Language, Standard Transactions 3.8 Nodes Types and Roles, The Extended Bitcoin Network, Network Discovery, Full Nodes, 3.9 Exchanging "Inventory", Simplified Payment Verification (SPV) Nodes.	

SW-3 Suggested Sessional Work (SW):

i. Assignments:

3. Bitcoin Mining
4. Bitcoin Transactions

j. Mini Project:

Simplified Payment Verification

k. Other Activities (Specify):

NA

CO4: To understand how to build & test compelling blockchain applications using the Ethereum Blockchain.

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 basics of Ethereum. **SO4.2** Understanding Ethereum's four stages of development. **SO4.3** Understanding the third age of internet. **SO4.4** Understanding basics of MetaMask. **SO4.5** Understanding basics of transaction gas.		**Unit-4 Blockchain 3.0: Justice Applications Beyond Currency** 4.1 Components of a Blockchain, The Birth of Ethereum, Ethereum's Four Stages of Development, 4.2 Ethereum: A General-Purpose Blockchain, Ethereum's Components, Ethereum and Turing Completeness, 4.3 From General-Purpose Blockchains to Decentralized Applications (DApps), 4.4 The Third Age of the Internet, Ethereum's Development Culture, Why Learn Ethereum? Ether Currency Units, 4.5 Choosing an Ethereum Wallet, Control and Responsibility, Getting Started with MetaMask. 4.6 Ethereum Networks, Running an Ethereum Client, The First Synchronization of Ethereum-Based	1. Learning applications of blockchain.

		Blockchains, Remote Ethereum Clients. 4.7 Wallet Technology Overview, Wallet Best Practices. 5.8 The Structure of a Transaction, The Transaction Nonce, Transaction Gas, 4.9 Transaction Recipient, Transaction Value and Data, Special Transaction: Contract Creation, Digital Signatures.	

SW-4 Suggested Sessional Work (SW):

j. Assignments:

5. Transaction Gas
6. Transaction Nonce

k. Mini Project:

Getting Started with MetaMask.

l. Other Activities (Specify):

NA.

CO5: To implement security algorithms to make a secure Blockchain ecosystem.

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 basics of smart contacts and solidity. **SO5.2** Understanding Ethereum high level languages. **SO5.3** Understanding decorators and compilation. **SO5.4** Understanding gas considerations. **SO5.5** Understanding Ethereum contacts.		**Unit-5 Smart Contracts and Solidity**: 5.1 What Is a Smart Contract? 5.2 Life Cycle of a Smart Contract, 5.3 Introduction to Ethereum High-Level Languages, 5.4 Building a Smart Contract with Solidity, 5.6 The Ethereum Contract ABI, Programming with Solidity, 5.7 Gas Considerations, Vulnerabilities and Vyper, Comparison to Solidity, 5.8 Decorators, Function and Variable Ordering, Compilation, 5.9 Protecting Against Overflow Errors at the Compiler Level, Reading and Writing Data	1. Learning smart contracts and solidity.

SW-5 Suggested Sessional Work (SW):

j. Assignments:

1. Programming with Solidity
2. Ethereum High-Level Languages

k. Mini Project:

Building a Smart Contract with Solidity

l. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	LI	Sessional	Self-	Total hour

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	Lecture (Cl)	(Laboratory Instruction)	Work (SW)	Learning (Sl)	(Cl+SW+Sl)
CO1**:** At the end of this chapter the student will understand the blockchain technology landscape.	9	0	2	1	12
CO2**:** At the end of this chapter the student will apply the concept of cryptocurrencies and bitcoin.	9	0	2	1	12
CO3: At the end of this chapter the student will recognize different types of threats and be able to apply cryptographic techniques to counterattack.	9	0	2	1	12
CO4: At the end of this chapter the student will understand how to build and test compelling blockchain applications using the Ethereum blockchain.	9	0	2	1	12
CO5: At the end of this chapter the student will implement security algorithms to make a secure Blockchain ecosystem.	9	0	2	1	12
Total Hours	45	00	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction to Blockchain Technology	02	05	01	08
CO2	Blockchain 2.0 & 3.0	02	03	05	10
CO3	Satoshi's Bitcoin	02	03	07	12
CO4	Blockchain 3.0: Justice Applications Beyond Currency	00	03	07	10
CO5	Smart Contracts and Solidity:	00	05	05	10
Total		06	19	25	50

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

The end of semester assessment for blockchain will be held with written examination of 50 marks.

Suggested Learning Resources:

d. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained	Imran Bashir	Packt Publishing,	1st Edition
2	Mastering Bitcoin: Unlocking Digital Cryptocurrencies	Andreas M. Antonopoulos	O'Reilly Publications	2rd Edition
3	Blockchain: Blueprint for a new economy	Melanie Swan	O'Reilly Publications	1st Edition

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: PEC09

Course Title: Blockchain 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	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 Blockchain Technology landscape.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Able to apply the concept of Cryptocurrencies and Bitcoin.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: Recognize different types of threats and be able to apply cryptographic techniques to counterattack.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: To understand how to build & test compelling blockchain applications using the Ethereum Blockchain.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO5: To implement security algorithms to make a secure Blockchain ecosystem.	-	-	-	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: To understand the Blockchain Technology landscape.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Introduction to Deep Learning 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Able to apply the concept of Cryptocurrencies and Bitcoin.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Activation functions and parameters 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: Recognize different types of threats and be able to apply cryptographic techniques to counterattack.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Auto-encoders & Regularization 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: To understand how to build & test compelling blockchain applications using the Ethereum Blockchain.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Deep Learning 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	CO5: To implement security algorithms to make a secure Blockchain ecosystem.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Deep Learning Applications 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

Faculty of Computer Application Science and Information Technology

Department of Computer Science Bachelors in Technology [B.Tech.]

Artificial Intelligence and Data Science [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-VIII

Course Code: PEC10

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:

CO.1At the end of this chapter the student will Understand the statistical foundation for data science.

CO.2 At the end of this chapter the student will Apply statistical thinking in collecting, modeling and analyzing data.

CO.3 At the end of this chapter the student will visualize all types of data

CO.4 At the end of this chapter the student will 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)	
Program Core (PCC)	PEC10	Statistical Thinking for Data Science	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.

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Department of Computer Science Bachelors in Technology [B.Tech.]
Artificial Intelligence and Data Science [Cyber Security] Program
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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 (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	PEC 10	Statistical Thinking for Data 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.

CO.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	LI1.1. Calculate the mean, median, and mode for a given dataset. LI1.2. Determine the standard deviation and variance of a set of	**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. Learn Feature engineering

analysis **SO1.4** Discuss data Visualization **SO1.5** Model creation and validation.	data points. LI1.3. Create a histogram and interpret the distribution of a dataset.	1.5 Aggregation 1.6 Exploratory data analysis 1.7 Visualization 1.8 Feature engineering 1.9 Model creation and validation	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) **Discuss about different techniques of data analysis**

b. Presentation

CO2.2: 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 SO2.3To 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

CO3.3: 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 SO3.2 know the Conditional Probability and Bays Rule SO3.3 To understand the Linear Regression. SO3.4 develop a Special Regression Model	LI3.1. Compute 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.	**Unit3:Statistical Thinking 2 (9 lecture)** 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.	I. Learn about Simpsons Paradox

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain Association and Causation

b. Presentation

CO.4: Ability to visualize all types of data

Approximate Hours

Item	Appx. Hrs
Cl	9
LI	0
SW	2

SL	1
Total	12

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 **SO4.4** To Understand the Principles of graphics	LI4.1. Use autocorrelation and partial autocorrelation functions in time series analysis. LI4.2. Apply ARIMA modeling to make predictions in a time series dataset. LI4.3. Evaluate the accuracy of time series forecasts using appropriate metrics.	**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 4.6. Graphs to Check Fitted Models 4.7. What makes a good graph? 4.8. Principles of graphics. 4.9. Principles of graphics.	i. Draw a different graphs to fitted models

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.

CSE101.5: Understand how to use R for different types of data

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)**
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 data science project.	**Unit5: Introduction to Bayesian 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 5.6 Bayesian modeling for Big Data	I. Learn forecasting problem

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)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1. Understand the statistical foundation for data science	9	2	1	**12**
CO2 Apply statistical thinking in collecting, modeling and analyzing data	9	2	1	**12**
CO3 Apply statistical thinking in **collecting**, modeling and analyzing data	10	2	1	**13**
CO4 Ability to visualize all types of data	9	2	1	**12**
CO5 Understand how to use R for different types of data	8	2	1	**11**
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	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 Guid A Beginner's Guide	C. Raju	Penguin Random House	2023

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: B. Tech. (Computer Science & Engineering) [Cyber Security]

Course Code: PEC10

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** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

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)

VIII Semester

Course Code: OEC03

Course Title: Intrusion Detection Systems

Pre-requisite: Fundamental knowledge in Operating Systems, and Networks

Rationale: Intrusion Detection Systems (IDS) monitor networks for unauthorized access and anomalies, providing early threat detection, compliance support, and enhancing overall cybersecurity posture with proactive monitoring and incident response capabilities.

Course Outcome:

CO.1. To introduce basic concepts of intrusion detection system.
CO.2. To understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.
CO.3. To Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
CO.4. To Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
CO.5. To learn agent development for intrusion detection and architectural models of IDs and IPs.

Scheme of Studies:

Board ofStudy	Course Code	CourseTitle	Scheme ofstudies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Program Core (CS)	OEC03	Intrusion Detection Systems	2	2	1	1	6	3

Legend: CI: Classroom Instruction (Includes different instructional strategiesi.e., Lecture(L)andTutorial (T)andothers),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locationsusingdifferentinstructionalstrategies)
SW: Sessional Work (includesassignment, seminar, miniproject etc.),
SL: Self Learning,
C: Credits.

Note:
SW&SLhastobeplannedandperformedunderthecontinuousguidanceandfeedbackofteacherto ensure outcome ofLearning.

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Scheme of Assessment:

Theory

Board ofStudy	Couse Code	CourseTitle	SchemeofAssessment (Marks)							
			ProgressiveAssessment (PRA)						EndSemesterAssessment	Total Marks
			Class/HomeAssignment5number3 marks each (CA)	Class Test2 (2bestout of3) 10 marksea ch(CT)	Seminarone (SA)	ClassActivityanyone (CAT)	ClassAttendance (AT)	TotalMarks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ESA)
ProgramCore(CS)	OEC03	Intrusion Detection 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.

CO .1. Introduction to Intrusion Detection

Item	AppXHrs
Cl	6
LI	2
SW	1
SL	1
Total	10

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

SO1.1 Define network security and its importance in protecting computer networks from unauthorized access and malicious activities **SO1.2** Identify common network security threats and vulnerabilities, including malware, phishing, and denial-of-service (DoS) attacks **SO1.3** Understand the basics of intrusion detection systems (IDS) and intrusion prevention systems (IPS), including their types, features, and deployment options **SO1.4** Understand the strengths and limitations of each type of IDS**.** **SO1.5** Describe the key features and functionalities of each type of IDS.	LI1. What is the difference between signature-based and anomaly-based IDS detection methods? LI2. Compare: Host-based IDS monitors single hosts for internal threats, while Network-based IDS monitors network traffic for external attacks.	**Unit-1.0** Introduction to Intrusion Detection 1.1 Introduction to Network Security and Intrusion Detection . 1.2 Overview of network security concepts 1.3 Threats and vulnerabilities in computer networks 1.4 Introduction to intrusion detection and its role in network security 1.5 Types of Intrusion Detection Systems 1.6 Host-based vs. Network-based IDS	**SL.1** Monitors network traffic for signs of unauthorized access or malicious activity

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain the difference between a console and a database in IDS.
ii. Explain the concept of the OSI model and how it relates to network security.
iii. Explain the importance of network segmentation and how to implement it.

b. Mini Project:

c. Other Activities (Specify):
Provide examples and case studies.

CO .2 IDS Architecture and Components

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Item	AppXHrs
Cl	6
LI	2
SW	1
SL	1

Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Explain the use cases and scenarios where each type of IDS is best suited. **SO2.2** Understanding the types of IDS is crucial for selecting the most effective solution for a given network environment. **SO2.3** Identify the advantages and disadvantages of each IDS architecture type. **SO2.4** Explain the importance of data collection, processing, and storage in IDS. **SO2.5** Describe the role of signature databases and rule sets in IDS.	2.1 Design a centralized IDS architecture for a small network. 2.2 How does a distributed IDS architecture improve scalability and flexibility?	**Unit-2.0 IDS Architecture and Components** 2.1. Signature-based vs. Anomaly-based IDS 2.2. Behavior-based and Heuristic-based IDSDeterminant 2.3. IDS Architecture and Components 2.4. Sensors, analyzers, and response modules 2.5. Centralized vs. Distributed IDS architectures 2.6. Integration with other security systems	**SL.1** Describe the role of a sensor in an IDS architecture. How does it collect data?

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain the purpose of signature databases in IDS.
ii. How are rule sets used in IDS to detect threats?
iii. How does IDS tune impact system resources and performance?

b. Mini Project:

c.Other Activities (Specify):

CO .3 Signature-Based IDS

Item	AppXHrs
Cl	8
LI	2
SW	1
SL	1
Total	10

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
SO3.1 Define signature-based IDS and explain its role in network security. **SO3.2** Describe the architecture of a signature-based IDS **SO3.3** Explain the process of signature-based detection	1.1 Configure a signature-based IDS to detect a specific network attack (e.g. SQL injection). 1.2 Describe the process of updating signature databases in a signature-based IDS.	**Unit-3.0 Signature-Based IDS** 3.1. Signature-Based IDS 3.2. Understanding signature-based detection. 3.3. Understanding signature-based detection 3.4. Snort as a case study for signature-based IDS 3.5. Signature creation and management 3.6. Anomaly-Based IDS	**SL.1** Explain how to integrate signature-based IDS with other security tools (e.g. firewalls, antivirus software).

SW-1 Suggested Sessional Work (SW):

a. Assignments:

I. What is signature-based detection, and how does it work?
II. What are the advantages and disadvantages of signature-based detection?
III. Describe the process of creating and managing signatures.
IV. How do you optimize signature performance in IDS?

b. Mini Project:

c. Other Activities (Specify):

Case Study: Provide hands-on examples of tool usage.

CO .4 IDS Evasion Techniques and Countermeasures

Item	AppXHrs

Cl	8
LI	2
SW	1
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Identify common IDS evasion techniques used by attackers **SO4.2** Explain how each evasion technique works and its impact on IDS detection. **SO4.3** Describe countermeasures to detect and prevent IDS evasion **SO4.4** Understand the importance of IDS tuning and optimization to detect evasion techniques. **SO4.5** Apply best practices for implementing countermeasures to prevent IDS evasion.	1. How would you detect and prevent fragmentation attacks on an IDS? 2. Configure an IDS to detect encrypted traffic and identify potential evasion techniques.	Unit-4 IDS Evasion Techniques and Countermeasures 4.1 Understanding anomaly-based detection 4.2 Machine learning approaches for anomaly detection 4.3 Challenges and limitations of anomaly-based IDS 4.4 Common techniques used by attackers to evade detection 4.5 Strategies for improving IDS evasion resilience 4.6 Case studies on real-world evasion scenarios	**SL.1** Develop a comprehensive countermeasure plan to detect and prevent IDS evasion techniques.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   I. Implement a stateful inspection countermeasure to detect and prevent IDS evasion.
   II. Explain how to use behavioral analysis to detect and prevent IDS evasion.
   III. How would you integrate IDS with other security controls to detect and prevent evasion techniques?

b. Mini Project:

c. Other Activities (Specify):
Case Study: Explore regulations and compliance requirements.

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CO .5 **IDS Deployment and Management**

Item	AppXHrs
Cl	6
LI	2
SW	1
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1. Plan and design an IDS deployment strategy for a network. **SO5.2** Identify and explain the different IDS deployment modes (e.g. inline, tap, span). **SO5.3** Configure and deploy an IDS sensor on a network. **SO5.4** Understand and explain the importance of IDS sensor placement. **SO5.5**. Describe and implement IDS management best practices	1. Deploy an IDS sensor in inline mode on a network and configure it to detect and alert on specific traffic patterns. 2. Configure an IDS sensor to use a specific signature database and update the signatures regularly.	**Unit-5.0** : IDS Deployment and Management 5.1 Best practices for deploying IDS in different network environment 5.2 IDS configuration and tuning 5.3 Incident response and management using IDS alerts 5.4 Emerging Trends in IDS Intrusion detection in cloud environments 5.5 IoT security and intrusion detection Future developments and challenges in intrusion detection	**SL.1** Deploy an IDS sensor in a cloud environment and configure it to integrate with cloud security services.

Brief of Hours suggested for the Course Outcome

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

Course Outcomes	ClassLecture (Cl)	SessionalWork (SW)	Self-Learning (Sl)	Total hour(Cl+SW+Sl)
CO1	6	1	1	8

CO2	6	1	1	8
CO3	6	1	1	8
CO4	6	1	1	**8**
CO5	6	1	1	8
TotalHours	30	5	5	40

CO	**UnitTitles**	**MarksDistribution**			**Total Marks**
		R	**U**	**A**	
CO1	Unit-1	03	04	03	10
CO2	Unit-2	05	03	02	10
CO3	Unit-3	05	03	02	10
CO4	Unit-4	04	05	01	10
CO5	Unit-5	03	05	2	10
Total		20	17	13	50

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

SuggestedInstructional/ImplementationStrategies:

18. ImprovedLecture
19. Tutorial
20. CaseMethod
21. GroupDiscussion
22. RolePlay
23. VisittoIT Industry.
24. Demonstration
25. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT,Blog,Facebook, Twitter,WhatsApp,Mobile,Onlinesources)
26. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID	Rafeeq Rehman	1st Edition, Prentice Hall ,	2003.
2	Intrusion Detection and Correlation Challenges and Solutions	. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna,	1st Edition, Springer	2005
3	Intrusion Detection & Prevention	Carl Endorf, Eugene Schultz and Jim Mellander	Tata McGraw-Hill	2004
4	A Text book on Grid Application Development and Computing Environment	T. Fahringer, R. Prodan	6th Edition, KhannaPublihsers	2012

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CO-PO Mapping:

PO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Program 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**
CO1	3	3	3	3	2	1	1	1	1	1	1	3
CO2	3	3	3	2	3	1	1	1	1	1	1	3
CO3	3	3	3	3	3	2	1	1	1	1	1	3
CO4	3	3	2	3	3	1	1	1	1	1	1	3
CO5	3	3	2	3	3	1	1	1	1	1	1	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	**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 above
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** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

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-VIII

Course Code: OEC06
Course Title: AI using Python

Pre-requisite: Before embarking on the "AI Using Python" program, students should possess a foundational understanding of programming concepts, preferablyin Python.

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, commonpitfalls, 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)	
	OEC- 06	AI using Python	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)		
	OEC- 06	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)		
	OEC - 06	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	**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	**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.	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.

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	activation functions and gradient descent. **LI01.3** Data Preprocessing Workshop: Lead a workshop on common data preprocessing techniques	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.	
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	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.	

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.			

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 AIsystems for fairness.	**LI04.1** Bias Detection and Mitigation: Identifyand address bias inAI algorithms using datasets and mitigation	**Unit-4 AI and Society** 4.1 AI Realism Discussion: Explore AI's capabilitiesand limitations realistically. 4.2 Bias Detection	SL1. Self-study AI ethics frameworks by organizations like IEEE and ACM. Explore key principles

SO4.3 Evaluate AI's Job Impact: Assess AI'simpact on employment and identify strategies for workforce transitions. **SO4.4** Analyze Ethical Dilemmas: Examine ethicalissues in AI, fostering ethical decision-makingskills. **SO4.5** Understand Socioeconomic Implications: Explore AI's socioeconomic effects and consider policy interventions.	techniques. **LI04.2** Ethical AI Scenarios: Analyzeethical dilemmas inAI through case studies and proposeethical solutions. **LI04.3** Socioeconomic Impact Analysis: Investigate the socioeconomic implications of AI adoption using dataanalysis and discussion. **LI04.4** Policy Intervention Simulation: Simulate policy interventions to address AI's societalimpacts and discuss potential outcomes.	Workshop: Identify andmitigate bias in AI algorithms using practical examples. 4.3 Ethical Dilemma Debate: Engage in debates on ethical issuesin AI, fostering ethical decision-making. 4.4 Job Impact Analysis: Assess AI's impact on employment and discussstrategies 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 proposesolutions. 4.8 AI Governance Panel: Host a panel discussion	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 designingand 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

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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 -06

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.	

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Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of BSC (IT) (Bachelor of Science)

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Semester-VIII

Course Code: **OECO5**

Course Title: Linux and Shell Programming

Pre-requisite: **Student should have basic knowledge of Operating System.**

Rationale: The aim of the course is teaching the students to understand the basic principles of Linux OS and also help them understand its utilities. The syllabus includes shell programming, a control
Section, and general coding. Linux OS supports programming in various languages like C, C++, Java, etc.

Course Outcomes:

CO.1: Student will understand the basic concepts of Linux OS.
CO.2: Student will learn how to install and configure Linux on physical or virtualmachines.
CO.3: Student will acquire proficiency in using the Linux command-line interface
CO.4: Student will learn how to manage user accounts and groups on a Linux system.
CO5: Student will understand Linux security mechanisms

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)	
Major	OEC05	Linux and Shell Programming	4	4	1	1	10	6

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	Cous e 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)
Major	01CA612	Linux Operating system	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)**		
Major	01CA612	Linux Operating system	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.

01CA612.1: Student will understand the basic concepts of Linux OS.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

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Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand about history and introduction of Linux. **SO1.2 Understand** about Basic Architecture, Different Flavor **SO1.3 Understand** about CUI And GUI, LINUX Vs Windows File System and Blocks **SO1.4 Understand** about Installation of Linux. **SO1.5 Understand** about Essential Tools: Log in	1. How to install Linux. 2. Linux Directory Commands: pwd, mkdir, rm -rf, ls, cd,cd /,cd~ 3. Linux File Commands: touch, cat, cal > 4. , cat >>, rm,cp, mv, rename 5. Linux Permission Commands: su, id, 6. Linux Permission useradd,passwd,	**Unit-1.** **(11Lectures)** 1.1. History, what is LINUX 1.2. Basic Architecture, Different Flavor, 1.3. CUI And GUI, 1.4. LINUX Vs Windows 1.5. File System and Blocks, 1.6. Installation of Linux. 1.7. Essential Tools:	1. 1.Search History of Linux and run basic commands.
And Switch Users, Create and Edit Text Files, Delete. **SO1.6 Understand** Copy, and Move Files and Directories, Create Hard and Soft Links **SO1.7 Understand** about Archive, File Compression **SO1.8 Understand** about Decompression using tar, star, gzip, and bzip2.		Log in and Switch 1.8. Users, Create and Edit Text Files, Delete, 1.9. Copy, and Move Files and 1.10. Directories, Create Hard and Soft Links 1.11. Archive, File Compression Decompression 1.12. using tar, star, gzip, and bzip2.	

SW-1Suggested Sessional Work (SW):

a. Assignments:

(i) Describe basic architecture of Linux.

b. *Presentation*

c. Pictorial representation of Installation of Linux.

01CA612.2: Student will learn how to install and configure Linux on physical or virtual machines.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning(SL)
2.1 Understand the boot, reboot and shutdown services. **SO2.2 Discuss** about start and stop vm. **SO2.3 Demonstrate** ip configuration. **SO2.4 Discuss** about list, create, delete partition. **SO2.5 Discuss** about mount and unmount file system. **SO2.6 Discuss** about vFAT, ext4, xfs File Systems, **SO2.7 Discuss** about Extend Existing Logical Volumes, **SO2.8 Discuss** about Create and Manage **SO2.8 Discuss** about Access Control Lists	2.1 Linux Permission Commands: groupadd, chmod, groupdel, chown, chgrp 2.1 Linux File Content Commands: head, tail, tac,more, less, 2.2 Linux Filter Commands:grep, cat, cut, grep 2.3 Linux Filter Commands:comm, sed, tee, tr, uniq, wc,od, sort, diff. 2.4 Diffrentiate Vfat, ext4, xfs. 2.5 Configure Local system.	**Unit-2** **(09 Lectures)** Services 2.1. Boot, Reboot, and Shut Down 2.2. Start and Stop Virtual Machines, 2.3. IP Configuration, Start, Stop, and 2.4. Check the Status of Network Services. 2.5. Configure Local Storage: 2.6. List, Create, and Delete Partitions, Logical Volumes, and 2.7. Swap. File System Configuration: 2.8. Create ,mount,unmount 2.9. Vfat,ext4, xfs file system. 2.10. Extend exixting Logical Volumes. 2.11. Create and manage 2.12. Access Control list.	1. How to configure file system and how to work services by practical.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) How to work boot, reboot, and shutdown services in Linux.

(ii) Presentation

b. Pictorial representation of creating partition in Linux:

01CA612**.3:** Student will acquire proficiency in using the Linux command-line interface.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1

Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
O3.1 Understand the Shell, Types of Shell, Shell Variable, Keywords, Environment Variable **SO3.2 Discuss** about shell script. **SO3.3 Discuss** about For Loop, While Loop, Until Loop, **SO3.4 Discuss** about if statements. **SO3.5 Discuss** about case statements. **SO3.6 Discuss** about Create, Delete, Modify Local User Accounts **SO3.7 Discuss** about Create, Delete, Modify Local Groups and Group Memberships. **SO3.8 Discuss** about grep, egrep, sed, cut, **SO3.9 Discuss** about paste, sort, split, **SO3.10 Discuss** about write, mail, mesg, wall.	3.1 Linux Utility Commands: find, bc, locate, date, cal, 3.2 Linux Utility Commands: sleep, time, df, mount, 3.3 Linux Utility Commands: exit,clear, gzip, gunzip. 3.4 Linux Networking Commands: ip,ssh, mail, ping, host 3.5 Commands grep,egrep 3.6 Create user group with permissions.	**Unit-3: Shell Programming: (09 Lectures)** 3.1. Shell, Types of Shell, Shell Variable, Keywords, Environment Variable 3.2. Shell Script, Parameter Passing, 3.3. Positional Parameter & Shifting, 3.4. For Loop, While Loop, Until Loop, 3.5. If Statement 3.6. Case Statement. **User and Group Management:** 3.7. Create, Delete, Modify Local User Accounts **3.8.** Create, Delete, Modify Local Groups and Group Memberships. **Text Manipulation:** 3.9. grep, egrep, sed, cut, 3.10. paste, sort, split, 3.11. User to User Communication: 3.12. write, mail, mesg, wall.	i. Create shell script and run in vi editor.

SW-3 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write a shell program using for loop.

(ii) Presentation

b. Pictorial representation of Linux commands:

01CA612.4: Student will learn how to manage user accounts and groups on a Linux system.

Approximate Hours

Item	Appx. Hrs.
Cl	12

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LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the concept of security management. **SO4.2 Discuss** about firewall and iptables. **SO4.3 Discuss** about set enforcing and permissive modes. **SO4.4 Discuss** process and its types. **SO4.5 Discuss** about process command **SO4.6 Discuss** about scheduling command. **SO4.7 Discuss** about wait and background jobs. **SO4.8 Discuss** about pattern scanning **SO4.9 Discuss** about BEGIN and END Pattern **SO4.10 Discuss** about awk functions.	4.1 Edit Crontab file: towall message on system on particular time automatically. 4.2 Vi editor: Create file, edit, save and quit. 4.3Vi editor: Highligting the searched term within a file. cut, yank,undo 4.4.Process command ps,kill, nice 4.5Scheduling commands at,crontab 4.6 Awk Arithmetic. .	**Unit-4 :** **(10 Lectures)** Security Management: 4.1.Configure Firewall, firewall-config, 4.2.firewall-cmd, iptables, 4.3. Set Enforcing and Permissive Modes for SElinux. Process: 4.4.Process, Types, 4.5. Process Command: ps, kill, nice. 4.6. Scheduling Commands: at, crontab, sleep 4.7. wait, Back Ground Jobs. 4.8. AWK: Pattern Scanning 4.9. BEGIN and END Pattern 4.10. awk Arithmetic, Variables, 4.11. Operations and 4.12. Function.	i. Configure firewall and process command

SW-4 Suggested Sessional Work (SW):

Assignments:

PresentationWrite about process command.

(i) Write about awk command.

c. Pictorial representation of configure firewall in Linux

CO5. Comprehend the use of learning system.

Approximate Hours

Item	Appx. Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the concept of Student will understand Linux security mechanisms **SO5.2** Demonstrate theuse of Webhosting, FTP **SO5.3** Demonstrate the use **TELNET, Traceroute** SO5.4 Discuss about DNS, Linux **SO5.5** Discuss about the Cloud. Introduction to Cluster and Site **SO5.6** Discuss about the Docker Container **SO5.6** Discuss about the OpenShift, **SO5.6** Discuss about the Python,scripting language	.	**Unit-5.0** **IPC & Socket Programming:** 5.1. Student will understand Linux security mechanisms, 5.2. Webhosting, 5.3. FTP, 5.4. 5.3.TELNET, 5.5. Traceroute, 5.6. DNS, 5.7. Linux and Cloud. 5.8. Introduction to Cluster and Site 5.9. Docker Container, 5.10. OpenShift, Kubernetes, Ansible. 5.11. Azure, 5.12. introduction Scripting Language Python.	1. Search and analyze socket programming.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Different types of learning techniques.

b. Presentation:

c. Other Activities (Specify): Group discussion on important topics.

Brief of Hours suggested for the Course Outcome

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Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
01CA612.1**: Student will understand the basic concepts of Linux OS.**	**12**	**12**	**1**	**1**	**26**
01CA612.2 **Student will learn how to install and configure Linux on physical or virtual machines.**	**12**	**12**	**1**	**1**	**26**
01CA612.3 **Student will learn how to manage user accounts and groups on a Linux system.**	**12**	**12**	**1**	**1**	**26**
01CA612.4 **Student will learn how to manage user accounts and groups on a Linux system.**	**12**	**12**	**1**	**1**	**26**
01CA612.5 **Student will understand Linux security mechanisms**	**12**	**12**	**1**	**1**	**26**
Total Hours	**60**	**60**	**05**	**05**	**130**

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	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for autonomous system for AI and DS 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	Unix shell programming	Y Kanetkar.	BPB Publications	6th edition
	The 'C' Odyssey Unix –The open Boundless C	Meeta Gandhi, Tilak Shetty and Rajiv Shah	BPB Publications	3rd Edition

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: B.Tech(CSE) Cyber Security
Course Code: 0EC05
Course Title: Linux and Shell 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 Student will understand the basic concepts of Linux OS.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2 Student will learn how to install and configure Linux on physical or virtual machines.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO3 Student will acquire proficiency in using the Linux command-line interface	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO4: Student will learn how to manage user accounts and groups on a Linux system.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO.5: Student will understand Linux security mechanisms	-	-	-	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	CO1: Student will understand the basic concepts of Linux OS.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Linux operating system 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: Student will learn how to install and configure Linux on physical or virtual machines	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Services 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	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Student will acquire proficiency in using the Linux command-line interface	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Shell Programming: 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: Student will learn how to manage user accounts and groups on a Linux system	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Security Management 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Student will understand Linux security mechanisms	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : IPC & Socket Programming 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science Bachelors in Technology [B.Tech.]

Artificial Intelligence and Data Science [Cyber Security] Program

(Revised as on 01 August 2023)

Semester-VIII

Course Code: **OEC06**

Course Title: **AI for Everyone**

Pre- requisite: Student should have good knowledge of mathematics, analytical skills, programming language and ability to understand complex algorithm.

Rationale: Artificial intelligence (AI) has the potential to revolutionize education by providing students with personalized learning experiences, real-time feedback, and access to a wealth of educational resources.

Course Outcomes: After completion of course, students will able to

CO.1 Understand the basic concepts of AI and machine learning.
CO.2 Understand the working of self-driving systems.
CO.3 Understand how to build different AI projects.
CO.4 Evaluate the impact of AI on society.
CO.5 Apply AI techniques to any application domain.

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)	
OE	PC702	AI for everyone	2	2	1	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	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)		
OE	PC702	AI for everyone	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)

			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
O E	OEC06	AI for every one	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.

OE004.1 Understand the basic concepts of AI and machine learning.

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)**
SO1.1 Understand the concept of machine learning. **SO1.2** Explanation of various terminologies of AI **SO1.3** Understand non technical explanation of deep learning. **SO1.4** Understand Basics of neural network.	LI1.1Familiarize yourself with basic Python syntax. LI1.2Write a Python script that prints "Hello, AI!" to the console..	**Unit-1.0 Introduction to Artificial Intelligence.** 1.1 Understanding definition and role of data in machine learning. 1.2 Overview of machine learning. 1.3 Learning various terminologies like deep learning,	1. Understand how to manipulate and prepare data for machine learning.

SO1.5 Examples and application domains of AI. .		machine learning and artificial intelligence. 1.4 What do we need to establish an AI company. 1.5 What Machine Learning Can and Cannot Do. 1.6 Understanding	
		basics of neural network like – Neurons, Layers, Weights and Biases etc. 1.7 Learning about examples of AI like virtual assistance, Recommendation system, Image recognition, Natural language processing etc. 1.8 Understanding use of AI in various application domain.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i) Explore the application of AI in processing and understanding human language.
ii) Explore the societal impacts and ethical considerations of AI.

b. Mini Project:

i) Choose a dataset (e.g., from Kaggle) and load it using a Python library like Pandas. Explore the data, handle missing values, and perform basic preprocessing.

Other Activities (Specify):

Write a short essay or create a presentation discussing the ethical considerations in AI. Address topics like bias, transparency, and accountability.

OE004.2 Understand the working of self-driving systems.

Approximate Hours

Item	Appx. Hrs
Cl	8
LI	6
SW	2
SL	1
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 To Understand the work flow in machine learning and data science projects. **SO2.2** To learn data cleaning, preprocessing, exploring and analyzing. **SO2.3** How to select an AI project for your company. S**O2.4** To process and visualize data. **SO2.5** Learn technical tools for AI and use of python in AI projects.	**LI2.1** Explore and clean datasets using tools like Pandas **LI2.2**. Handle missing data, outliers, and categorical variables. **LI2.3** Implement a simple machine learning model using Scikit-learn.	**Unit-2 Building AI project** **2.1** Workflow of a machine learning project. **2.2** Workflow of a data science project. **2.3** how to use data **2.4** How to choose an AI project **2.5** Working with an AI team. **2.6** How to process and visualize data. **2.7** Technical tools for AI teams. **2.8** use of python in AI related projects	i. Understand the organization's goal and challenges for AI projects. ii. Use libraries like Pandas for cleaning and processing data.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explore a dataset of your choice. Clean the data, visualize key trends using graphs or charts, and perform basic statistical analysis.

ii. Create a guide or presentation on essential technical tools for AI teams.

b. Mini Project:

Develop a simple AI project using Python. This could be a basic machine learning model, a data analysis task, or a script to interact with an API

c. Other Activities (Specify):

Form a hypothetical AI team and assign roles to each member. Develop a communication plan,

set up collaborative tools, and outline a project management strategy for a given AI project.

OE004.3 Understand how to build different AI projects.

Approximate Hours

Item	Appx. Hrs
Cl	07
LI	6
SW	2
SL	1
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 A case study of new smart speaker with advanced AI capabilities **SO3.2** A case study of self-driving car to enhance safety. **SO3.3** Understanding example roles of an AI team. **SO3.4** AI pitfall to avoid project failure. **SO3.5** Survey of major AI application area.	**LI 3.1**. Fuzzy logic and neural network. **LI 3.2** Integrate the deployed model into a web application or API. **LI 3.3** Tokenize and preprocess text data.	**Unit-3** : **Building AI in your company.** **3.1** The goal is to case study a device that not only plays music but also understands and responds to user commands, acting as a virtual assistant. **3.2** A case study of a self-driving car to enhance safety and provide an autonomous driving experience. **3.3** Evaluate the role of AI project team members. **3.4** Understanding AI pitfalls to avoid project failure. **3.5** Understanding AI pitfalls to avoid project failure 1 **3.6** Understanding the use of AI in major application areas. **3.7** Understanding the use of AI in major application areas. 1	i. Clearly outline the goals of the smart speaker, including the desired AI features. ii. Explore the motivation behind creating smart speakers.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Introduce the specific smart speaker or brand you will focus on for the case study.

ii. Research and identify at least five common pitfalls associated with AI development and deployment.

b. Mini Project:

Explore the machine learning and AI models used in the development of smart speakers.

Other Activities (Specify):

Speculate on potential future developments in smart speaker technology.

OE004.4 Evaluate the impact of AI on society.

Approximate Hours

Item	Appx. Hrs
Cl	10
LI	6
SW	4
SL	2
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 To understand realistic view of AI. **SO4.2** Understanding the discrimination/Bias in AI **SO4.3** Understanding adversarial attacks on AI. **SO4.4** Understand adverse uses of AI. **SO4.5** Impact of AI on employment.	**LI 4.1** Explore ethical implications of AI projects. **LI 4.2** Address bias, fairness, and privacy concerns in your models. **LI4.3** Automate	**Unit-4 : AI and Society** **4.1** Assessment of AI's current capabilities, limitations and challenges. **4.2** Define the concepts of discrimination and bias in the context of AI. **4.3** Define adversarial attacks and their significance in the context of AI with example.	i. Find out areas where AI struggles, such as common-sense reasoning, ethical considerations, and the need for massive amounts of data. ii. Explore how bias can emerge in AI systems

	testing and deployment processes.	**4.4** Explore the ethical implications of using AI for malicious purposes. **4.5** Explore how AI can benefit developing economies, such as improving healthcare, optimizing agriculture, and enhancing education. **4.6** Explore how AI can benefit developing economies, such as improving healthcare, optimizing agriculture, and enhancing education 1 **4.7** Examine the impact of AI on different sectors of employment. **4.8** Examine the impact of AI on different sectors of employment 1. **4.9** Discuss instances where AI may lead to job displacement and scenarios where it contributes to job creation. **4.10.** Explore how the job market may require new skill sets due to AI integration.	

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

a. Assignments:

i. Highlight AI applications that have made positive impacts, such as healthcare diagnostics, language translation and automation.

ii. Explore how the job market may require new skill sets due to AI integration.

c. Mini Project:

Create a report to discuss potential policy interventions to manage the impact on employment, such as retraining programs and social safety nets.

d. Other Activities (Specify):

Power Point Presentation on adverse uses of AI.

OE004.5 Apply AI techniques to any application domain.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Explore AI case studies related to a specific domain.	**LI.5.1** Implement self-driving vehicle algorithm. **LI 5.2** Use techniques like one-hot encoding, scaling, and dimensionality reduction. **LI 5.3** Train a neural network using a deep learning library like TensorFlow or PyTorch.	**Unit 5: AI case studies related to a specific domain.** **5.1** Case study of medical Imaging using AI. **5.2** Case study of Retina scan using AI. **5.3** Case study of Mining surveying using AI. **5.4** Case study of AI in Share Market. **5.5** Case study of Google weather forecasting using AI. **5.6** Case study of smart watch using AI. **5.7** Case study of Tesla self driving cars using AI. **5.8** Case study of AI in vaccination development. **5.9** Case study of " HANOOMAN" BharatGPT. **5.10** Case study of AI in Airforce. **5.11** Case study of AI in Defence. **5.12**. Case study of AI in chadrayaan 3.	1.Try to study some major AI application domains like : Healthcare, finance, retail, Education, manufacturing, autonomous vehicles, Entertainment, agriculture, cybersecurity etc.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Find out uses AI to make trading decisions based on market trends and historical data.

ii. Adapts educational content to individual student needs.

b. Mini Project:
Implement self-driving vehicle algorithm.

c. Other Activities (Specify):
Demonstrate the versatility of AI in addressing complex challenges and optimizing processes across various industries.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
OE004.1 Understand the basic concepts of AI and machine learning.	8	2	1	11
OE004.2 Understand the working of self-driving systems.	8	2	1	11
OE004.3 Understand how to build different AI projects.	7	2	1	10
OE004.4 Evaluate the impact of AI on society.	10	4	2	16
OE004.5 Apply AI techniques to any application domain.	12	2	1	15
Total Hours	45	12	6	63

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Understand the basic concepts of AI and machine learning.	03	01	01	05
CO-2	Understand the working of self-driving systems.	02	06	02	10

CO-3	Understand how to build different AI projects.	03	07	05	15
CO-4	Evaluate the impact of AI on society.	02	08	05	15
CO-5	Apply AI techniques to any application domain.	03	02	-	05
Total		13	24	13	50

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

The end of semester assessment for AI for everyone 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. Case study on AI domain
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	Artificial Intelligence: A Modern Approach	Stuart Russell	Prentice Hall	2010
2	Artificial Intelligence: The Basics	Kevin Warwick	Routledge2011	1999
3	Artificial Intelligence for Humans	Jeff Heaton	CreateSpace Independent Publishing	2015
4	https://www.coursera.org/learn/ai-for-everyone#syllabus			

5	https://www.edx.org/course/artificial-intelligence-for-everyone

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : PC702

Course Title: AI for Everyone

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 concepts of AI and machine learning.	1	1	2	2	3	2	3	2	3	1	3	2	2	3	3	1	2
CO 2 Understand the working of self-driving systems	1	1	2	2	1	2	3	2	1	1	3	2	2	2	1	1	3
CO 3: Understand how to build different AI projects	2	2	1	1	1	2	2	2	1	2	1	2	1	1	3	2	2
CO 4: Evaluate the impact of AI on society.	3	2	2	1	3	2	3	2	2	1	2	3	2	3	3	2	2
CO 5: Us Apply AI techniques to any application domain.	-	-	-	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 concepts of AI and machine learning	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI1.1 LI1.2 LI1.3	Unit-1 1 Introduction to Artificial Intelligence. 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 Understand the working of self-driving systems	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	LI2.1 LI2.2 LI2.3	Unit-2 Building AI project . 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: Understand how to build different AI projects	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	LI3.1 LI3.2 LI3.3	Unit-3 Building AI in your company. 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: Evaluate the impact of AI on society.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1 LI4.2 LI4.3	Unit-4 AI and Society 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 Apply AI techniques to any application domain.	SO5.1	LI5.1 LI5.2 LI5.3	Unit-5 AI case studies related to a specific domain.5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12,	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

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

(Revised as on 01 August 2023)

VIII-SEMESTERS

Course Code: EEC801

Course Title: Capstone Project(partII)

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 801.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
CO 801.2: - The student will be able to implement the project plan and manage the project.
CO 801.3: - 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)	
Program Core (PCC)	EEC-801	Capstone Project(Part II)	0	5	0	1	4	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: -

5. 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 (l i f e l o n g learning)
- Skill to manage the real- l i f e 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- l i f e 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- l i f e 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 *(Cyber Security)*

Course Code: EEC801

Course Title: CapStone Project(Part II)

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.	-	-	-	