Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

and

Choice – Based Credit System (CBCS)

in

Master in Computer Application
M.C.A.

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

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A K S University, Satna

Faculty of Computer Applications & Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum & Syllabus of M.C.A.

(Master in Computer Application) Program

(Revised as of 01 August 2023)

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A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of MCA

(Revised as on 01 August 2023)

Foreword

I am thrilled to observe the updated curriculum of the Computer Application & Information Technology Department for the M.C.A. (Master of Computer Application) Program, which seamlessly integrates the most recent technological advancements and adheres to the guidelines set forth by UGC. 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 M.C.A. (Master of Computer Application) program for implementation in the upcoming session.

Er. Anant Soni
Pro Chancellor & Chairman
AKS University,

01 August 2023
Satna

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 Application & Information Technology 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 Application & Information Technology 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 Application & Information Technology department has diligently adhered to the guidelines provided by the AICTE. Additionally, they have maintained a total credit requirement of 94 for the MCA 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 Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

Preface

As part of our commitment to ongoing enhancement, the Department of Computer Application & Information Technology consistently reviews and updates its MCA 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 MCA 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 UGC model syllabus distributed in 2020. 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.

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

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

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

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

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

Introduction:

AKS University proudly stands as a pioneer, being the first in the nation to introduce a comprehensive 2-year MCA program back in 2020. This innovative curriculum has been meticulously crafted to align with the dynamic needs of the software industry and the most current technological advancements. Currently, a vibrant community of 100 plus students is actively engaged in pursuing their MCA within this department. The Computer Science department boasts cutting-edge laboratories that serve as hubs for immersive hands-on training, enabling students to delve into practical applications of their learning. The program incorporates both in-industrial training and sandwich internship training, vital components that enrich the educational journey. Distinguished by a faculty composed of software industry experts who bring with them a wealth of industrial experience, the department combines robust classroom instruction with practical and industrial acumen. This unique blend empowers our students to confidently contribute to industrial training and make a significant impact in the field.

Vision:

To conduct its key programs and activities in a unique manner that promotes excellence and leadership in education, research, innovation in software technology and fosters an environment that is safe, highly productive, cooperative and collegial, and dedicated to continual improvement.

Mission:

M01 : Achieve academic excellence in Computer Technology through an innovative teaching-learning process.

M02 : Application of sustainable faster technology in software development without compromising quality.

M03 : Inculcate technical competence and collective discipline in students to excel for software development industries, higher education and societal needs.

M04 : Establish focus research groups in leading areas of computer technology for optimization of software complexity in software development and industrial needs.

Program Educational Objectives

PEO1. Excel in professional career and/or higher education by acquiring knowledge in mathematical, computing and IT principles.

PEO2. Analyze real life problems, design computing systems appropriate to its solutions that are technically sound, economically feasible and socially acceptable.

PEO3. Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.

Program Outcomes

PO1 **Computer knowledge:** Upon completion of the MCA program, students should be able to demonstrate technical competence in computer applications. They should be able to develop and implement software solutions using various programming languages and tools, and understand the underlying concepts and principles of computer applications.

PO2 **Problem Solving:** MCA graduates should be able to identify, analyze, and solve problems related to computer applications. They should be able to apply their technical knowledge to develop effective solutions to real-world problems in various domains, including business, healthcare, education, and entertainment.

PO3 **Communication:** MCA graduates should be able to communicate effectively with stakeholders in their respective fields. They should be able to articulate technical concepts and solutions to non-technical audiences and collaborate with other professionals to develop solutions that meet the needs of their clients.

PO4 **Carry out investigations into complicated issues:** To come to reliable findings, use research-based knowledge and research techniques, such as experiment design, data analysis and interpretation, and information synthesis.

PO5 **Designing/developing solutions:** Designing system components or processes that match the required needs while taking into account public health and safety, as well as cultural, socioeconomic, and environmental factors, is important when solving complex computer challenges.

PO6 **Use of modern tools:** Develop, pick, and apply appropriate methods, resources, and modern computer and IT and IT tools, such as modeling and prediction, to complicated computer and IT tasks while being aware of their limitations.

PO7 **Environment and sustainability:** Understand how professional computer and IT solutions will affect society and the environment, and show that you are aware of the importance of sustainable development.

PO8 **Ethics:** Adhere to professional ethics, obligations, and standards of computer and IT practice. Apply ethical concepts.

PO9 **Individual and teamwork:** Work well both individually and as a member or leader in teams made up of people from different disciplines.

PO10 **Communication:** Be able to effectively communicate with the computer and IT community and society at large about complicated computer and IT operations. Examples of this include being able to understand and write effective reports and design documentation, deliver effective presentations, and give and receive clear directions.

PO11 **Project management and finance:** Exhibit knowledge of, and a grasp of, computer and IT and management principles and apply them to one's own work, as a team member and leader, to manage projects, and in interdisciplinary settings.

PO12 **Lifelong Learning:** MCA graduates should be committed to lifelong learning and professional development. They should be able to adapt to new technologies and tools, and continue to build their knowledge and skills throughout their careers. They should also be able to critically evaluate new developments in the field and incorporate them into their work.

Program Specific Outcomes

PSO1 Being able to comprehend and put knowledge of software application analysis, design, and development to use.

PSO2 Apply knowledge and skills for computer practice while upholding social, ethical, and legal principles.

PSO3 the capacity to work with cutting-edge computing systems and pursue employment in the IT sector, including consulting, research and development, education, and related fields.

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

GENERAL COURSE STRUCTURE & THEME

1. Definition of Credit

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

2. Range of Credits:

In the light of the fact that a typical Model two-year Post Graduate degree program in Computer Application has about 94 credits, the total number of credits proposed for the two-year MCA in is kept as 94 considering NEP-20 and NAAC guidelines.

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

MASTER OF COMPUTER APPLICATION [MCA]
SCHEME

Semester I						
3-Week Orientation Programme						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	TMCA01	Discrete Mathematics	3	1	0	4
2.	TMCA02	Computer Organization	3	1	0	4
3.	TMCA03	Operating System	3	1	0	4
4.	TMCA04	Computer Network	3	1	0	4
5.	TMCA05	Programming in C	3	1	2	5
6.	TMCA06	Web Technologies	3	1	2	5
Total						**26**

Semester II						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	TMCA07	Object-Oriented Programming using C++	3	1	2	5
2.	TMCA08	Database Management System	3	1	0	4
3.	TMCA09	Data Structure	3	1	2	5
4.	TMCA10	.NET Technologies	3	1	2	5
5.	TMCA11	Cloud Computing	3	1	0	4
6.	TMCA12	Elective- I	3	1	0	4
Total						**27**

TMCA12- Elective I-

TMCA12A. Linux Administration
TMCA12B. Data Science and Visualization
TMCA12C. Artificial Intelligence for Real World Application (AI) TCS iON.
TMCA12D. SWAYAM Subject

Semester III						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	TMCA13	Programming in Java	3	1	2	5
2.	TMCA14	Elective- II	3	1	2	5
3.	TMCA15	Elective- III	3	1	0	4
4.	TMCA16	TOC & Compiler Design	3	1	0	4
5.	TMCA17	Software Engineering	3	1	0	4
6.	TMCA18	Cryptography & Network Security	3	1	0	4
7.	PMCA08	Minor Project- LAB	0	0	2	1
Total						**27**

TMCA14- Elective -II

TMCA14A. Python & R Programming
TMCA14B. Mobile Application Development

TMCA15- Elective-III

TMCA15A.	Applied Cloud Computing (CC) – TCS iON
TMCA15B.	IoT and its Applications (IOT)- TCS iON
TMCA15C.	SWAYAM Subject
TMCA15D.	Data Science and Visualization

Semester IV						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	PMCA09	Seminar and Presentation/Review of Literature	0	0	2	2
2.	PMCA10	Major Project-Internship	0	0	12	12
Total						**14**

A K S University

Faculty of Computer Application and Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum of MCA (Master in Computer Application) Program

Semester-I

Course Code: **TMCA01**

Course Title : Discrete Mathematics

Pre-requisite: Student should have basic knowledge of elementary mathematics.

Rationale: The rationale behind discrete mathematics is grounded in its practical applications to computer science and related fields.

Course Outcomes:

TMCA01.1: The student will acquire knowledge of set theory has shaped the way mathematicians think about the foundations of their subject.
TMCA012: The student will acquire knowledge of combinatorial principles and techniques for counting and analyzing arrangements, permutations, and combinations.

TMCA013: The student will apply propositional and predicate logic in Computer Science.

TMCA014: Student will understand the basic concepts and properties of graphs.

TMCA015: Understand the importance of algebraic properties with regard to working within various number systems.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA01	Discrete Mathematics	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

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)		
TMCA01	Discrete Mathematics	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.

TMCA01.1:- The student will acquire knowledge of set theory has shaped the way mathematicians think about the foundations of their subject.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	00
SW	02
SL	01
Total	15

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

SO1.1 Understanding Set theory. **SO1.2** Explain different laws on set **SO1.**3 discuss relation and types of relation **SO1.4** define Function and types of function**.**	.	**Unit-1. Set Theory:-** 1.1. Element of set, Types of set. 1.2. Operation on Sets, Union. 1.3. Intersection and Complement of Sets, Cartesian product, 1.4. Venn diagram 1.5. Different Laws on sets. 1.6. Relation **and Function** 1.7. Introduction and Types of Relation. 1.8. Composition of relation, transitive composition 1.9. Symmetric-Transitive Composition, Reflexive-Transitive composition. 1.10. Partial Order Relation, Equivalence Relation. 1.11. Domain and Range 1.12. Onto, Into and One-One Function.	1. To Learned about union, intersection and complement set. 2. Introduction of the relations and Types of Relation.

SW-1 Suggested Sessional Work(SW):

a. Assignments:-
(1) Define:- Set and types of set, operation on set, Venn diagram ,Cartesian product.
(2) Relation and types of relation.
(3) Function and types of functions.

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

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

TMCA01.2: The student will acquire knowledge of combinatorial principles and techniques for Counting and analyzing arrangements, permutations, and combinations.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	00
SW	02
SL	01
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 define Mathematical inductions. **SO2.2 discuss** Principle of inclusion and exclusion. **SO2.3** To learn about Permutations and combinations. **SO2.4 Explain** recurrence relations with example	.	**Unit-2** : **Combinatory:** **2.1** Mathematical inductions, Strong induction and **2.2** well ordering. **2.3** Principle of Inclusion and Exclusion. **2.4** the basics of counting, **2.5** the pigeonhole principle. **2.6** Permutations and **2.7** combinations, **2.8** Recurrence Relations. **2.9** Solving Recurrence Relations **2.10** Solving Recurrence Relations, **2.11** Solving Recurrence Relations, **2.12** Generating Functions.	1. Question based on mathematical inductions. 2. Permutations and combinations, Recurrence Relations.

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

a. Assignments:-
(1) Mathematical inductions, principle of inclusion and exclusion.
(2) Understand the basics of counting, the pigeonhole principle.
(3) Permutations and combinations, Recurrence Relations.

b. Mini Project:
NA

c. Other Activities (Specify):
NA

TMCA01.3: The student will apply propositional and predicate logic in Computer Science.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	00
SW	02
SL	01
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand basic logic operation. **SO3.2** To learn truth table with operations. **SO3.3 Explain** lattices and properties of lattice. **SO3.4 To** Understand different type of lattice.	.	**Unit-3 : Preposition:-** 3.1. Preposition, 3.2. First Order Logic. 3.3. Basic Logic Operation, 3.4. Logical Equivalence. 3.5. Truth Table, 3.6. Normal Forms. 3.7. Predicates and 3.8. Quantifiers, 3.9. POSET, Hasse Diagram. 3.10. Lattices and Boolean algebra 3.11. Properties of lattices, Complete Lattice. 3.12. Distributive Lattice, Bounded Lattice.	1. To learn basic logic operation with question. 2. To learn lattice.

		3.13. Lattice Homomorphism, Lattices Isomorphism 3.14. Least Upper Bound, Greatest Lower Bound.	

SW-3 Suggested Sessional Work (SW):

a. Assignments:-
(1) Basic logic operations and question based on operations.
(2) Poset and Hasse diagram.
(3) Lattice and types of lattices.

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

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

TMCA01.4. Student will understand the basic concepts and properties of graphs.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	00
SW	02
SL	02
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand concept of graph and types of graphs. **SO4.2** To learn matrix representation on graph. **SO4.3** To understand Shortest Paths in weighed graphs **SO4.4** Explain tree and types of tree. **SO4.**5 To understand Prim's, Algorithms and Kruskal Algorithms.	.	**Unit-4 Graph Theory:-** 4.1. Concepts of Graph, Sub graph, Isomorphic Graph. 4.2. Homomorphic Graphs, Labeled Graph, Weighted Graphs, Cyclic Graphs. 4.3. Directed Graph, complete graph, Regular graph, 4.4. Bipartite graph, connected graphs. 4.5. Operations on Graphs, 4.6. Matrix Representation on Graphs.	1. Graph set and types of graph set 2. Question based on Shortest Paths in weighed graphs and Prim's, Algorithms and Kruskal Algorithms in trees.

		4.7. Shortest Paths in weighed graphs (Dijkstra's Algo), 4.8. Tree 4.9. Introduction of Tree, Rooted Tree. 4.10. Decision trees or Sorting Tree, 4.11. Spanning Tree, 4.12. Binary Trees. 4.13. Prim's, Algorithms and 4.14. Kruskal Algorithms.	

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

a. Assignments:
(1) Graph and types of graph, Matrix Representation on Graphs.
(2) Question based on Shortest Paths in weighed graphs and Prim's, Algorithms and Kruskal Algorithms in trees.
(3) Tree and types of trees.

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

c. Other Activities (Specify):
NA

TMCA01 5:- Understand the importance of algebraic properties with regard to working within various number systems.

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)**
SO5.1 To understand binary operation. **SO5.2** To learn about group **SO5.3** Explain abelian group. **SO5.4** define ring and field with example.		**Unit 5 Algebraic Structures**: 5.1. Algebraic **Structures**: 5.2. Properties, 5.3. Binary operation, groupoid, 5.4. semi group,	1. To learn about group, monoid ,semi group, and abelian group. 2. Definition

		5.5. monoid, Group, abelian group. 5.6. Generator and evaluation of power, Subgroup, cyclic group. 5.7. Homeomorphism and isomorphism of group. 5.8. Definition and examples of rings and field.	and examples of rings and field.

SW-5 Suggested Sessional Work (SW):

a. Assignments:-

(1) Binary operation, group and sub types of groups.
(2) Definition and examples of rings and field.
(3) Homeomorphism and isomorphism of group.

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)
TMCA01.1:- The student will acquire knowledge of set theory has shaped the way mathematicians think about the foundations Of their subject.	12	2	1	15
TMCA01.2:- The student will acquire knowledge of combinatorial principles and Techniques for counting and analyzing arrangements, permutations, combinations.	12	2	1	15
TMCA01.3:- The student will apply Propositional and predicate logic in Computer Science.	14	2	2	18
TMCA01.4: Student will understand the basic concepts and properties of graphs.	14	2	2	18
TMCA01. 5:- Understand the importance of algebraic properties with regard to working within various number systems.	08	2	1	11
Total Hours	60	10	7	77

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Set Theory, Relation and Function**	03	01	01	05
CO-2	**Combinatory**	02	02	01	05
CO-3	**Preposition, Lattices and Boolean algebra**	03	07	05	15
CO-4	**Graph Theory, Tree**	04	06	05	15
CO-5	**Algebraic Structures**	03	04	03	10
Total		15	20	15	50

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

The end of semester assessment for Discrete Mathematics will be held with written examination of 50 marks

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. 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	Elementary Abstract Algebra	B.R. Thakur	Ram Prasad and Sons	1996
2	Discrete Mathematics	Dr. D.C. Agrawal	Shree Sai Prakashan	Aug-2006

3	A Textbook of Discrete Mathematics	By Sarkar, Swapan Kumar	S. Chand Publishing	9th Edition and 2016

Curriculum Development Team

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Course : M.CA.
Course Code : TMCA01
Course Title: Discrete Mathematics

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
	Engineering knowledge	Problem analysis	Design/development of	Conduct studies of	Utilization of modern tools	Engineers and society	Environment and	Ethics	Individual and team work	Communication	Project management and	Life-longlearning			
CO1 The student will acquire knowledge of set theory has shaped the way mathematicians think about the foundations of their subject.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO2 The student will acquire knowledge of combinatorial principles and techniques for counting and analyzing arrangements, permutations, combinations	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO3 The student will apply Propositional and predicate logic in Computer Science.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
CO4: Student will understand the basic concepts and properties of graphs.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
CO.5: Understand the importance of algebraic properties with regard to working within various number systems.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will acquire knowledge of set theory has shaped the way mathematicians think about the foundations of their subject	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 **Set Theory** 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 : The student will acquire knowledge of combinatorial principles and techniques for counting and analyzing arrangements, Permutations, combinations.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 **Combinatory** 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: The student will apply Propositional and predicate logic in Computer Science.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 **Preposition** 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 understand the basic concepts and properties of graphs.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 **Graph Theory** 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: Understand the importance of algebraic properties with regard to Working within various number systems.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 **Algebraic Structures**: 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 MCA Program

Semester-I

Course Code: TMCA02
Course Title: Computer Organization
Prerequisite: Computer Fundamental
Rationale: The students should possess foundational understanding about the basic components of digital Computer system. This encompasses familiarity with the operational elements of Digital computer system. Additionally, Students ought to acquire fundamental insights into different types of computer, their applications.

Course Outcomes:

TMCA02.1: The student will define the basic components of computer system and its operations.
TMCA02.2: The student will describe the building blocks of computer system
TMCA02.3: Student will execute Instruction code and use addressing modes
TMCA02.4: The student will differentiate various types of memory
TMCA02.5: The student will compare various microprocessors and select DMA in computer system

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA02	**Computer Organization**	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 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

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)
TMCA02	**Computer Organization**	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.

TMCA02.1: **The student will define the basic components of computer system and its Operations.**

Approximate Hours

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

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

SO1.1 Define a Computer, **Discuss** about the Block Diagram of a Computer **SO1.2 Explain** data representation **SO1.3Explain**1'sandr'scomplement with example **SO1.4** Discuss error detection and correction codes **SO1.**5 **Explain** computer arithmetic operations .		**Unit-1. STRUCTURE OF COMPUTERS: (13 Lectures)** 1.1. Evolution **of** Computer Types, 1.2. Functional Units. 1.3. Attributes of Basic Operational Concepts, 1.4. Von Neumann Architecture 1.5. Understand bus Structures, 1.6. Software, Performance 1.7. Overview Error Detection and Correction Codes. 1.8. COMPUTER ARITHMETIC: 1.9. Significance of Number Systems and Complements 1.10. Data Representation, Fixed and Floating-Point Representation, 1.11. Character Representation 1.12. Addition, Subtraction, 1.13. Magnitude, Comparison.	1. Draw basic diagram of functional units of computer system

SW-1Suggested Sessional Work (SW):

a. Assignments:
(i) Discuss about different types of computer system
b. Presentation
c. Pictorial representation of different components of computer:

TMCA02.2: **The student will describe the building blocks of computer system**

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 the basic logic gates **SO2.2**To learn different types of gates **SO2.3**To understand the Boolean algebra and laws . **SO2.4** To simplify the Boolean expressions by using different methods **SO2.**5 To design a flip flop.	.	Unit-2 **LOGIC GATES (10 Lectures)** **2.1** Types of Basic Logic Circuits, **2.2** Logic Gates (AND, OR, NOT), **2.3** Universal Gates (NAND, NOR), **2.4** Ex-OR, Ex-NOR **2.5** Their Truth Tables, **2.6** Laws of Boolean Algebra, **2.7** De-Morgan's Theorem **2.8** K-Map **2.9** K-Map **2.10** Simplification of Boolean Expression by different methods **2.11** Flip Flop.	1. Solve Boolean expression by using k-map.

SW-2 Suggested Seasonal Work (SW):
a. Assignments:
(i) Design Flip flop

b. Presentation

c. Pictorial representation of different components of computer:

TMCA02.3: The student will execute Instruction code and use addressing modes.

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)**
SO3. 1 Overview of registers SO3.2 to understand addressing modes SO3.3 to understand the computer instructions SO3.4 know about Data Transfer and Manipulation SO3.5 differentiate CISC and RISC	.	**Unit-3:BASIC COMPUTER ORGANIZATION:** 3.1 Instruction Codes, 3.2 Computer Registers, 3.3 Computer Instructions 3.4 Instruction Cycle. 3.5 Memory-Reference Instructions, 3.6 Instruction Formats, 3.7 Addressing Modes, 3.8 Data Transfer 3.9 Manipulation, 3.10 CISC Vs RISC, 3.11 Parallel Processing 3.12 Pipelining.	i. Advantages CISC Vs RISC ii. Parallel Processing,

SW-3 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain parallel processing

b. Presentation

c. Pictorial representation of different components of computer:

TMCA02.4**:** The student will differentiate various types of memory

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 Explain Main Memory, Discuss Memory Hierarchy **SO4.2 To u**nderstand different types of ROM **SO4.3 Explain** Auxiliary memory **SO4.4 Explain** Cache Memory **SO4.**5 Explain virtual memory and pagging	.	**Unit-4 : MEMORY SYSTEM: (12 Lectures)** 4.1 Memory Hierarchy, 4.2 Semiconductor Memories, 4.3 RAM (Random Access Memory), 4.4 Read Only Memory (ROM), 4.5 Types of ROM 4.6 Cache Memory, 4.7 Performance 4.8 Considerations, 4.9 Virtual Memory, 4.10 Paging 4.11 Secondary Storage, 4.12 RAID.	i. Preparation of performance consideration ii. Draw a classification diagram of RAID

SW-4Suggested Sessional Work (SW):

a. Assignments:
b. (i) Explain Raid
c. Discuss secondary storage
d. Presentation
e. Pictorial representation of different components of computer

TMCA02.5**:** The student will compare various microprocessors and select DMA in computer system.

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)**
SO5.1 Understand I/O und interrupt **SO5.2** Explain Characteristics of Multiprocessor **SO5.3** Explain DMA **SO5.4** Discuss about inter process communication and Synchronization **SO5.5 Discuss** about Cache Coherence		**Unit5: INPUT-OUTPUT:** (12 Lecture) 5.1 I/O Interface, 5.2 Programmed IO, 5.3 Interrupt Driven IO 5.4 DMA. 5.5 Multiprocessors 5.6 and Multicomputer 5.7 Characteristics of Multiprocessors, 5.8 Interconnection Structures, 5.9 Inter Processor Arbitration. 5.10 Inter Processor Communication 5.11 Synchronization, 5.12 Cache Coherence	1.Draw a diagram of DMA. 2.Pictorial representation of multiprocessors concept.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

(i) Explain Interconnection Structures

b. Presentation:

c. Other Activities (Specify): Group discussion on 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)
TMCA02.1 At the end of this chapter the student will define the basic components of computer system and its operations	13	2	1	16
TMCA02.2 At the end of this chapter the student will describe the building blocks of computer system	11	2	1	14

TMCA02.3 At the end of this chapter the student will execute Instruction code and use addressing modes	12	2	2	16
TMCA02.4 At the end of this chapter the student will differentiate various types of memory	12	2	2	16
TMCA02.5 At the end of this chapter the student will compare various microprocessors and select DMA in computer system	12	2	2	16
Total Hours	60	10	08	78

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA02-1	STRUCTURE OF COMPUTERS	03	02	03	08
TMCA02-2	LOGIC GATES	03	01	05	09
TMCA023	BASIC COMPUTER ORGANIZATION	03	07	02	12
TMCA02-4	MEMORY SYSTEM:	03	05	05	13
TMCA02-5	INPUT-OUTPUT	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Computer Organization 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	Computer Organization and Architecture	Rajaraman V. and T. Radhakrishnan	Prentice Hall	2011
2	Digital Logic & Computer Design	Mano M. M	Pearson Education	2013
	Computer Organization and Design	Patterson D.A. and J. L. Hennessey	Morgan Kauffmann Publishers	2013

Curriculum Development Team

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COs, POs and PSOs Mapping

Course: MCA
Course Code:TMCA02
Course Title: Computer Organization

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
	Engineering knowledge	Problem analysis	Design/development of	Conduct studies of	sustainability Utilization of modern tools	Engineers and society	Environment and	Ethics	finance Individual and team work	Communication	Project management and	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.
CO1 The student will define the basic components of computer system and its operations	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO2The student will describe the building blocks of computer system.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO3Student will execute Instruction code and use addressing modes	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
CO4: The student will differentiate various types of memory	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
CO.5: The student will compare various microprocessors and select DMA in computer system	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1:The student will define the basic components of computer system and its operations	SO1.1 SO1.2 SO1.3 SO1.4		UNIT – I:STRUCTURE OF COMPUTERS: 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	CO2:The student will describe the building blocks of computer system	SO2.1 SO2.2 SO2.3 SO2.4		UNIT – II:LOGIC GATES 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:Student will execute Instruction code and use addressing modes	SO3.1 SO3.2 SO3.3 SO3.4		UNIT – III:BASIC COMPUTER ORGANIZATION 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: The student will differentiate various types of memory	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4:MEMORY SYSTEM 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: The student will compare various microprocessors and select DMA in computer system	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5:MULTIPROCESSORS 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

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Department of Computer Science & Engineering

Curriculum of MCA Program

Semester-I

Course Code: TMCA03

Course Title : Operating System

Pre-requisite: Student should have basic knowledge of components and architecture of Operating System as well as memory management of the system.

Rationale: The student's Operating System should possess foundational understanding about the basic components of Operating System. This encompasses Familiarity with the operational elements of Operating System. Additionally, Students ought to acquire fundamental insights into different types of memory management techniques.

Course Outcome:

CO NO	Course Outcomes
TMCA03.1	At the end of this chapter the student will recognize the structure and services of OS
TMCA03.2	At the end of this chapter the student will use the concept of process
TMCA03.3	At the end of this chapter the student will differentiate various threads and deadlocks
TMCA03.4	At the end of this chapter the student will compare memory systems
TMCA03.5	At the end of this chapter the student will select the appropriate storage system

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA03	Operating System	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 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

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)		
TMCA03	Operating 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) up on the course's conclusion.

TMCA03.1: **The student will define the basic components of OS and its operations.**

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 OS, **Discuss** about the Block Diagram of a OS **SO1.2 Explain** OS operations **SO1.3** System Design **SO1.4** discuss OS Structure **SO1.**5 **Explain** Windows and Linux.	.	**Unit-1. Introduction:** Operating System 1.1. Operating-System 1.2. Operations. 1.3. Services, 1.4. User and Operating-System Interface 1.5. System Calls and 1.6. Types 1.7. Operating-System Design and 1.8. Implementation 1.9. OS Structure 1.10. Types of Systems 1.11. Case Study of Windows and 1.12. Case Study of Linux.	1. Properties of OS 2. Types of OS

TMCA03.2: the student will describe the Process

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 the CPU Scheduling **SO2.2** To learn different Process states **SO2.3** Inter-Process Communication . **SO2.4** To simplify State Transition, Scheduler and its Types **SO2.**5 To understand different CPU Scheduling.	.	Unit-2 Process 2.1. Process Concept, 2.2. Process Control Block 2.3. Operations on Processes, 2.4. Inter-Process Communication (IPC) 2.5. Process-State Transition, 2.6. Scheduler and its Types 2.7. CPU Scheduling – FCFS, 2.8. SJF, 2.9. SRTF 2.10. RR, 2.11. Priority 2.12. Introduction to Process Synchronization.	1. Solve CPU Scheduling algorithm example.

TMCA03.3: the student will describe the Threads

a. 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 the Threads **SO3.2** To learn Multithreading Models **SO3.3** Handling of Deadlock . **SO3.4** Deadlock Detection and Recovery	.	Unit-3 Threads- **3.1.** Threads, **3.2.** Multithreading **3.3.** Models **3.4.** Deadlock: Introduction **3.5.** Deadlock Characterization **3.6.** Handling of Deadlock 1 **3.7.** Handling of Deadlock 2 **3.8.** Handling of Deadlock 3 **3.9.** Deadlock Prevention and	1. Execution of multiple threads concurrently within a process

		3.10. Avoidance **3.11.** Banker's Algorithm. **3.12.** Detection and Recovery	

TMCA03.4: the student will describe the Memory Management

b. 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)**
SO4.1 To Understand Memory Management **SO4.2** To learn Memory Hierarchy **SO4.3** contiguous Memory Allocation . **SO4.4** Page Replacement algorithm	.	Unit-4 Memory Management **4.1.** Memory Hierarchy **4.2.** Contiguous and **4.3.** non-contiguous Memory Allocation **4.4.** Swapping **4.5.** Segmentation **4.6.** Paging, **4.7.** Virtual Memory **4.8.** Demand Paging **4.9.** Page Replacement-FIFO **4.10.** Optimal, **4.11.** LRU, **4.12.** Thrashing	1. Familiarize yourself with the basic concepts of memory management, such as memory hierarchy, virtual memory, and physical memory

CT101.5: the student will describe the **Secondary Storage**

Approximate Hours

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

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session Outcomes (SOs)	Laboratory Instruction (LI)	classroom Instruction (CI)	Self-Learning (SL)
SO5.1 To Understand Secondary Storage **SO5.2** To learn Disk Structure, Disk Management **SO5.3 A**im to know about Disk Scheduling . **SO5.4** Access Time	.	Unit-5 Secondary Storage **5.1.** Disk Structure, **5.2.** Disk Management **5.3.** Swap-Space Management, **5.4.** Disk Scheduling-FCFS, **5.5.** SSTF, **5.6.** SCAN **5.7.** C-SCAN, **5.8.** LOOK, **5.9.** C-LOOK **5.10.** Attributes, Allocation Methods **5.11.** Free-Space Management **5.12.** Disk Access Time Evaluation	1. Solve Disk Scheduling algorithm example

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	SessionalWork (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA01: At the end of this chapter the student will explain the core concept of OS.	12	2	1	15
TMCA02**:** At the end of this chapter the student will know about process	12	2	1	15
TMCA03: At the end of this chapter the student will describe the threads and deadlock.	12	2	1	15

TMCA04: At the end of this chapter the student will understand the different memory management scheme	12	2	1	15
TMCA05: At the end of this chapter the student will understand the secondary memory management scheme	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	Introduction Operating System	03	02	03	08
CO-2	Process	03	01	05	09
CO-3	Threads-	03	07	02	12
CO-4	Memory Management	03	05	05	13
CO-5	Secondary Storage	03	02	03	08
Total		15	17	18	50

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

The end of semester assessment for Operating System 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	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin, Greg Gagne	Prentice Hall	8th Edition 2011
2	Operating Systems: Internals and Design Principles	William Stallings	Pearson Education	2013
3	Operating System Concepts	Avi Silberschatz		2013
4	Modern Operating Systems	Andrew S. Tanenbaum		
5	Schaum's Outline of Operating Systems	J. Archer Harris		

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8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

CO-PO Mapping:

Course: MCA
Course Code: TMCA03
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
	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.
TMCA03.1 At the end of this chapter the student will recognize the structure and services of OS	3	3	2	2	1	2	1	1	1	1	1	3	2	2	2
TMCA03.2 At the end of this chapter the student will use the concept of process	3	3	2	2	1	2	1	1	1	1	1	3	3	3	2
TMCA03.3 At the end of this chapter the student will differentiate various threads and deadlocks	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA03.4 At the end of this chapter the student will compare memory systems	3	3	2	2	1	2	1	1	1	1	1	3	1	2	1
TMCA03.5 At the end of this chapter the student will select the appropriate storage system	3	3	2	2	1	2	1	1	1	1	1	3	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	TMCA03.1: At the end of this chapter the student will explain the core concept of OS.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		**Unit-I Introduction to Operating Systems** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10, 1.11,1.12	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	TMCA03.2: At the end of this chapter the student will know about process.	SO2.1 SO2.2 SO2.3 SO2.4		**Unit-2 Application requirements** 2.1, 2.2, 2.3, 2.4, 2.5,2.6,2.7,2.8,2.9,2.10,2.11,2.12	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	TMCA03.3: At the end of this chapter the student will describe the threads and deadlock.	SO3.1 SO3.2 SO3.3 SO3.4		**Unit-3 Process** 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	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	TMCA03.4: At the end of this chapter the student will understand the different memory management scheme	SO4.1 SO4.2 SO4.3		**Unit-4: Address bus and memory access** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.1 1,4.12	
PO:1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	TMCA03.5: At the end of this chapter the student will understand the secondary memory management scheme	SO5.1 SO5.2 SO5.3		**Unit 5- The process lifecycle** 5.1,5.2,5.3,5.4,5.5,5.6,5.6,5. 7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of M.C.A.(Computer Science & Application) Program

Semester-I

Course Code: **TMCA04**

Course Title: **COMPUTER NETWORK**

Pre- requisite: **DATA COMMUNICATION**

Rationale: Architect sensor networks for various application setups. Devise appropriate data dissemination protocols and model links cost. Understanding of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers. Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes:

TMCA04.1: At the end of this chapter the student will explain the core concept of Computer Network

TMCA04.2: At the end of this chapter the student will use the services of data link layer

TMCA04.3: At the end of this chapter the student will organize Internetworking

TMCA04.4: At the end of this chapter the student will recognize services of transport layer

TMCA04.5: At the end of this chapter the student will solve the develop the script by implementing the application layer

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA04	COMPUTER NETWORK	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 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

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)		
TMCA04	COMPUTER NETWORK	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) up on the course's conclusion.

TMCA04.1: At the end of this chapter the student will explain the core concept of computer network

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)
SO1.1 Understand **Network** **SO1.2 Explain** Network Structure and Architecture **SO1.3 Discuss** OSI Reference Model, Layer Services **SO1.4 Explain** Framing, Transmission Media **SO1.**5 Explain Bit Rate, Baud Rate, Signals.	.	**Unit-1ntroduction to Network:** 1.1. Goals and Applications of Networks 1.2. Network Structure and Architecture 1.3. OSI Reference Model, 1.4. Layer Services, 1.5. TCP/IP Model 1.6. Network Topology 1.7. Types, 1.8. FDDI 1.9. Connecting Devices (Hub,	**1.8** Bit Rate, Baud Rate, Signals. 1. Network Structure and Architecture 2. Network Topology

		Switch, Router, Repeater) 1.10. **Physical Layer:** Framing, Transmission Media 1.11. Switching, 1.12. Multiplexing, ISDN	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   1. Network Structure and Architecture
   2. Network Topology, Types
   3. Switching, Multiplexing, ISDN

b. **Major - Paper I**:

c. Other Activities (Specify): Seminar

TMCA04.2: At the end of this chapter the student will use the services of data link layer

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Tota l	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 To Understand the Data Link Layer **SO2.2** To learn CSMA, CSMA-CD, CSMA-CA **SO2.3** To learn about Error Control Methods **SO2.4 Explain** Parity Checking, VRC, LRC **SO2.**5 Explain LLC, Physical Addressing	.	Unit-2:- **Data Link Layer:** 2.1. MAC, 2.2. Channel Allocations 2.3. CSMA, 2.4. CSMA-CD, 2.5. CSMA-CA 2.6. Terminal Handling, 2.7. Access Control 2.8. (Stop-and-Wait, ARQ, 2.9. Sliding Window Protocols) 2.10. Error Control Methods 2.11. Parity Checking, VRC, LRC, CRC, 2.12. Hamming Code)	2.7 LLC, Physical Addressing 1. MAC,Channel Allocations 2. Terminal Handling, Access Control

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. CSMA, CSMA-CD, CSMA-CA
2. Parity Checking, VRC, LRC, CRC, Hamming Code)
3. MAC, Channel Allocations

b. Major - Paper I:

c. Other Activities (Specify):

TMCA04.3: At the end of this chapter the student will organize Internetworking

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)**
SO3.1 To Understand the Network Layer **SO3.2** To learn Point - to-Point Networks **SO3.3** To learn about ARP, RARP, ICMP **SO3.4 Explain** IP Address, Sub netting	.	**Unit-3 : Network Layer:** **3.1** Point - to- Point Networks, **3.2** Routing **3.3** (Static, Dynamic, **3.4** Interdomain, Intra-domain Routing) **3.5** Congestion Control Techniques **3.6** ARP, RARP, **3.7** ICMP **3.8 Internetworking:** IP Packet **3.9** IP Address, **3.10** Sub netting **3.11** CIDR, **3.12** IPv6, NAT	1. ARP, RARP, ICMP 2. IPAddress, Subnetting

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Point - to- Point Networks, Routing
2. Static, Dynamic, Interdomain, Intra-domain Routing
3. CIDR, IPv6, NAT

b. **Major - Paper I**:

c. Other Activities (Specify):

TMCA04.4: At the end of this chapter the student will recognize services of transport layer

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)**
SO4.1 To Understand the Design Issues, Connection Management **SO4.2** learn to Error Control, Flow Control **SO4.3** To understand the **Session Layer** **SO4.4** To lean about **Presentation Layer**	.	**Unit-4 : Transport Layer:** **4.1.** Design Issues, **4.2.** Connection Management **4.3.** TCP, **4.4.** Handshaking, **4.5.** UDP **4.6.** Error Control, **4.7.** Flow Control **4.8.** Port Addressing, QoS **4.9. Session Layer**: Design	1. TCP, Handshaking, UDP 2. Remote Procedure Call

		Issues **4.10.** Remote Procedure Call **4.11. Presentation Layer:** Design Issues **4.12.** Data Compression Techniques, Cryptography	

SW-4 Suggested Sessional Work (SW):

a. **Assignments:**

1. Design Issues, Connection Management
2. Session Layer: Design Issues
3. Presentation Layer: Design Issues

b. **Major - Paper I:**

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

TMCA04.5: At the end of this chapter the student will solve the develop the script by implementing the application layer

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 the **Application Layer** **SO5.2** To learn about 4 DNS, Virtual Terminals **SO5.3 Explain** ping, traceroute, ipconfig **SO5.4 Explain** ARP, telnet **SO5.**5 To learn Electronic Mail (SMTP)		**Unit 5: Application Layer:** **5.1.**File Transfer **5.2.**(FTP/TFTP/HTTP) **5.3.** Access and Management **5.4.** Electronic Mail (SMTP) **5.5.** DNS, **5.6.** Virtual Terminals **5.7.** Network Commands/ **5.8.** Case Studies **5.9.** ping, traceroute, ipconfig **5.10.** netstat, hostname **5.11.** ARP, telnet **5.12.** NMAP, Packet Tracer etc	1. File Transfer (FTP/TFTP/HTTP) 2. DNS, Virtual Terminals

SW-4 Suggested Sessional Work (SW):

a. Assignments:
   1. File Transfer (FTP/TFTP/HTTP)
   2. Network Commands/Case Studies
   3. DNS, Virtual Terminals
b. Major - Paper I:
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)
TMCA04.1: At the end of this chapter the student will explain the core concept of computer network	12	02	01	15
TMCA04.2: At the end of this chapter the student will use the services of data link layer	12	02	01	15

TMCA04.3: At the end of this chapter the student will organize Internetworking	12	02	01	15
TMCA04.4: At the end of this chapter the student will recognize services of transport layer	12	02	01	15
TMCA04.5: At the end of this chapter the student will solve the develop the script by implementing the application layer	10	02	01	13
Total Hours	58	10	5	73

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA04-1	**Introduction to Network**	03	02	03	08
TMCA04-2	**Data Link Layer**	03	01	05	09
TMCA04-3	**Network Layer**	03	07	02	12
TMCA04-4	**Transport Layer**	03	05	05	13
TMCA04-5	**Application Layer**	03	02	03	08
Total		15	17	18	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. 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	Computer Networks	Andrew S. Tanenbaum	Prentice Hall PTR, 2003	illustrated
2	Computer Networks	Tanenbaum	Pearson Education India	5th edition

Curriculum Development Team

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CO, PO and PSO Mapping

Course Title: M.C.A.
Course Code: TMCA04
Course Title: Computer Network

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
	Engineering knowledge	Problem analysis	Design/development of	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	Being able to comprehend and put knowledge of software application analysis, design, and development to use	Apply knowledge and skills for computer practice while upholding social, ethical, and legal principles	The capacity to work with cutting-edge computing systems and pursue employment in the IT sector, including consulting, research and development, Education, and related fields.
TMCA04..1 : At the end of this chapter the student will explain the core concept of computer network	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA04.2: At the end of this chapter the student will use the services of data link layer	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA04.3: At the end of this chapter the student will organize Internetworking	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
TMCA04.4: At the end of this chapter the student will recognize services of transport layer	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA04.5: At the end of this chapter the student will solve the develop the script by implementing the application layer	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1 :** At the end of this chapter the student will explain the core concept of computer network	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 **Introduction to Network** 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	**CO1:** At the end of this chapter the student will use the services of data link layer	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 **Data Link Layer** 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	**CO1:** At the end of this chapter the student will organize Internetworking	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 **Network Layer** 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	**CO1:** At the end of this chapter the student will recognize services of transport layer	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 **Transport Layer** 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	**CO1:** At the end of this chapter the student will solve the develop the script by implementing the application layer	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 **Application Layer** 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	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of Master of Computer Application [MCA] Program

Semester-I

Course Code: TMCA05

Course Title: PROGRAMMING IN C

Pre- requisite: Student should have a basic understanding of Fundamental of Computer.

Rationale: Importance of C programming and its practical applications C programming language holds immense importance in the software development industry. Its simplicity, efficiency, and versatility make it a powerful tool for developing a wide range of applications. From operating systems to embedded systems, C finds its use in numerous domains.

Course Outcome:

TMCA05.1: At the end of this chapter the student will explain the core concept of C programming.

TMCA05.2: At the end of this chapter the student will use Array and Function in programs.

TMCA05.3: At the end of this chapter the student will describe the pointers and DMA.

TMCA05.4: At the end of this chapter the student will design macro and programs.

TMCA05.5: Comprehend the functions of Preprocessor.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credit (C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA05	PROGRAMMING IN C	4	2	1	1	7	5

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Theory

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)		
TMCA05	Programming in C	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
TMCA05	Programming in C	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.

TMCA05.1: At the end of this chapter the student will explain the core concept of C programming

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)**
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. **SO1.**6 use of operator in programming **SO1.7** Learn about the decision control statements in C language. **SO1.**8 Learn about the Looping Statement in C programming.	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**: 1.1 Programming Paradigm. 1.2 C-Character Set. 1.3 Identifier 1.4 Keyword 1.5 Data Types 1.6 Constant in c 1.7 Variable 1.8 Operator 1.9 Decision Control Statement-1 1.10 Decision Control Statement-2 1.11 Looping control Statement-1 1.12 Looping control Statement-2	1. Use of algorithms for develop program. 2. Create program in C use of decision and looping statement.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create a program in C to check the input no is prime or not.
ii Create a program in C to print a factorial of given no.
iii. Write a C program to find the reverse of an integer number.

b. Mini Project:

i. Create C Program to Make a Simple Calculator Using switch...case.

c. Other Activities (Specify):

Class Test

TMCA05.2: At the end of this chapter the student will use Array and Function in programs.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Array. **SO2.2** Types of arrays **SO2.3** Use of function **SO2.4** Understand about call by value and call by reference **SO2.5** Understand about storage classes. **SO2.**6 use of structure and union	LI 2.1 Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not. LI 2.2 Write a program that prints a table indicating the number of occurrences of	**Unit-2.0 Array**: 2.1 Defining, Declaring and Initializing Array. 2.2 Types of Arrays.-1 2.3 Types of Arrays-2 2.4 C-Function: Declaration and definition 2.5 Predefine functions 2.6 Example based on 2.7 Call by value and call by reference 2.8 Example based on 2.9 Storage Classes 2.10 Structure 2.11 Union 2.12 Example based on	1. Use of array for develop program. 2. Create program in C use of function.

	Each alphabet in the text entered as command line arguments. LI 2.3 Write a program to compute the factors of a given number.		

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create a program in C to create two-dimensional array.

ii Write a C program to input n numbers in an array, calculate the sum of all even numbers and all odd numbers in the array and print the larger sum.

Example:

If the array contains the following elements:

2, 3, 3, 5, 4, 8, 7, 11, 2

The sum of all even elements is 2+4+8+2=16

Sum of all odd elements is 3+3+5+7+11=29

Therefore, the output should be 29.

iii Write a C program, that reads list of n integer and print sum of product of consecutive numbers.

if n=7 and numbers are 4,5,2,5,6,4,7

then output is 4*5+5*2+2*5+5*6+6*4+4*7 = 122

b. Mini Project:

i. Voting System

c. Other Activities (Specify):

Quiz

TMCA05.3: At the end of this chapter the student will describe the pointers and DMA.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

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

SO3.1 Understand about pointer. **SO3.2** declaration of pointer **SO3.3** Use of pointer with array **SO3.4** use pointer with function **SO3.5** Understand about pointer and structure. **SO3.**6 use of pointer within structure **SO3.7** understand about DMA.	LI 3.1 Write a program that swaps two numbers using pointers. LI 3.2 Write a program in which a function is passed address of two variables and then alter its contents. LI3.3 Create a structure called "Student" with members name, age, and total marks. Write a C program to input data for two students, display their information, and find the average of total marks.	**Unit-3.0 Pointer** 3.1 Introduction, Features 3.2 Declaring Pointer 3.3 Pointer to Array 3.4 Pointers to Function 3.5 Pointer to Structure 3.6 Pointer within Structure 3.7 Example based on pointer 3.8 DMA: concept of Memory and 3.9 dynamic memory allocation 3.10 Calloc() 3.11 malloc() 3.12 realloc()	1. Use pointer. 2. Learn about DMA.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   - i. Create a program in C to check the input no is prime or not.
   - ii Write difference between structure and union.
   - iii Explain DMA in detail.

b. Mini Project:
   Create a C program to store and print 5 employee record using structure.

c. Other Activities (Specify):
   Oral Power Point Presentation

TMCA05.4: At the end of this chapter the student will design macro and programs

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand about file handling. **SO4.2** file handling function **SO4.3** random access file **SO4.4** learn graphics programming	LI.4.1WAP to display Fibonacci series (i)Using recursion, (ii) Using iteration LI4.2 Write a Program to draw basic graphics construction like line, circle, arc, ellipse and rectangle. LI 4.3 Write a Program to draw animation using increasing circles filled with different colors and patterns.	**Unit-4.0 File Handling** 4.1 Introduction, Text vs Binary File. 4.2 Declaring Pointer 4.3 File Handling: fopen (), fclose () 4.4 getc (), putc (), gets (), puts (), fprintf: fopen () 4.5 fclose (), getc (), putc (), 4.6 gets (), puts (), fprintf (), fscanf () 4.7 Random Access File, 4.8 fseek (), ftell (), rewind (). 4.9 Graphics Programming: Intergraph 4.10Drawing Objects- Line 4.11 Rectangles Ellipse, Circle, Polygon 4.12 Text Formatting Functions	1. Use of file handling. 2. learn about graphics.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create a program in C to store and read a file content in C.
ii Create a program in C to draw and fill rectangle.
iii. Explain Text Formatting in Graphics.

b. Mini Project:

i. Bank Management System

c. Other Activities (Specify):

Quiz and presentation

TMCA05.5: Comprehend the functions of Preprocessor..

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	1
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about macro-Substitution. **SO5.2** Understand about file inclusion **SO5.3** Use of conditional compilation **SO5.4** Understand about preprocessor directive **SO5.5** Understand Miscellaneous Directives. **SO5.**6 use of command line argument. **SO5.7** Learn about objective of C	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 Pointer** **5.1** Macro Substitution **5.2** File Inclusion **5.3** Conditional Compilation-1 **5.4** Conditional Compilation-2 **5.5** Preprocessor Directive **5.6** Miscellaneous Directives **5.7** Command Line Arguments **5.8** Introduction to Objective C	1.Use of macro.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain command line argument.

ii Explain the preprocessor directive.

Iii Explain conditional Compilation with example.

b. Mini Project:

i. Hangman Game

c. Other Activities (Specify):

Project Presentation

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total Hour (Cl+SW+Sl)
TMCA05.1: At the end of this chapter the student will Explain the core concept of C Programming.	12	4	1	1	22

TMCA05.2: At the end of this chapter the student will use Array and Function in programs.	12	3	1	1	20
TMCA05.3: At the end of this chapter the student will describe the pointers and DMA.	12	3	1	1	20
TMCA05.4: At the end of this chapter the student will design macro and programs	12	3	1	1	20
TMCA05.5: Comprehend the functions of Preprocessor.	12	2	1	1	20
Total Hours	**60**	**30**	**5**	**5**	**60**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA05.1	At the end of this chapter the student will explain the core concept of C programming.	03	04	03	10
TMCA05.2	At the end of this chapter the student will use Array and Function in programs.	05	03	02	10
TMCA05.3	At the end of this chapter the student will Describe the pointers and DMA.	05	02	03	10
TMCA05.4	At the end of this chapter the student will design macro and programs	04	04	02	10
TMCA05.5	Comprehend the functions of Preprocessor.	03	05	2	10
Total		20	15	15	50

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

Suggested Instructional/Implementation Strategies:

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

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
1	The C Programming Language	Kernighan, Ritchie	Prentice Hall of India.	Revised edition 21 edition 2020
2	Programming Language Concepts	Carlo Ghazi, Mehdi Jazayeri	John Wiley and Sons	1999
3	Programming in ANSIC C	E. Balagurusamy	Tata McGraw Hill	2002
4	Let Us C	Yashavant Kanetkar	Seventh Edition, BPB Publications	2007
5	Programming in C	Reema Thareja	Oxford University Press India, Noida	2008

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COs, POs and PSOs Mapping

Course: MCA

Code: TMCA05

Course Title: Programming in C

Course Outcomes	Program Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Being able to comprehend and put knowledge of software application analysis, design, and development to use	Apply knowledge and skills for computer practice while upholding social, ethical, and legal principles.	The capacity to work with cutting-edge computing systems and pursue employment in the IT sector, including consulting, research and development, Education, and related fields.
TMCA05 1: At the end of this chapter the student will explain the core concept of C programming.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	3
TMCA05 2 : At the end of this chapter the student will use Array and Function in programs.	1	1	2	2	1	2	3	1	1	1	2	2	2	2	2
TMCA05 3: At the end of this chapter the student will describe the pointers and DMA.	2	2	1	1	1	2	2	1	1	2	1	2	1	1	2
TMCA05 4: At the end of this chapter the student will design macro and programs.	3	2	2	2	3	2	3	1	2	1	2	3	3	3	3
TMCA05 5: Comprehend the functions of Preprocessor.	2	3	2	2	2	3	3	1	1	1	2	2	3	3	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	CO 1: At the end of this chapter the student will explain the core Concept of C programming.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1 .12	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	CO 2 : At the end of this chapter the student will use Array and Function in programs.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 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: : At the end of this chapter the student will describe the pointers and DMA.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3 .12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: At the end of this chapter the student will design macro and programs.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11 ,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Comprehend the functions of Preprocessor.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5 .12	

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023)

Semester-I

Course Code: **TMCA06**

Course Title : **WEB TECHNOLOGY**

Pre- requisite: **BASICS OF PROGRAMMING & INTERNET**

Rationale: The purpose of the Web Technologies course is to build the skills students will need as web designers. Web designers understand the principles of web technology and design as well as web design principles. In Web Technologies, students will build their technology skills using scripting with state-of-the-art web design software.

Course Outcomes:

TMCA06.1: At the end of this chapter the student will explain the principles of Web development
TMCA06.2: At the end of this chapter the student will use CSS and Java script
TMCA06.3: At the end of this chapter the student will compare HTML and XML
TMCA06.4: At the end of this chapter the student will execute PHP programs
TMCA06.5: At the end of this chapter the student will develop Web sites by using PHP and MySql.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA06	WEB TECHNOLOGY	4	2	1	1	8	5

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

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	TM CA06	WEB TECHNOLOGY	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TM CA0 6	Web Technology	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.

TMCA06.1: At the end of this chapter the student will explain the principles of Web development**.**

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand client server architecture. **SO1.2** Understanding various technologies use in web sites. **SO1.3** Creating web Page using HTML tags. **SO1.4** Creating forms using HTML. **SO1.**5 Using latest IDE for web page development .	1. Create a web page by making use of the following tags: HEAD, BODY, BGCOLOR 2. Write an HTML page that contains a selection box with a list of 5 countries. 3. Create a Web page Layout with Tables and all its attributes.	**Unit-1.0 Creation of web pages using HTML tags** 1.1 Introduction to various technologies used for web development. 1.2 Client server architecture. 1.3 Client-side scripting1 1.4 Client-side scripting2 and 1.5 server-side scripting1 1.6 server-side scripting2 1.7 Use of basic tags and attributes of HTML1 1.8 Use of basic tags and attributes of HTML2 1.9 Use of basic tags and attributes of HTML3 1.10 Use of form elements of HTML. 1 1.11 Use of form elements of	1. Learning various attributes of HTML tags. 2. Learning online HTML editors.

		HTML. 2 1.12 Use of latest editors for web developme nt like. VS Code, Notepad++ etc.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Explain basic HTML tags and their properties.

b. Mini Project:

i. Create an admission form using HTML tags.

c. Other Activities (Specify):

Note on client server Architecture.

TMCA06.2: Acquire knowledge regarding the CSS and Java script

Approximate Hours

Item	AppX Hrs
Cl	12
LI	10
SW	1
SL	1
Total	24

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 To Understand the types and selectors of CSS. **SO2.2** To learn about properties and values in CSS. **SO2.3** To implement transition and animation on a web element.	1. Create an Internal Style Sheet that defines a style for Positioning elements &editing the background	Unit-2 CSS and Java Script 2.1. Introduction to CSS and 2.2. Types of CSS. 2.3. Types of CSS selectors. 2.4. Difference between Class and ID, 2.5. DIV and SPAN. 2.6. Implementing border,	I. Implement CSS to previously created web page Ii. Use Java scripting to make a page dynamic.

SO2.4 To understand JavaScript Basics and DOM model. **SO2.**5 Execute JS code on the basis of an event.	(color/image) . 2. Create an External Style Sheet to define the style for the following tag: H1, H2, Body, P. 3. Write a JavaScript program to design a simple calculator. 4. Write a JavaScript program to find the factorial of given number by using function. 5. Write a JavaScript program to demonstrate the use of message box, and loops.	background, colors, 2.7. Gradient, shadow using CSS. 2.8. Introduction to JavaScript and 2.9. Syntax. 2.10. DOM model. 2.11. JavaScript Events. 2.12. Form validation using JavaScript.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Implement CSS and JavaScript in your web page.

b. Mini Project:

Create an online calculator using HTML, CSS and JavaScript.

TMCA06.3: At the end of this chapter the student will compare HTML and XML

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	1
SL	1

Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO3.1 Fundamental of XML. **SO3.2** XML syntax **SO3.3** Accessing data from XML. **SO3.4** Introduction and structure of jQuery. **SO3.5** jQuery events and effects	1. Create a XML Document with following details: roll no, sname, contact, email, address. 2. Write a jQuery script to perform hide /show effect on login and Logout button.	Unit-3 : XML and jQuery **3.1.** Fundamental of XML and **3.2.** Syntax of XML. **3.3.** Accessing data from XML documents.1 **3.4.** Accessing data from XML documents2 **3.5.** Intro to jQuery. **3.6.** Structure of jQuery **3.7.** Selectors1 **3.8.** Selectors2 **3.9.** Event1 **3.10.** Event2 **3.11.** Effects1 **3.12.** Effects2	i. Differentiate between HTML and XML ii. Advantages of XML and jQuery.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Implement XML tags in a web page.

b. Mini Project:

Make a web page implementing XML and jQuery.

c. Other Activities (Specify):

Differentiate between HTML tags and XML tags.

TMCA06.4: At the end of this chapter the student will execute PHP programs

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Understanding importance of server side scripting. **SO4.2** Using PHP as server side scripting. **SO4.3** Embedding PHP in HTML **SO4.4** PHP functions and control structure. **SO4.**5 Array and accessing array elements.	1. Create a web form using PHP for Student Registration and Login. 2. Show form validation using PHP 3. Example of User define functions	**Unit-4 : PHP** **4.1.** Introduction, **4.2.** syntax and **4.3.** comments in PHP **4.4.** Creating variable and constants in PHP **4.5.** Embedding PHP in HTML. **4.6.** Form validation using PHP **4.7.** User Defined Functions and **4.8.** Strings functions **4.9.** 4Creating Array and Accessing Array Elements **4.10.** Control Statements 1 **4.11.** Control Statements 2 **4.12.** Loops	i. Differentiate between client side and server side scripting. ii. Learn XAMMP for executing PHP files.

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

a. Assignments:

i. Write down the advantages of server side scripting.

ii. Explain types of arrays in PHP.

d. Mini Project:

i. Create a web page with the help of PHP scripting.

e. Other Activities (Specify):

Understand XAMMP.

TMCA06.5: At the end of this chapter the student will develop Web sites by using PHP and MySQL

Approximate Hours

Item	AppX Hrs
Cl	12
LI	4
SW	1
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Creation of classes and object using PHP. **SO4.2** Implementing objects in PHP **SO4.3** Connecting MySQL database with PHP **SO4.4** Implementing session and cookies. **SO4.**5 Performing CRUD operation on database using PHP.	1. Write a PHP script to perform CRUD Operations. 2. Design the self-blog using J Query, CSS, PHP and MySQL	**Unit-5 : Object Oriented Programming with PHP** **5.1.** Creating Classes and Objects **5.2.** Accessing Methods. **5.3.** **CRUD**: Database Creation, **5.4.** Inserting, **5.5.** Deleting and **5.6.** Updating Records **5.7.** Session and Cookies. **5.8.** PHP with MS-Access/ **5.9.** MySQL: **5.10.** Creating Connections **5.11.** Selecting Database, **5.12.** Perform Database Operations	i. Learn OOP's Using PHP. Ii. Perform CRUD operation using PHP

SW-5 Suggested Sessional Work (SW):

a. **Assignments**
   i. Perform CRUD operation on MySQL database using PHP scripting.
   ii. Create PHP scripting implementing OOP's.
b. **Mini Project:**
   i. Design the self-blog using J Query, CSS, PHP and MySQL
c. **Other Activities (Specify):**
   Create form validation using PHP.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA06.1: At the end of this chapter the student Will explain the principles of Web development.	12	6	1	1	20
TMCA06.2: At the end of this chapter the student will use CSS and Java script	12	10	1	1	24

TMCA06.3: At the end of this chapter the student will compare HTML and XML	12	4	1	1	18
TMCA06.4: At the end of this chapter the student will execute PHP programs	12	6	2	2	20
TMCA06.5: At the end of this chapter the student will develop Web sites by using PHP and MySQL.	12	6	2	2	18
Total Hours	60	30	7	7	100

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA06-1	At the end of this chapter the student will explain the principles of Web development.	03	01	01	05
TMCA06-2	At the end of this chapter the student will use CSS and Java script	02	06	02	10
TMCA06-3	At the end of this chapter the student will compare HTML and XML	03	07	05	15
TMCA06-4	At the end of this chapter the student will execute PHP programs	-	10	05	15
TMCA06-5	At the end of this chapter the student will develop Web sites by using PHP and MySQL	03	02	-	05
Total		11	26	13	50

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

The end of semester assessment for Web Technology 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	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

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course: MCA
Course Code: TMCA06
Course Title: Web Technology

Course Outcomes	Program Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	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	Being able to comprehend and put knowledge of software application analysis, design, and development to use	Apply knowledge and skills for computer practice while upholding social, ethical, and legal principles.	The capacity to work with cutting-edge computing systems and pursue employment in the IT sector, including consulting, research and development, education, and related fields.
CO1. At the end of this chapter the student will explain the principles of Web development.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	3
CO2. At the end of this chapter the student will use CSS and Java script	1	1	2	2	1	2	3	1	1	1	2	2	2	2	2
CO3. At the end of this chapter the student will compare HTML and XML	2	2	1	1	1	2	2	1	1	2	1	2	1	1	2
CO4. At the end of this chapter the student will execute PHP programs	3	2	2	2	3	2	3	1	2	1	2	3	3	3	3
CO 5: At the end of this chapter the student will develop Web sites by using PHP and MySQL	2	3	2	2	2	3	3	1	1	1	2	2	3	3	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	CO 1: At the end of this chapter the student will explain the principles of Web development	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1,2,3	Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11, 1.12	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	CO 2 : At the end of this chapter the student will use CSS and Java script	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	1,2,3,4,5	Unit-2 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: : At the end of this chapter the student will compare HTML and XML	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	1,2	Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: At the end of this chapter the student will execute PHP programs	SO4.1 SO4.2 SO4.3 SO4.4	1	Unit-4 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: At the end of this chapter the student will develop Web sites by using PHP and MySql.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	1,2	Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5. 12	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of Master of Computer Application [MCA] Program

SEMESTER-II

Course Code: **TMCA07**

Course Title: Object-Oriented Programming using C++

Pre- requisite: Basic introduction of computer

Rationale: C is a powerful programming language that enables developers to create sophisticated software systems. The language is fast, efficient, and easy to learn, making it a popular choice for many applications. C is also portable, meaning that programs written in C can be easily ported to other platforms.

Course Outcomes:

TMCA07.1: Understand the core concept of C++ programming
.TMCA07.2: Apply Function
TMCA07.3: Use constructors
TMCA074: Apply Inheritance
TMCA07.5: Apply File Handling

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA 07	Object- Oriented Programming using C++	4	2	1	1	8	5

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

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

Scheme of Assessment:

Theory

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)		
TMCA 07	Object-Oriented Programming using C++	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA 07	Object-Oriented Programming using C++	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.

TMCA 07.1: Introduction about programming in c Language

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Introduction **SO1.2** Decision Control Structures **SO1.3** Looping Control Structures	1. Write a program in C++ to exchange the content of two variables using call by reference. 2. Write a program in C++ to demonstrate the Constructor Overloading, and assume desired parameters. 3. Write a program in C++ demonstrating the public, protected, and private parameters..	**Unit-1.0** Introduction of C programming language I. 1.1 Introduction 1.2 Programming Paradigm 1.3 C-Character Set 1.4 Identifier and Keyword 1.5 Data Types 1.6 Constants and Variables 1.7 Operators1 1.8 Operators2 1.9 if, if-else, 1.10 switch-case 1.11 While, do-while, 1.12 for.	1. Learn and understand programming language 2. Make program all topics

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on back propagation.
ii. Numerical based on radial basis.
iii. Numerical based on recurrent network.

TMCA 07.2: Apply Function.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Functions **SO2.2** Pointers	4. Write a program in C++ to demonstrate constructors with default arguments. 5. Write a program in C++ to demonstrate multiple inheritance 6. Write a program in C++ to demonstrate a constructor call in the derived class..	**Unit-2.0 Function** 2.1. Function 2.2. Prototyping 2.3. Call by Reference 2.4. Return by Reference 2.5. inline Functions 2.6. Default Arguments 2.7. Function Overloading, 2.8. Function Overriding 2.9. Friend Class and Function 2.10. Array of Objects 2.11. Pointers to Objects, this Pointer 2.12. Dynamic Objects	1. How to make a function and learn program 2. How to pointer program

SW-1 Suggested Sessional Work (SW):

Assignments:

iv. Numerical based on Fuzzy logic.
v. Numerical based on Membership Function.
vi. Numerical based on Genetic algorithm.

TMCA 07.3: Use Constructors:

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Constructors **SO3.2** Operator Overloading	7. Write a program in C++ to copy the content of a file into another. (Assume suitable data) 8. Write a program in C++ to append the content of the file. (Assume suitable data). 9. Write a program in C++ to demonstrate the friend function..	**Unit-3.0** Constructors 3.1. Constructors 3.2. Different Types of Constructors. 3.3. Overloading Constructors 3.4. Destructors 3.5. Container Classes 3.6. Static Class Members 3.7. Static Objects 3.8. Overloading Unary and 3.9. Overloading Binary Operator 3.10. Stream Operator Overloading 3.11. Data Conversion 3.12. Questions based on Constructor	Make program and learn all topics

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.

TMCA 07.4: Apply Inheritance.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Inheritance **SO4.2** Templates	10. Write a program to implement an Account Class with member	**Unit-4.0** Inheritance 4.1. Defining Derived Classes 4.2. Types of Inheritance 4.3. Examples based on	1. Analyze and learn Inheritance program.
	functions to Compute Interest, Show Balance, Withdraw, and Deposit amount from the Account. 11. Write a program for static data and member functions in C++. 12. Write a program to handle exceptions in C++..	Inhritance 4.4. Abstract Classes 4.5. Polymorphism: Introduction 4.6. Examples based on Polymorphism 4.7. Example of Scripts 4.8. Virtual Function 4.9. Virtual Base Class, Pure Virtual Function 4.10. Templates 4.11. : Function Template 4.12. Class Template	

SW-1 Suggested Sessional Work (SW):

Assignments:

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

TMCA 07.5: Apply Manipulators.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	06
SW	01
SL	01
Tota l	20

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

SO5.1 Manipulators **SO5.2** Exception Handling **SO5.3** Streams	13. Write a program to demonstrate a template in C++. 14. Write a program to print	**Unit-5.0** Manipulators, Exception handling, stream 5.1. Manipulators. 5.2. User Defined Manipulators 5.3. IO Functions 1 5.4. IO Functions 2	1. Compare and analyze exception handling.
	a pyramid pattern in C++. 15. Write a program to demonstrate operator overloading in C++..	5.5. Certainty factors 5.6. Handling User-Defined Exception 5.7. Try/ 5.8. catch/ 5.9. throw. 5.10. Stream Classes 5.11. File Streams, 5.12. File Open and Close	

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)
TMCA 07.1: Introduction about programming in c language	12	6	1	01	20
TMCA 07.2: Apply Function	12	6	1	01	20
TMCA 07.3:Apply Constructor	12	6	1	01	20
TMCA 07.4: Apply Inheritance	12	6	1	01	20
TMCA 07-5: Apply File Handling	12	6	1	01	20
Total Hours	60	30	5	05	100

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit	Marks Distribution			Total
	Titles	R	U	A	Marks
TMCA 07-1	Introduction of C programming language I.	03	02	03	08
TMCA 07-2	Function II.	03	01	05	09
TMCA 07-3	Constructor III	03	07	02	12
TMCA 07-4	Inheritance VI	03	05	05	13
TMCA 07-5	Manipulators, Exception handling, stream V	03	02	03	08
Total		15	17	18	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. 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	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall	1988
2	C Programming Absolute Beginner's Guide	Greg Perry and Dean Miller	Que Publishing	2013 (3rd Edition)
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

Curriculum Development Team

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COs, POs and PSOs Mapping

Course: MCA
Course Code: TMCA07
Course Title: Object- Oriented Programming using C++

	Program Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	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	pplying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.
TMCA 071 : Introduction about programming in c language	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA 07 2 : Apply Function	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA 07 3: Apply Constructor	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
TMCA 07 4: Apply Constructor	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA 07 5: Apply File Handling	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO: 1,2,3,	CO-1: Understand the core concept of C++ programming	SO1.1 SO1.2 SO1.3	1,2,3	Unit-1.0 Introduction of C++ programming language I 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 no. ____to _____
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO: 1,2,3,	CO 2 : Apply Function	SO2.1 SO2.2	4,5,6	Unit-2: Function II. 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,	CO3: Use Constructor	SO3.1 SO3.2	7,8,9	Unit-3 : Constructor 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,	CO4: Apply Inheritance	SO4.1 SO4.2	10,11,12	Unit-4 : Inheritance VI 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,	CO 5: Apply File Handling,	SO5.1 SO5.2 SO5.3	13,14,15	Unit5: Manipulator, File Handling, Stream 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 MCA Program

Semester-II

Course Code: TMCA08

Course Title : Database Management Systems

Pre-requisite: Student should have basic knowledge of components and architecture of digital computer system

Rationale: The students should possess foundational understanding about the basic components of digital Computer system. This encompasses familiarity with the operational elements of Digital computer system. Additionally, Students ought to acquire fundamental insights into different types of computers, their applications.

Course Outcomes:

TMCA08.1: Explain The Features Of Database Management Systems And Relational Database.

TMCA08.2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.

TMCA08.3: Create And Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL

TMCA08.4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.

TMCA08.5 Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA 08	Database Management Systems	4	0	1	1	6	4

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

Cous e 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+CA T+AT)		
TMCA08	Database Management Systems	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA08	Database Management Systems	35	5	5	5	50	50	100

Course-Curriculum Detailing:

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

TMCA08.1: Explain The Features Of Database Management Systems And Relational Database.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	6
SW	1
SL	1
Total	21

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Define DBMS Discuss about the Characteristics. **SO1.2** Explain Architecture and Modeling **O1.3** Explain1 Entity Relationship (ER) Model **SO1.4** Enhanced Entity Relationshi (EER) Model **SO1.5** Explain Generalization	1.1 draw ER Model and Relational Model for a given database. 1.2 Show ER to Relational Model reduction. 1.3 Create a table using select command.	**Unit-1. Introduction to DBMS: (13 Lectures)** 1.1 Why database? Characteristics of data in database Functional Units. 1.2 What are database Advantages of DBMS?, 1.3 Conceptual, physical and logical database models . 1.4 Role of DBA, Database design 1.5 Components of ER-model, ER modeling symbols . 1.6 Relationships. 1.7 An introduction, Superclass and subclass entity types. 1.8 Specialization, Generalization. 1.9 Attribute inheritance, Categorization& Aggregation. 1.10 DBMS, DBA, Entity Relationship (ER) 1.11 S EER, Superclass 1.12 Subclass, Specialization Floating-Point Representation 1.13 Generalization, Categorization & Aggregation.	1. Why we are using database. And how much its important .

SW-1Suggested Sessional Work (SW):

a. Assignments:

(i) **Explain Components of ER-model and ER modeling symbols.**

b. Presentation.

c. Pictorial representation of ER-Model:

TMCA08.2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	6
SW	1
SL	1
Total	19

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
2.1 Fundamental Concepts. **SO2.2** To learn Normalization Process **SO2.3**To understand Transforming a Conceptual Model to a Relational Model. **SO2.4** Transforming Relationships. **SO2.**5 Aggregated Object Sets.	1) Creation of Database with proper constraints (Pk, Fk etc). 2) Insert into database using different types of insert statements. 3) To display the table after creation and insertion we use the following syntax: select *front <table nanze>	Unit-2 **The Relational Data Model** **(11 Lectures)** **2.1** Relations, Null Values, **2.2** Keys, Foreign Keys. **2.3** Integrity Constraints Entity Integrity & Relational Integrity. **2.4** First Normal Form, Functional Dependencies, **2.5** Second Normal Form, Third Normal Form. **2.6** Boyce-Codd Normal Form (BCNF), Fourth Normal Form; Other Normal Forms Fifth Normal Form & Domain/Key Normal Form. **2.7** Transforming Objects Sets and Attributes **2.8** Transforming Models without External Keys. **2.9** Transforming Specialization and Generalization Object Sets. **2.10** One-One Relationships. **2.11** One-Many	1. Solve Recursive Relationship.

		Relationships, Many-Many Relationships Transforming Aggregated Object Sets, Transforming Recursive Relationships.	

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Design BCNF

b. Presentation

c. Pictorial representation of different type of Keys:

TMCA08.3**:** Create and Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 Relational Algebra and Calculus Relational Algebra. SO3.2 to understand Relational Calculus . SO3.3 to understand the The Existential Quantifier	1. Applying different constraints check, not null, etc. 2. Alter table: add column, remove column, add constraint, remove constraint	Unit-3: Relational database implementation: 3.1.Union, Intersection 3.3 Product, 3.4 Select, 3.5 Project, 3.6 Join Natural, 3.7 Theta & Outer Join 3.8 Divide, Assignment. 3.9 Target list & 3.10 Qualifying Statement, 3.11 The Existential Quantifier, 3.12 The Universal Quantifier.	i. Explain Target list, Existential Quantifier,

SW-3 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain Join Natural, Theta & Outer Join.

b. Presentation

c. Pictorial representation of different Relational Calculus:

TMCA08.4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	6
SW	1
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Explain Relational Implementation with SQL, Relational Implementations. **SO4.2** To An Overview. Schema and Table Definition. **SO4.3** Explain Data Manipulation **SO4.4** Explain Relational Algebra Operations **SO4.5** Explain Using SQL with Data Processing Languages	1. Selection of rows and columns, renaming columns, use of distinct keyword 2. Select clause is used to list the attributes desired in the result of a query. It corresponds to the projection operation of the relational algebra: Eg. select EMPLOYEE 3. SQL provides a case construct which we can use to perform both the update with a single update statement avoiding the problem with the order of updates.	4.1 Unit-4 : Relational database implementation 4.2 (12 Lectures) 4.3 Schema definition, 4.4 Data types & domains, Defining Tables . 4.5 Simple Queries (SELECT, FROM, WHERE), 4.6 Multiple-Table Queries, Subqueries, Correlated Subqueries. 4.7 EXISTS and NOT EXISTS Operators. 4.8 Built-ln Functions (SUM, AVG, COUNT,	i. Define Data Manipulation

		4.9 MAX, and MIN). GROUP BY and HAVING clause 4.10 Built-In Functions 4.11 UNION, INTERSECT, EXCEPT, 4.12 JOIN.Database Change Operations. INSERT, UPDATE, DELETE. 4.13 View Definition, Restrictions on View Queries and Updates	

SW-4 Suggested Sessional Work (SW):
Assignments: a.

(i) Database Change Operation.

b. Presentation

c. Pictorial representation of different Built-ln Functions

TMCA08.5**:** Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Approximate Hours

Item	Appx. Hrs
Cl	11
LI	6
SW	1
SL	1
Total	19

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

SO5.1 Understand Physical Access of the Database. Physical Storage Media **SO5.2 Explain** Disk Performance Factors **SO5.3 Explain** Data Storage Formats on Disk **SO5.4** Discuss Input/output Management. File Organizing and Addressing Methods. **SO5.5 Discuss** Hashing	1) JOINS: SQL joins are used to query data from two or more tables, based on a relationship between certain columns in these tables. 2) Create a personalized collection of relation that is better user's intuition than is logical model 3) Creation of Views To define a view we must give the view a better name and must state the query that computes the view. Syntax: create vieu'<view najne> as <query expression>	**Unit5: INPUT-OUTPUT:** (12 Lecture) 5.1 Secondary Storage, 5.2 Physical Storage Blocks, 5.3 : Access Motion Time, Head Activation Time, 5.4 Rotational Delay, Data Transfer Rate, Data Transfer Time. 5.5 Track Format,Record Format— Fixed-Length Records & 5.6 Variable-Length Records, 5.7 Sequential File Organization, Indexed Sequential File Organization 5.8 Direct File Organization. 5.9 Static Hash Functions and 5.10 Dynamic Hash Functions 5.11 Synchronization,	1. Disk Performance Factors 2. Sequential File Organization

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Indexed Sequential File Organization.

b. Presentation:

c. Other Activities (Specify): Group discussion on important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA08 .1 At the end of this chapter the student will Explain The Features Of Database Management Systems And Relational Database.	13	6	2	1	21
TMCA08.2 At the end of this chapter the student will Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	11	6	1	1	19
TMCA08.3 At the end of this chapter the student will Create and Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL	12	6	1	1	20
TMCA08.4 At the end of this chapter the student will Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	13	6	1	1	21
TMCA08.5 At the end of this chapter the student will Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	11	6	2	2	19
Total Hours	60	30	07	06	100

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA08-1	Introduction to DBMS	03	02	03	08
TMCA08-2	The Relational Data Model	03	01	05	09
TMCA08-3	Relational database implementation	03	07	02	12
TMCA08-4	Relational database implementation	03	05	05	13

TMCA08-5	INPUT- OUTPUT	03	02	03	08
Total		15	17	18	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. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

Books:

S. No.	Title	Author	Publisher	Edition & Year
1	SQL, PL/SQL – The Programming Language of Oracle	Ivan Bayross	Prentice Hall	1 Dec 2010
2	SQL & PL / SQL for Oracle 11g Black Book	P.S. Deshpande	Pearson Education	7 Jul 2011
3	Mastering Oracle SQL	Sanjay Mishra	Morgan Kauffmann Publishers	17 Apr 17 Apr 2002 2002

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: MCA
Course Code: TMCA08
Course Title: Database Management 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
	Engineering knowledge	Problem analysis	Design/development of	Conduct studies of	Utilization of modern tools	Engineers and society	Environment and	Ethics	Individual and team work	Communication	Project management and	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.
CO1 Explain The Features Of Database Management Systems And Relational Database.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO3: Create And Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
CO.5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Explain The Features Of Database Management Systems And Relational Database.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		UNIT – I: Management Systems And Relational Database: 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 above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		UNIT – II: ER Modelling For Real Life Applications And Construct Queries In Relational Algebra 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	CO3: Create And Populate A RDBMS For A Real-Life Application, With Constraints And Keys, Using SQL	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		UNIT – III: Constraints And Keys, Using SQL 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: Type Of Information From A Database By Formulating Complex Queries In SQL. 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO.5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5: Design An Optimal Database. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of Master of Computer Application [MCA] Program

Semester-II

Course Code: **TMCA09**

Course Title: Data Structure

Pre- requisite: Computer Fundamental

Rationale: Data structures make it easy for users to access and work with the data they need in appropriate ways.

Course Outcomes:

TMCA09.1: Apply knowledge of data structures to solve programming problems and implement algorithms effectively.

TMCA09.2: Apply and implement algorithms for common operations and functionalities associated with different data structures.

TMCA09.3: Compare and analyze different data structures and assess their suitability for specific problem-solving scenarios.

TMCA09.4: Evaluate the strengths and weaknesses of different data structures based on their characteristics, performance, and memory usage.

TMCA09.5: Apply knowledge of data structures to solve programming problems and implement algorithms effectively.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA09	DATA STRUCTURE	4	2	1	1	8	5

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:
Theory

Course	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 of 3)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
TMCA09	Data Structure	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA09	Data Structure	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.

TMCA09.1. Apply knowledge of data structures to solve programming problems and implement algorithms effectively.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand concepts of data structure **SO1.2** Calculate complexities of algorithm **SO1.3.** Apply link-list data structure	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-1.0 Introduction to Data structures** 1.1 Definition, Classification 1.2 Operations on data structures 1.3 DMA 1.4 Asymptotic Notation 1.5 Algorithm Complexity 1.6 Linked List 1.7 Types of Linked List: singly linked List, Doubly Linked List 1.8 Circular Linked list, 1.9 Circular Doubly Linked List 1.10 Application of Linked List 1.11 Polynomial Representation and 1.12 Addition.	1. Discuss small O, small omega 2. Implement link-list using C Programming 3. Discuss Flow Chart

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Write an algorithm for adding two numbers.

ii. Calculate algorithm complexities for various algorithms.
iii. Write a program in C and C++ that implements link list.
iv. Write a program in C and C++ for operations on link list.

TMCA09.2: Apply and implement algorithms for common operations and functionalities associated with different data structures.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Apply stack data structure **SO2.2** Apply Queue data structure	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. .	**Unit-2.0 Stack & Queue** 2.1. **:** Stack, 2.2. Array and Linked List Representation of Stack 2.3. Operations on Stack, 2.4. PUSH and POP 2.5. Applications of Stack: Conversion from Infix to Postfix 2.6. and Prefix. 2.7. Evaluation of Prefix and Postfix Expression using Stack 2.8. Recursion 2.9. Queue: Array and Linked List Representation of Queue 2.10. Types of Queues	1. Discuss Array data structure 2. Implement stack and queue using C Programming

		2.11. Various Operations on Queue 2.12. Applications of Queue	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Conversion of infix into postfix and prefix expressions.
ii. Algorithms based on recursion.
iii. Compare stack and queue data structure.

TMCA09.3: Compare and analyze different data structures and assess their suitability for specific problem-solving scenarios.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand graph application **SO3.2** Apply graph algorithms in real life problems.	. 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.	**Unit-3.0 Graphs** 3.1. Graphs: Introduction 3.2. Graph Representation 3.3. Adjacency Matrix 3.4. Adjacency List, 3.5. Adjacency Multi-list 3.6. Graph Traversal 3.7. Graph Traversal 3.8. Minimum Spanning Tree 3.9. Shortest Path Algorithm 3.10. Kruskal Algorithm 3.11. Prim's Algorithm 3.12. Questions based on it	1. Application of graph in Computer Network 2. Application of graph in Mathematics 3. Search various terminologies related to tree data structure

SW-1 Suggested Sessional Work (SW):

Assignments:

i. To find minimum spanning tree for given graphs
ii. To find shortest path in a given graph using Kruskal algorithm.

iii. To find shortest path in a given graph using Prim algorithm.

TMCA09.4: Evaluate the strengths and weaknesses of different data structures based on their characteristics, performance, and memory usage.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the concepts of trees **SO4.2.** Analyze application of tree data structure **SO4.3.** apply heap and binary search tree data structure.	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-4.0 Trees** 4.1. Trees: Introduction 4.2. binary tree, 4.3. Binary Tree Representation: Array and 4.4. Linked List Representation of Binary Tree 4.5. Complete Binary Tree, 4.6. Extended Binary Tree 4.7. Array and Linked List Representation of Binary Tree 4.8. Threaded Binary Tree 4.9. B-tree, 2-3 tree 4.10. AVL Tree 4.11. Insertion and Deletion in Binary Search Tree 4.12. Heap Introduction, Max Heap and Min Heap.	1. Analyze application of trees in other fields of science. 2. Search various terminologies related to tree data structure.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. To find AVL tree rotations for given tree.
ii. Implement binary search tree using C Programming.
iii. Give application of binary search tree and heap data structure.

TMCA09.5: Apply knowledge of data structures to solve programming problems and implement algorithms effectively.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	06
SW	01
SL	01
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Compare various sorting algorithms **SO5.2** Compare all searching algorithms **SO5.3** Use hashing techniques **SO5.4**. Understand concept of greedy and dynamic programming.	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.	**Unit-5.0 Sorting, searching, hashing and advance data structure** 5.1. **Sorting:** Introduction, Types of Sorting, Selection Sorting 5.2. Bubble Sorting, Insertion 5.3. Merge 5.4. Heap 5.5. Quick Sort 5.6. Searching: Introduction, Linear, 5.7. Binary Search 5.8. Hashing: Basics, Methods 5.9. Collision Resolution, Chaining, Linear Probing, Rehashing. 5.10. Greedy Method, Dynamic Programming, 5.11. Knapsack Problem 5.12. Travelling Salesman Problems.	1. Compare complexities of all searching algorithms 2. Compare complexities of all sorting algorithm

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on hashing techniques.
ii. Examples of greedy approach.
iii. Examples of dynamic approach.

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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)
TMCA09.1. Apply knowledge of data structures to solve Programming problems and implement Algorithms effectively.	12	6	01	01	14
TMCA09.2. Apply and implement algorithms for common operations and functionalities associated with different data Structures.	12	6	01	01	14
TMCA09.3. Compare and analyze different data structures and assess their suitability for specific problem- solving Scenarios.	12	6	01	01	14
TMCA09.4. Evaluate the strengths and weaknesses of different data structures based on their characteristics, performance, and memory Usage.	12	6	01	01	14
TMCA09.5. Apply knowledge of data structures to solve Programming problems and implement algorithms effectively.	12	6	01	01	14
Total Hours	60	30	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA09-1	**Introduction to Data structures**	03	02	03	08
TMCA09-2	**Stack & Queue**	03	01	05	09
TMCA09-3	**Graphs**	03	07	02	12
TMCA09-4	**Trees**	03	05	05	13
TMCA09-5	**Sorting, Searching, Hashing & Advance data structure**	03	02	03	08
Total		15	17	18	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. 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	Data structure – A Pseudocode Approach with C	Richard F Gilberg Behrouz A. Forouzan, Thomson	United States, Brooks/Cole	2001
2	Data Structures Using C.	Reema Thareja	Oxford University Press	2014
3	Advanced Data structures	Peter Bras	United Kingdom, Cambridge University Press	2019
4	Schaum's Outlines Data structure	Seymour Lipschutz	Tata McGraw Hill	2nd Edition.
5	"An Introduction to Structure with application"	Jean – Paul Trembly and Paul Sorenson	Tata McGraw Hill	2007
6	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.	Data Structures and Algorithms	Prof. Naveen Garg	IIT Delhi.

Curriculum Development Team

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5. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
6. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: MCA
Course Code: TMCA09
Course Title: Data Structures

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
	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.
TMCA09.1 Apply knowledge of data structures to solve Programming problems and implement Algorithms effectively.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA09.2: Apply and implement algorithms for common operations and functionalities associated with different data Structures.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA09.3: Compare and analyze different data structures and assess their suitability for specific problem- solving Scenarios.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
TMCA09.4 Evaluate the strengths and weaknesses of different data structures based on their characteristics, performance, and memory Usage.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA09.5 Apply knowledge of data structures to solve Programming problems and implement algorithms effectively.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
PO: 1,2,3,4,5,6, 7,8,9,10,11, 12 PSO:1,2,3	CO.1: Apply knowledge of data structures to solve programming problems and implement algorithms effectively.	SO1.1 SO1.2 SO1.3	1,2,3	Unit-1.0 Introduction to Data structures 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 no. above
PO: 1,2,3,4,5,6, 7,8,9,10,11, 12 PSO:1,2,3	CO2. Apply and implement algorithms for common operations and functionalities associated with different data structures.	SO2.1 SO2.2	1,2,3	Unit-2 Stack & Queue 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	CO3. Compare and analyze different data structures and assess their suitability for specific problem-solving scenarios.	SO3.1 SO3.2	1,2,3	Unit-3 : Graphs 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	CO4. Evaluate the strengths and weaknesses of different data structures based on their characteristics, performance, and memory usage.	SO4.1 SO4.2 SO4.3	1,2,3	Unit-4 : Trees 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO: 1,2,3,4,5,6, 7,8,9,10,11, 12 PSO:1,2,3	CO5. Apply knowledge of data structures to solve programming problems and implement algorithms effectively.	SO5.1 SO5.2 SO5.3 SO5.4	1,2,3	Unit5: Sorting, Searching, Hashing & Advance data structure 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

Curriculum of MCA Program

(Revised as on 01 August 2023)

SEMESTER-II

Course Code: **TMCA10**

Course Title: .NET TECHNOLOGIES

Pre- requisite: Student should have a basic understanding of Fundamental of Computer.

Rationale: Importance of C programming and its practical applications C programming language holds immense importance in the software development industry. Its simplicity, efficiency, and versatility make it a powerful tool for developing a wide range of applications. From operating systems to embedded systems, C finds its use in numerous domains.

Course Outcome:

TMCA10.1: Understand .NET framework, C# basics, and advanced OOP concepts.

TMCA10.2: Master ASP.NET Core for web application development.

TMCA10.3: Build dynamic web applications using controllers, views, and helpers.

TMCA10.4: Implement data validation, state management, and security features.

TMCA10.5: Gain proficiency in Entity Framework Core for database interactions and routing.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(5)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA10	.NET PROGRAMING	4	2	1	1	8	5

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

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

Scheme of Assessment:

Theory

Couse Code	Course Title	Scheme of Assessment (Marks)							
		Progressive Assessment (PRA)						End Semester Assessment (E S A)	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)		
TMCA10	.NET PROGRAMING	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA10	.NET PROGRAMING	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.

TMCA10.1: Understand .NET framework, C# basics, and advanced OOP concepts.

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Curriculum of MCA Program

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Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 .NET Framework Fundamentals. **SO1.2** C# Basics Mastery. **SO1.3** Advanced OOP Concepts. **SO1.4** Application of OOP in .NET: **SO1.5** Hands-On Practice.	1. Write a C# program that demonstrates the use of Enums and explains their significance in a real-world scenario. 2. Implement a C# program that showcases the concept of operator overloading, providing examples for different operators. 3. Create a C# program that handles exceptions gracefully, incorporating both try-catch blocks and custom exception classes.	**Unit-1.0 Introduction to .Net & C#:** 1.1. Introduction to .Net,CLI,CLR, 1.2. .Net Framework Architecture and versions, 1.3. Overview of .NET Core, Introduction to Visual Studio, 1.4. Introduction to C#, 1.5. Data Types, Identifiers, Variables,Constants, Literals, 1.6. Array and Strings, 1.7. Concept of OOPs, 1.8. Operator Overloading, 1.9. Errors & Exception Handling, 1.10. Enums, Interfaces, 1.11. Delegates, and Events. 1.12. Type conversion.	1. Use of algorithms for develop program. 2. Create program in C# use of decision and looping statement.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Create a program in C to check the input no is prime or not.

Ii Create a program in C to print a factorial of given no.

b. Mini Project:

i. C Program to Make a Simple Calculator Using switch...case.

c. Other Activities (Specify):

Printing patterns using C programs

TMCA10.2: Master ASP.NET Core for web application development.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 Understand Array. **SO2.2** Types of arrays **SO2.3** Use of function **SO2.4** Understand about call by value and call by reference **SO2.5** Understand about storage classes. **SO2.**6 use of structure and union	4. Develop a basic ASP.NET Core application that follows the MVC pattern. Include a controller, action method, and corresponding view.	**Unit-2.0** **Introduction to ASP.NET Core** 2.1. Introduction, 2.2. what is ASP.NET Core? 2.3. ASP.NET Core Features, 2.4. Advantages of ASP.NET Core.	1. Use of array for develop program. 2.Create program in C use of function.

	5. Explain the differences between ASP.NET Core, ASP.NET MVC, and ASP.NET Web Forms. Provide a simple scenario where each could be most effectively used. 6. Set up a new ASP.NET Core project using Visual Studio and demonstrate the life cycle of an ASP.NET Core request.	2.5. MVC Pattern, 2.6. Understanding ASP.NET Core MVC, 2.7. ASP.NET Core vs. ASP.NET MVC vs. ASP.NET Web Forms, 2.8. ASP.NET Core Environment Setup, 2.9. ASP .NET Core First Application, 2.10. Project Layout, 2.11. Understanding Life Cycle of ASP.Net Core Request	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
i. Create a program in C to create two-dimensional array.
b. Mini Project:
i. C Program to add two matrices.
c. Other Activities (Specify):
Printing patterns using C programs

TMCA10.3: Build dynamic web applications using controllers, views, and helpers.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

SW-1 Suggested Sessional Work (SW):

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand about pointer. **SO3.2** declaration of pointer **SO3.3** Use of pointer with array **SO3.4** use pointer with function **SO3.5** Understand about pointer and structure. **SO3.**6 use of pointer within structure **SO3.7** understand about DMA.	7. Create an ASP.NET Core controller with multiple action methods. Demonstrate how views can be associated with each action. 8. Implement a Razor view that utilizes HTML helpers for form creation and display. Include both built-in and custom HTML helpers. 9. Write a C# program that showcases the concept of model binding using both default and custom model binders.	**Unit-3.0 Controller, Action Methods, Views, Helpers & Model Binding** **3.1.** Controller, **3.2.** Action Methods, **3.3.** Views, **3.4.** Helpers & Model Binding: **3.5.** Controllers Overview, **3.6.** Action Methods and **3.7.** IActionResult object, **3.8.** Introducing Razor View, **3.9.** Types of Views, Partial Views, Layout Pages, Html Helpers, **3.10.** Built-In Html Helpers, URL helpers, Tag Helpers, **3.11.** Html Form behavior, Model Binder Overview, **3.12.** Default Model Binder, Binding to Complex Classes	1. Use pointer. 2. Learn about DMA.

a. **Assignments:**

i. Create a program in C to check the input no is prime or not.
Ii Write difference between structure and union.
b. **Mini Project:**
i. Create a C program to store and print 5 employee record using structure.
c. **Other Activities (Specify):**
Define the DMA in memory**.**

TMCA10.4: Implement data validation, state management, and security features.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand about file handling. **SO4.2** file handling function **SO4.3** random access file **SO4.4** learn graphics programming	10. Develop an ASP.NET Core application that incorporates server-side and client-side validation using data annotations. 11. Implement a session management system in ASP.NET Core to store and retrieve user-specific data across multiple requests. 12. Integrate ASP.NET	**Unit-4.0 Validation & Data Annotation, State management & Security:** 4.1 Data Annotations and 4.2 Validations Overview, 4.3 Server Side and 4.4 Client-Side Validation, 4.5 Custom Server-side validation, 4.6 Model level validation using Valid able Object 4.7 Custom unobstrive Client side, 4.8 Validation, 4.9 Cookies & 4.10 Sessions, 4.11 Authentication and Authorization, 4.12 Implementing Security using ASP.NET Core	1. Use of file handling. 2. learn about graphics.

	Core Identity into a web application, demonstrating user authentication and authorization.	Identity	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   i. Create a program in C to store and read a file content in C.
   Ii Create a program in C to draw and fill rectangle.

b. Mini Project:
   i. Write a program in C draw polygon.

c. Other Activities (Specify):
   Printing patterns using C programs

TMCA10.5: Gain proficiency in Entity Framework Core for database interactions and routing.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about macro-Substitution. **SO5.2** Understand about file inclusion **SO5.3** Use of conditional compilation **SO5.4** Understand about preprocessor directive	13. Design a C# program that performs basic CRUD operations using Entity Framework Core for a	**Unit-5.0 Entity Framework Core & Routing:** **5.1.** Introduction Entity Framework Core **5.2.** Introduction Routing **5.3.** Basic CRUD Operations using Entity Framework1 **5.4.** Basic CRUD Operations using Entity Framework 2	1.Use of macro. 2.Preprocessor

SO5.5 Understand Miscellaneous Directives. **SO5.**6 use of command line argument. **SO5.7** Learn about objective of C	simple database schema. 14. Implement URL routing in ASP.NET Core, including custom routes and routing constraints. 15. Develop a web application that utilizes attribute routing to enhance the organizatio n of URLs within the application.	**5.5.** Separation of work using BO Classes, **5.6.** Writing Generic Class / **5.7.** Repository, **5.8.** Caching in Repository, **5.9.** URL Routing Overview, **5.10.** Custom Routes, **5.11.** Attribute Routing, **5.12.** Routing Constraints	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
i. Explain command line argument.
Ii explain the preprocessor directive.
b. Mini Project:
i. C Program to Make a Simple Calculator Using switch...case.
c. Other Activities (Specify):
Printing patterns using C programs

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)
TMCA10.1: At the end of this chapter the student will explain the core concept of C programming.	12	6	1	1	20

TMCA10.2: At the end of this chapter the student will use Array and Function in programs.	12	6	1	1	20
TMCA10.3: At the end of this chapter the student will describe the pointers and DMA.	12	6	1	1	20
TMCA10.4: At the end of this chapter the student will design macro and programs	12	6	1	1	20
TMCA10.5: Gain proficiency in Entity Framework Core for database interactions and routing.	12	6	1	1	20
Total Hours	60	30	5	5	100

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA10.1	At the end of this chapter the student will explain the core concept of C programming.	03	04	03	10
TMCA10.2	At the end of this chapter the student will use Array and Function in programs.	05	03	02	10
TMCA10. 3	At the end of this chapter the student will describe the pointers and DMA.	05	02	03	10
TMCA10. 4	At the end of this chapter the student will design macro and programs	04	04	02	10
TMCA10. 5	Gain proficiency in Entity Framework Core for database interactions and routing.	03	05	2	10
Total		20	15	15	50

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.

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

Suggested Learning Resources:

1. ASP.Net 3.5 Black Book (Covers C# and VB 2008 Codes) – Dream Tech Publication
2. The Complete Reference ASP.Net By Mathew Macdonald – TMH
3. Kothari Nikhil and Datye Vandana, Developing ASP .NET Server Controls and Components, Tata McGraw Hill, 2003.
4. Esposito Dino, Applied XML Programming for Microsoft .NET, Tata McGraw Hill, 2003.
5. C# Using .Net Framework by Lalit Arora, Anjali Arora.
6. .NET 5 for Beginners: A Step-by-Step Guide to Learn .NET 5 and C#" by Matt R. Cole
7. Learn .NET 5.0: Build modern desktop, cloud, and web applications" by Arnaud Weil
8. C# in Depth, Fourth Edition" by Jon Skeet
9. Programming C# 8.0: Build Cloud, Web, and Desktop Applications" by Ian Griffiths
10. NET Core in Action" by Dustin Metzger and Jim Wooley

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COs, POs and PSOs Mapping

Course Title: MCA
Course Code: TMCA10
Course Title: . NET Technologies

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
	Engineering knowledge	Problem analysis	Design/development of	Conduct studies of	Utilization of modern tools	Engineers and society	Environment and	Ethics	Individual and team work	Communication	Project management and	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.
TMCA10.1 Understand .NET framework, C# basics, and advanced OOP concepts.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA10.2**:** Master ASP.NET Core for web application development.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA10.3 Build dynamic web applications using controller's views, and helpers.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA10.4**:** Implement data validation, state management, and security features	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA10.5**:** Gain proficiency in Entity Framework Core for database interactions and routing.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,	**CO.1:** Understand .NET framework, C# basics, and advanced OOP concepts.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1,2,3	Unit-1.0 Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As Mentioned in above
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO: 1,2,3,	**CO.2:** Master ASP.NET Core for web application Development.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6	4,5,6	Unit-2: Introduction to ASP.NET Core 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,	**CO.3:** Build dynamic web applications using controllers, views, and helpers.	SO3.1 SO3.2	7,8,9	Unit-3 : Controller, Action Methods, Views, Helpers & Model Binding 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,	**CO.4:** Implement data validation, state management, and security features.	SO4.1 SO4.2	10,11,12	Unit-4 : Validation & Data Annotation, State management & Security: 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,	**CO.5:** Gain proficiency in Entity Framework Core for database interactions and routing.	SO5.1 SO5.2 SO5.3	13,14,15	Unit5: Entity Framework Core & Routing: 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 And Science & Technology

Department of Computer Application And Science & Technology

Curriculum of M.C.A. [Program]

(Revised as on 01 August 2023)

Semester-II

Course Code: TMCA11

Course Title: Cloud Computing

Pre-requisite: Database Management System

Rationale: Cloud Computing is important because it helps to process and store large amount of data sets on virtual space.

Course Outcomes:

TMCA11.1: Students should be familiar with various characteristics of the cloud platforms.
TMCA11.2: Learn how virtual platform works for application execution and storage.
TMCA11.3: Create relational database and other cloud-based file system.
TMCA11.4: Understand the privacy issues and security strategies in cloud storage.
TMCA11.5: Implement real time application over various cloud-based platform.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA11	Cloud Computing	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

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)		
TMCA11	Cloud Computing	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

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

TMCA11.1: Students should be familiar with various characteristics of the cloud platforms.

Approximate Hours

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

A K S University

Faculty of Computer Application And Science & Technology

Department of Computer Application And Science & Technology

Curriculum of M.C.A. [Program]

(Revised as on 01 August 2023)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding the characteristics of cloud. **SO1.2** Understanding various components of cloud. **SO1.3** Understanding various models of cloud. **SO1.4** Understanding cloud computing platforms.		**Unit-1.0 Cloud Computing** 1.1 Introduction of Cloud Computing, 1.2 History of Cloud Computing, 1.3 Key Characteristics, 1.4 Private, Public and Hybrid Cloud. 1.5 Cloud Types; 1.6 IaaS, PaaS, SaaS. 1.7 Benefits and Challenges, 1.8 Cluster Computing 1.9 Grid Computing 1.10 Cloud Computing vs. Cluster Computing vs. Grid Computing; 1.11 Applications of Cloud Computing, 1.12 Deploying a web Service in Cloud platform.	Learning components, models, and various Platforms of cloud.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Private, Public and Hybrid Cloud.
2. Amazon EC2, Google App Engine, Microsoft Azure.

b. Mini Project:

Cloud Internet Service Provider (ISP)

c. Other Activities (Specify):

NA

TMCA11.2: Learn how virtual platform works for application execution and storage.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understanding Significance and types of virtualizations. **SO2.2** Understanding various types of virtual machine. **SO2.3** Understanding basics of hypervisor and its types. **SO2.4** Understanding virtual box and other modern virtual machines.		**Unit-2.0 Virtualization** 2.1 Need for Virtualization, 2.2 Pros and Cons, 2.3 Types of Virtualizations, 2.4 Virtual Machine Monitor and its Types, 2.5 Virtual Machine Properties, 2.6 Interpretation and Binary Translation, 2.7 Hypervisors – Introduction, 2.8 Hypervisor in Virtualization, 2.9 Types of Hypervisors, 2.10 Xen, VMWare, 2.11 Virtual Box 2.12 KVM, Hyper-V	Learning Virtualization and hypervisor in cloud.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Types of Virtualizations
2. Types of Hypervisors

b. Mini Project:

Storage virtualization & Network virtualization

c. Other Activities (Specify):

NA

TMCA11.3: Create relational database and other cloud-based file system.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding Various types of cloud file system. **SO3.2** Understanding basics of Map Reduce Model. **SO3.4** Understanding Parallel computing. **SO3.3** Understanding Relational operations with Map Reduce model.		**Unit-3.0 Cloud File System** 3.1 Distributed File System 3.2 Hadoop Technology 3.3 GFS, 3.4 HDFS, 3.5 Bitable, 3.6 HBase, 3.7 Dynamo, 3.8 Comparison among File Systems; 3.9 Map Reduce: Introduction, 3.10 Map Reduce Model, 3.11 Relational Operations using Map Reduce, 3.12 Applications of Map Reduce.	Exporting cloud file system and Map Reduce model.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. GFS
2. HDFS

b. Mini Project:

MapReduce Model

c. Other Activities (Specify):

NA

TMCA11.4: Understand the privacy issues and security strategies in cloud storage.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding security Fundamentals in cloud system. **SO4.2** Understanding cloud security Architecture. **SO4.3** Understanding Trusted cloud computing. **SO4.4** Understanding identity Management and access control.		**Unit-4.0 Cloud Security** 4.1 Cloud Security Introduction 4.2 Cloud Security Measures 4.3 Cloud Security Challenges, 4.4 Software as a Service Security; 4.5 **Common Standards:** 4.6 The Open Cloud Consortium, 4.7 The Distributed Management Task Force, 4.8 Standards for Application Developers, 4.9 Standards for Messaging, 4.10 Standards for Security, 4.11 End User Access to Cloud Computing, 4.12 Mobile Cloud Computing.	Learning Privacy and security Concerns in cloud.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Privacy and Security in Cloud.
2. Virtualization Security Management.

b. Mini Project:

Identity Management and Access Control

c. Other Activities (Specify):

NA.

TMCA11.5 Implement real time application over various cloud-based platform.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding implementing real time application over cloud platform. **SO5.2** Understanding Billing and Accounting System. **SO5.3** Understanding load balancing in cloud. **SO5.4** Understanding resource optimization and reconfiguration.		**Unit-5.0 Cloud Vendors** 5.1 Amazon AWS Cloud, 5.2 GoogleApp Engine, 5.3 Microsoft Azure, 5.4 Salesforce. **5.5 Service Management:** 5.6 Service Level Agreements (SLAs), 5.7 Billing & Accounting, 5.8 Load Balancing in Cloud; 5.9 Cloud Web Technologies: 5.10 Introduction, 5.11 SOAP, SOAP 5.12 REST vs REST, AJAX.	Learning data migration and load balancing in cloud.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Data Migration
2. Resource Optimization

b. Mini Project:

Mobile Cloud Computing

c. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA11.1**:** At the end of this chapter the student should be familiar with various characteristics of the cloud platforms.	12	0	2	1	15
TMCA11.2**:** At the End of this chapter the student will learn how virtual platform works for application Execution and storage.	12	0	2	1	15
TMCA11.3: At the end of this chapter the student will create relational database and other Cloud-based file system.	12	0	2	1	15

TMCA11.4: At the end of this chapter the student will understand the privacy issues and security strategies in cloud storage.	12	0	2	1	15
TMCA11.5: At the end of this chapter the student will implement real time application over various cloud-based Platform.	12	0	2	1	15
Total Hours	60	0	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA11.1	Students should be familiar with various characteristics of the cloud platforms.	02	05	01	08
TMCA11.2	Learn how virtual platform works for Application execution and storage.	02	03	05	10
TMCA11.3	Create relational database and other cloud- based file system.	02	03	07	12
TMCA11.4	Understand the privacy issues and security strategies in cloud storage.	1	03	7	10
TMCA11.5	Implement real time application over various cloud-based platform.	1	05	05	10
Total		08	19	25	50

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

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Enterprise Cloud Computing	Shroff Gautam	Cambridge Publication	2010, 1st Edition
2	Cloud Security	Dr. Kumar	Wiley-India	2012, 2nd Edition
3	Cloud Computing: A Practical Approach	Antohy T Velte	McGraw Hill	2009, 1st Edition

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9. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course: M.C.A
Course Code: TMCA11
Course Title: Cloud Computing

Course Outcomes	Program Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	Computer knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.
TMCA11 1: Should Students be familiar with varies characteristics of the Spreadsheet.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA11 2: Learn how to format spreadsheet, and viewing its appearance before printing.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA11 3: Importing/Exporting Access Data and Text Files. Securing worksheet and workbook.	2	2	1	1	1	2	2	2	1	2	1	2	1	2	2
TMCA11 4: Calculate values and process data through various formula, and using data validation formula.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA11 5: Visualize data values through various types of charts.	-	-	-	1	1	3	3	3	1	1	2	2	3	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students should be familiar with various characteristics of the cloud platforms.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Cloud Computing 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 above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Learn how virtual platform works for application execution and storage.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Virtualization 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 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: Create relational database and other cloud-based file system.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Data in Cloud Computing 3.1,3.2,3.3,3.4,3.5,3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the privacy issues and security strategies in cloud storage.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Cloud Security 4.1,4.2,4.3,4.4,4.5,4.6, 4.7, 4.8, 4.9, 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: Implement real time application over various cloud-based platform.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Issues in cloud computing 5.1,5.2,5.3,5.4,5.5,5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 5.12	

A K S University

Faculty of Computer Application And Science & Technology

Department of Computer Application And Science & Technology

Curriculum of M.C.A. [Program]

(Revised as on 01 August 2023)

Semester-II

Course Code: TMCA12A

Course Title: Linux Administration

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 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:

TMCA12A.1**:** Student will understand the basic concepts of Linux OS**.**
TMCA12A.2**:** Student will learn how to install and configure Linux on physical or virtual machines**.**
TMCA12A.3**:** Student will acquire proficiency in using the Linux command**-**line interface
TMCA12A.4**:** Student will learn how to manage user accounts and groups on a Linux system.
TMCA12A.5**:** Student will understand Linux security mechanisms**.**

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA12A	Linux and Administration	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, 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

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)		
TMCA12A	Linux and Administration	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.

TMCA12A.1: Student will understand the basic concepts of Linux OS.

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. 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 and flow charts for problem **SO1.4** Understand about Installation of Linux. **SO1.5** Understand about Essential Tools: Log in 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**.**		**Unit-1 Introduction** **1.1** History, **1.2** what is Linux. **1.3** Basic Architecture, Different Flavor, **1.4** CUI And GUI, **1.5** LINUX Vs Windows File System and Blocks, **1.6** Installation of Linux. **1.7** Essential Tools: Log in and Switch Users, **1.8** Create and Edit Text Files, Delete **1.9** Copy, and Move Files and Directories, **1.10** Create Hard and Soft Links **1.11** Archive File Compression **1.12** Decompression using tar,star.gzip and bzip2	1. Search history of Linux and run basic Commands.

SW-1 Suggested Sessional Work (SW):

Assignments:

1. Describe basic architecture of Linux.
2. Write Installation step of Linux.
3. How to compress and decompress file in Linux.

TMCA12A.2: Student will learn how to install and configure Linux on physical or virtual machines

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 Understand the 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,		**Unit-2.0** **Services:** 2.1. Boot, Reboot, and Shut Down 2.2. Start and Stop Virtual Machines, 2.3. IP Configuration, 2.4. Start, Stop, and Check the Status of Network Services. 2.5. Configure Local Storage**:** 2.6. 2.4. List, 2.7. Create, Delete Partitions, Logical	1. How to configure file system and how to work services by practical.

SO2.8 Discuss about Create and Manage **SO2.8 Discuss about** Access Control Lists		Volumes, Swap. File System Configuration**:** 2.8. Create, Mount, Unmount, 2.9. vFAT, ext4, xfs File Systems, 2.10. Extend Existing Logical Volumes, 2.11. Create and Manage 2.12. Access Control Lists.	

SW-2 Suggested Sessional Work (SW):

Assignments:

1. How to work boot, reboot, and shutdown services in Linux**.**
2. Describe about mount and unmount file system
3. How to create partition in Linux

TMCA12A.3: Student will acquire proficiency in using the Linux command-line interface.

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 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		**Unit-3.0** **Shell Programming:** **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, **User to User Communication:** **3.11.** write, mail, **3.12.** mesg, wall.	1. Create shell script and run in vi editor.

SW-3 Suggested Sessional Work (SW):

Assignments:

1. Write a shell program using for loop.
2. Write a shell script using if.
3. Describe grep and egrep in detail

TMCA12A.4: Student will learn how to manage user accounts and groups on a Linux system

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)
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**.**		**Unit-4.0 Security Management:** 4.1 Configure Firewall, firewall-config, 4.2 firewall-cmd, iptables, 4.3 Set Enforcing and Permissive Modes for SElinux. 4.4 **Process:**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, 4.11 Variables, Operations and 4.12 Function.	1. configure firewall and process command

SW-4 Suggested Sessional Work(SW):

Assignments:

1. How to configure firewall in Linux.
2. Write about process command
3. Write about awk command.

TMCA12A.5: Comprehend the use of learning system**.**

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)**
SO5.1 Understand the concept of Student will understand Linux security mechanisms **SO5.2** Demonstrate the use 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. TELNET, 5.5. Traceroute, 5.6. DNS, Linux 5.7. Cloud. Introduction to Cluster and Site 5.8. Docker Container 5.9. OpenShift, 5.10. Kubernetes, Ansible 5.11. Azure 5.12. Introduction to Scripting Language Python	1. Search and analyze socket programming

SW-5 Suggested Sessional Work (SW):

Assignments:

1. Different types of learning techniques.
2. Define docker

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA12A.1: Student will understand the basic concepts of Linux OS**.**	12	02	01	15
TMCA12A.2: Student will learn how to install and configure Linux on physical or virtual machines	12	02	01	15
TMCA12A.3: Student will learn how to manage user accounts and groups on a Linux system**.**	12	02	01	15
TMCA12A.4: Student will learn how to manage user accounts and groups on a Linux system	12	02	01	15
TMCA12A - 5: Student will understand Linux security mechanisms	12	02	01	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	
TMCA12A-1	Introduction of Linux	03	02	03	08
TMCA12A-2	Services and file system	03	01	05	09
TMCA12A-3	Shell Programming	03	07	02	12
TMCA12A-4	Security Management.	03	05	05	13
TMCA12A-5	IPC & Socket Programming.	03	02	03	08
Total		13	15	17	18

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 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:

Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Unix shell programming	Y Kanetkar.	BPB Pub	6th edition
2	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

Program: MCA

Course Code : TMCA12A

Course Title: Linux and administration

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
	Engineering knowledge	Problem analysis	Design/development of	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.
TMCA12A 1: Introduction of Linux	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA12A 2 : Services and file system	3	3	2	2	1	2	1	1	1	1	1	3	2	3	2
TMCA12A 3: Shell Programming	3	3	2	2	1	2	1	1	1	1	1	3	2	2	2
TMCA12A 4: Security Management	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA12A .5: IPC & Socket Programming	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Student will understand the basic concepts of Linux OS.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1, LI1.2,LI1.3,LI1.4,LI1.5,LI1.6	Unit-1 Introduction of Linux 1.1,1.2,1.3,1.4,1.5,1.6,1.7	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	CO 2 : Student will learn how to install and configure Linux on Physical or virtual machines.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI2.3,LI.2.4,LI.2.5,LI2.6	Unit-2 Services and file system. 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 acquire proficiency in using the Linux Command-line interface. .	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3,LI.3.4,LI3.5,LI3.6	Unit-3 Shell Programming 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 learn how to manage user accounts and groups on a Linux system	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2,LI4.3,LI4.4,LI4.5,LI4.6	Unit-4 Security Management 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Student will understand Linux security mechanisms	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2,LI5.3,LI5.4,LI5.5,LI5.6	Unit-5 IPC & Socket Programming 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023

Semester-II

Course Code: TMCA12B

Course Title: Data Science and Visualization

Pre-requisite: Strong foundation in mathematics and statistics, programming skills, and familiarity with data manipulation.

Rationale: This course is designed to foster critical thinking, problem-solving abilities, and a deep understanding of data, enabling students to extract valuable insights and make data-driven decisions in today's data-driven world by including statistical analysis, programming, data manipulation, and data visualization, as these skills are in high demand across various industries.

Course Outcomes:

TMCA12B.1: Student will understand the fundamentals of data science.
TMCA12B.2: Student will learn techniques to explore and preprocess data.
TMCA12B.3: Student will understand the fundamentals of R Language.
TMCA12B.4: Student will understand the fundamentals of Python Language.
TMCA12B.5: Student will acquire various techniques of Data Analytics.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA12B	Data Science and Visualization	4	0	1	1	6	4

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

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

A K S University

Faculty of Computer Application Science and Information Technology

Department of Computer Science

Curriculum of MCA Program

(Revised as on 01 August 2023

Scheme of Assessment:

Theory

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 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)		
TMCA 12B	Data Science and Visualization	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.

TMCA12B.1: Student will understand the fundamentals of data science.

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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 Recall the key concepts and definitions of data science, including the types of data, sources, and the data analytics life cycle. **SO1.2** Explain the impact of data science in various fields and the significance of structured, semi-structured, and unstructured data. **SO1.3** Demonstrate an Understanding of the various data types and sources by classifying and describing real-world examples. **SO1.4** Evaluate the stages in the data analytics life cycle and assess their relevance to data science projects. **SO1.**5 Formulate a Comprehensive overview of the fundamental principles of data science for effective communication. .		**Unit-1.0 Foundation of data science** 1.1 Introduction to data science. 1.2 Data science in various fields 1.3 Impact of Data Science 1.4 Data science Toolkit 1.5 Understanding data 1.6 Types of data: Numeric, Categorical, Graphical and multidimensional data 1.7 Classification of digital data: Structured, Semi-structured, Unstructured 1.8 Sources of Data: Time Series, Transactional data, biological data, Spatial data, social network data 1.9 Data analytics life cycle	1. Understand the real-world impact of data science in diverse fields. 2. Investigate various data sources (Time Series, Spatial, Social Network). 3. Learn how to work with these data types in data science projects.

SW-1 Suggested Sessional Work (SW):

a. **Assignments**:
   1. Demonstrate understanding of digital data classification: Structured, Semi-structured, And Unstructured.

b. **Mini Project**:
   1. Work on a real-world dataset following the Data Analytics Life Cycle.

c. Other Activities (Specify):
   1. Participate in a collaborative project involving different data sources: Time Series, Transactional, Biological, Spatial, Social Network data

TMCA12B.2: Student will learn techniques to explore and preprocess data.

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)
SO1.1 Recall the steps involved in data pre-processing, such as data cleaning, integration, transformation, and reduction. **SO1.2** Explain the concepts of classification and prediction and their applications in data science. **SO1.3** Implement data cleaning and reduction techniques on real datasets, and apply various classification algorithms. **SO1.4** Evaluate the accuracy of classification models and make informed model selection decisions. **SO1.**5 Develop a complete data pre-processing and classification pipeline for a given dataset.		**Unit-2.0 Data Pre-Processing and Predictive Analysis** 2.1. Data collection strategies 2.2. Data pre-processing overview 2.3. Data cleaning 2.4. Data integration and transformation 2.5. Data reduction: Feature selection and Dimensionality reduction 2.6. Data Discretization 2.7. Basic concepts of classification and prediction 2.8. General approach to solving a classification problem: Logistic regression Decision tree, Random Forest, Bayesian classification, 2.9. Evaluating the accuracy of the classifier/predictor 2.10. Model selection.	1. Self-assessment quizzes and case studies for applying predictive modeling in Real-world scenarios. 2. Interactive tools and datasets for students to practice evaluating the accuracy and performance of classification models.

SW-2 Suggested Sessional Work (SW):

a. **Assignments**:

1. Apply various techniques such as cleaning, integration, transformation, and reduction

b. Mini Project:

1. Develop a predictive analysis project using classification algorithms.
2. Implement logistic regression, decision tree, and random forest models for a real-worlddataset

c. Other Activities (Specify):

1. Collaborate with peers on a group project involving feature selection and dimensionality

reduction.

2. Contribute to a shared repository of data science resources, fostering a collaborative learning environment

TMCA12B.3: Student will understand the fundamentals of R Language.

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 Recall the basic data structures and control structures in R. **SO3.2** Explain the role of R packages like tidy verse, dplyr, and tidyr in data manipulation and analysis. **SO3.3** Utilize R Markdown for reproducible data analysis and demonstrate version control using Git and GitHub. **SO3.4** Perform inferential statistics and create meaningful data visualizations in R. **SO3.**5 Generate advanced 3D plots and complex data visualizations in R for effective data communication.		**Unit-3: Basics of R Programming** 3.1. Introduction to R 3.2. Data Structures: vectors, arrays, matrices, data frames, tuples, dictionary 3.3. Decision making and Control structures 3.4. Functions 3.5. Statistical analysis of data 3.6. Packages: tidy verse, dplyr, tidyr, stringr, rgl, etc. R Markdown, Version control, Git and GitHub. Inferential statistics with R. Regression, Correlation matrix 3.7. Data Visualization in R: Types of visualization 3.8. Packages for visualization 3.9. Basic visualization, Advanced visualization 3.10. Creating 3D plots	1. Practice writing data analysis reports using R Markdown to communicate your findings and insights clearly and professionally. 2. Explore Git and GitHub to collaborate with others on coding projects, track changes, and manage version control for your data science work.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Implement inferential statistics with R, focusing on regression and correlation matrix.

b. Mini Project:

1. Incorporate version control with Git and GitHub to track project evolution.

c. Other Activities (Specify):

1. Experiment with creating 3D plots using appropriate packages

TMCA12B.4: Student will understand the fundamentals of Python Language.

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 Recall fundamental Python concepts such as data types, variables, and basic I/O operations. **SO4.2** Explain the significance of Python libraries like NumPy, Pandas, and Matplotlib in data science. **SO4.3** Utilize Python for reading and processing data in various formats and apply basic and specialized visualization tools. **SO4.4** Evaluate the suitability of different Python libraries for specific data science tasks. **SO4.5** Develop Python scripts and utilizes data science libraries to perform complex data analysis and visualization.		**Unit-4: Basics of Python Programming:** 4.1 Introduction to Python language 4.2 Data types, Variables 4.3 Basic input-output operations 4.4 Operators 4.5 Conditional execution 4.6 loops 4.7 List and list processing 4.8 Dictionaries 4.9 Tuples 4.10 Strings 4.11 Functions 4.12 Data Processing, Reading and writing data in various formats 4.13 Python libraries for data science: TensorFlow, SciPy, NumPy, Pandas, Matplotlib, Seaborn, PyTorch, Scikit-learn 4.14 Basic and specialized visualization tools, ggplot, Folium.	1. Core Libraries: Utilizing NumPy, Pandas, Matplotlib, and Seaborn for data manipulation and visualization. 2. Advanced Tools: Exploring TensorFlow, SciPy, PyTorch, Scikit-learn, ggplot, and Folium for specialized tasks and visualization.

SW-4 Suggested Sessional Work (SW):

a. **Assignments**:

1. Demonstrate proficiency in Python basics: data types, variables, operators, conditional statements, loops, and functions.
2. Complete tasks involving list processing, dictionaries, tuples, and string manipulation

b. **Mini Project**:

1. Develop a small-scale data science project incorporating Tensor Flow or PyTorch for machine learning.

c. Other Activities (Specify):

1. Research and present a brief on specialized visualization tools: ggplot, Folium.

TMCA12B.5: Student will acquire various techniques of Data Analytics.

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 Recall the key descriptive statistics and central tendency measures. **SO5.2** Explain the concepts of probability, sampling, and hypothesis testing in the context of data analytics. **SO5.3** Utilize Python or R to perform hypothesis tests, correlation analysis, and feature engineering. **SO5.4** Evaluate the performance of supervised and unsupervised machine learning algorithms and ensemble methods. **SO5.**5 Develop predictive models and apply machine learning techniques to real-world data for forecasting and Recommendation systems.		**Unit5: Data Analytics and Machine Learning:** 5.1 The Descriptive Statistics 5.2 Central Tendency 5.3 Mean, Median, Range 5.4 Variance 5.5 handling missing values and Outliers 5.6 Probability and Linear Algebra 5.7 Distribution, Sampling 5.8 Hypothesis testing, Flask, Correlation matrix 5.9 F-Statistics 5.10 Target variables Vs Predictors 5.11 Feature Engineering 5.12 Supervised and Unsupervised Machine Learning 5.13 Ensemble learning 5.14 Factor analysis 5.15 Predictive modelling and forecasting 5.16 Recommender systems	1. Explore advanced concepts like machine learning, feature engineering, and predictive modeling independently. 2. Dive into specialized areas, including recommender systems, to enhance your data science skills.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Conduct a thorough analysis using Flask to create interactive visualizations of a given dataset, emphasizing the application of Correlation matrix and F-Statistics.
2. Submit a comprehensive report on the findings, insights, and challenges encountered during the

visualization process.

b. Mini Project:

1. Develop a predictive model employing Feature Engineering techniques on a real-world dataset, implementing Supervised and Unsupervised Machine Learning

c. Other Activities (Specify):

1. Participate in a group-based collaborative effort to discuss and present Target variables vs Predictors, emphasizing the importance of Predictive Modeling and Forecasting in the context of Data Science and Visualization.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA12B.1: Student will understand the fundamentals of data science.	9	2	1	12
TMCA12B.2: Student will learn techniques to explore and preprocess data.	10	2	1	13
TMCA12B.3: Student will understand the fundamentals of R Language.	12	2	1	15
TMCA12B.4: Student will understand the fundamentals of Python Language.	14	2	1	17
TMCA12B 5: Student will acquire various techniques of Data Analytics.	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	
TMCA12B -1	Foundation of data science	03	01	01	05
TMCA12B -2	Data Pre-Processing and Predictive Analysis	02	02	01	05
TMCA12B -3	Basics of R Programming	03	07	05	15
TMCA12B -4	Basics of Python Programming	04	06	05	15
TMCA12B -5	Data Analytics and Machine Learning	03	04	03	10
Total		15	20	15	50

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

The end of semester assessment for Data Science and Visualization 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	Doing Data Science	Cathy O'Neil and Rachel Schutt	O'Reilly	2015
2	Data Science and Big Data Analytics:	David Dietrich, Barry Heller, Beibei Yang	EMC	2013
3	Handbook of Research on Cloud Infrastructures for Big Data Analytics	Pethuru Raj	IGI Global	
4	Python Data Science Handbook	Jake Vander Plas	O'Reilly	2016
	Python for Data Analysis	Wes McKinney	O'Reilly	2017
7	Lecture note provided by Dept. Of CSE, AKS University, Satna.			

Curriculum Development Team

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course: M.C.A.
Course Code: TMCA12B
Course Title: Data Science and Visualization

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
	Engineering knowledge	Problem analysis	Design/development of	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.
TMCA12B 1: Student will understand the fundamentals of data science.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA12B 2. Student will learn techniques to explore and preprocess data.	3	3	2	2	1	2	1	1	1	1	1	3	2	3	2
TMCA12B 3. Student will understand the fundamentals of R Language.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	2
TMCA12B 4: Student will understand the fundamentals of Python Language.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA12B 5.Student will acquire various techniques of Data Analytics.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1. Student will understand the fundamentals of data science.	SO1.1 SO1.2 SO1.3 SO1.4		Unit 1: Foundation of data science 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. Student will learn techniques to explore and preprocess data.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2: Data Pre-Processing and Predictive Analysis 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3. Student will understand the fundamentals of R Language.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3.0 Basics of R Programming 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. Student will understand the fundamentals of Python Language.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4.0 Basics of Python Programming 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5. Student will acquire various techniques of Data Analytics.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5.0 Data Analytics and Machine Learning 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Computer Application and Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum of MCA (Master in Computer Application) Program

Semester-III

Course Code: TMCA13

Course Title : Introduction to Java 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:

TMCA13.1: Student will apply OOP principles.
TMCA13.2: Student will acquire skills in creating classes and objects.
TMCA13.3: Student will learn how to handle exceptions.
TMCA13.4: Student will acquire knowledge of AWT controls to develop graphical user interfaces.
TMCA13.5: Student will learn how to connect Java applications to databases using JDBC.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA13	Introduction to Java Programming	4	2	1	1	8	5

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

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)		
TMCA13	Introduction to Java Programming	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA13	Introduction to 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.

TMCA13.1: Student will apply OOP principles.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	4
SW	1
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Introduction to Java	**LI.1.1.** Write a program to Demonstrate Type Casting. **LI.1.2.** Write a program to design a String class that String operations (Equal, Reverse the String, Change case).	**Unit-1 Introduction to Programming** 1.1. Introduction 1.2. Features of Object-Oriented Programming (OOP) 1.3. Java Virtual Machine 1.4. Byte Code 1.5. Data Types 1.6. Variable 1.7. Arrays Expressions 1.8. Operators 1.9. Control Statements1 1.10. Control Statemnets2 1.11. Iterative Statements1 1.12. Iterative Statements2	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1) What are the Features of Object-Oriented Programming (OOP) and Java Virtual Machine?

2) Make a program for Constructor Overloading.

3) What is Multithreading Explain Thread Life Cycle.

TMCA13.2: Student will acquire skills in creating classes and objects.

Approximate Hours

Item	Appx. Hrs.
Cl	12

LI	10
SW	1
SL	1
Total	24

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. creating classes and objects.	**LI.2.1.** Design and develop a java program to read marks of a student and print the total and average of marks using scanner class. **LI.2.2.** Write a java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero **LI.2.3.** Write a program to design a class 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.	**Unit-2 Datatypes and Operators, Variables, Sequences and Iteration** 1.1. Objects and Classes 1.2. Access Control 1.3. Constructor 1.4. Constructor Overloading 1.5. Finalize 1.6. Method Overriding 1.7. Inheritance1 1.8. Inheritance2 1.9. Abstract Class 1.10. Package, 1.11. Package within package 1.12. Interfaces	1.

SW-2 Suggested Sessional Work(SW):

a. Assignments:

1) What are the Features of Object-Oriented Programming (OOP) and Java Virtual Machine.
2) Make a program for Constructor Overloading.
3) What is Multithreading Explain Thread Life Cycle?

TMCA13.3: Student will learn how to handle exceptions.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Exception Handling SO3.2 Learning about thread concept SO3.3 Learning about java streams	**LI.3.1.** Develop an applet that displays a simple message in Center of the screen. **LI.3.2.** Explain constructor overloading in java with an example. **LI.3.3.** Write a program that shows the partial implementation of the Interface	**Unit-3 :** Exception Handling **3.1.** Try and Catch **3.2.** Throw, Throws **3.3.** 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	

SW-3 Suggested Sessional Work(SW):

a. Assignments:

1) What are the Features of Object-Oriented Programming (OOP) and Java Virtual Machine.
2) Make a program for Constructor Overloading.
3) What is Multithreading Explain Thread Life Cycle

TMCA13.4: learning the concept of Swapping and event handling etc.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	4
SW	1
SL	1

Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Introduction to AWT **SO4.2** Swing Components	Li.4.1. Write a java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (use Adapter classes) Li.4.2. Design and develop a java program to display the reverse of a given number. .	**Unit-4 :** 4.1 Programming Layout and 4.2 Component Managers 4.3 Event Handling1 4.4 Event Handling2 4.5 Applet Class 4.6 Applet Life-Cycle 4.7 Passing Parameters 4.8 Embedding in HTML. 4.9 JApplet 4.10 JButton 4.11 JFrame 4.12 Sample Swing Programs	

SW-4 Suggested Sessional Work(SW):

a. Assignments:

1. What are the Features of Object-Oriented Programming (OOP) and Java Virtual Machine.
2. Make a program for Constructor Overloading.
3. What is Multithreading Explain Thread Life Cycle.

TMCA13.5: **Student will learn how to connect Java applications to databases using JD**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Studding about database connectivity **SO5.2** Creating and Executing SQL statements .	Li.5.1. Write a program to create a login form using AWT. Li.5.2. Write a java program that connects to a database using JDBC Li.5.3. Write a java program that connects to a database using JDBC and does add, delete, modify and retrieve Operations.	**Unit 5: File Handling and Memory Management** 5.1. File Handling1 5.2. File Handling2 5.3. Memory Management1 5.4. Memory Management2 5.5. Concepts of files and 5.6. basic file operations.1 5.7. basic file operations2 5.8. Writing Data to a .csv File. 5.9. Reading Data to from a .csv File. 5.10 Memory Management Operations. 1 5.11. Memory Management Operations.2 5.12 Questions based on it	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1) Different types of learning techniques.
2) Use of Dempster-Shafer Theory of Evidential reasoning.

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)
TMCA13.1**:** At the end of this chapter the Student will apply OOP principles.	12	4	2	1	15
TMCA13.2**:** At the end of this chapter the student will acquire skills in creating classes and objects.	12	10	2	1	15

TMCA13.3:At the end of this chapter the student will learn how to handle exceptions.	12	6	2	1	15
TMCA13.4: At the end of this chapter the student will acquire knowledge of AWT controls to develop graphical user interfaces.	12	4	2	1	15
TMCA135: Student will learn how to connect Java applications to databases using JDBC	12	6	2	1	25
Total Hours	60	30	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA13.1	Student will apply OOP principles.	02	05	01	08
TMCA13.2	Student will acquire skills in creating classes and objects.	02	03	05	10
TMCA13.3	Student will learn how to handle exceptions.	02	03	07	12
TMCA13.4	Student will acquire knowledge of AWT controls to develop graphical user Interfaces.	01	03	07	10
TMCA13.5	Student will learn how to connect Java applications to databases using JDBC.	01	05	05	10
Total		08	19	25	50

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

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

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7. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Program: MCA
Course Code: TMCA13
Course Title: Introduction to 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
	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
TMCA13 1: Student will apply OOP principles.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA132 : Student will acquire skills in creating classes and objects.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA13 3: Student will learn how to handle exceptions.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
TMCA13 4: Student will acquire knowledge of AWT controls to develop graphical user interfaces.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA13 5: Student will learn how to connect Java applications to databases using JDBC	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Student will apply OOP principles.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1,LI1.2	Unit-1 Introduction to programming 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Student will acquire skills in creating classes and objects.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI2.3,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: Student will learn how to handle exceptions.	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3	Unit-3 Exception Handling 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: Student will acquire knowledge of AWT controls to develop graphical user interfaces.	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2	Unit-4 knowledge of AWT controls to develop graphical user interfaces 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: Student will learn how to connect Java applications to databases using JDBC	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2,Li5.3	Unit-5 File Handling and Memory 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 and Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum of MCA (Master in Computer Application) Program

THIRD SEMESTER

Course Code: **TMCA14A**

Course Title : **PYTHON AND R PROGRAMMING**

Pre- requisite: **BASICS OF PROGRAMMING & INTERNET**

Rationale: The purpose of the PYTHON AND R PROGRAMMING Course is to build the skills students will need as PROGRAMMER.

Course Outcome:

TMCA14A .1 The student will recall variables and data types.
TMCA14A .2 Do research in the emerging areas of Python and R programming.
TMCA14A .3 Implement conditional and looping statements to solve computational problem.
TMCA14A .4 Implement Python libraries to create complex programs.
TMCA14A .5 Provide data visualization and statistics using R for exploratory analysis.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA14	Introduction to Java Programming	4	2	1	1	8	5

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

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)		
TMCA13	Introduction to Java Programming	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA13	Introduction to 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) up on the course's conclusion.

TMCA14A.1: The Student will recall and implement variable and data types with looping statement.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Define variables, loops and contol statements **SO1.2 Explain** Function, methods, Tuples and Dictionary **SO1.3 Explain** File and Exception Handling **SO1.4 Discuss** NumPy, SciPy, Pandas and Matplotlib libraries **SO1.**5 **Explain** data structure, operators, loops, function and data visualization in R	1. Write a program in Python add two numbers. 2. Write a program in Python to print a table-using loop. 3. Write a Python program to create a calculator class. Include methods for basic arithmetic operations. .	**Unit-1. Introduction** 1.1 History & 1.2Features 1.3 Working with Python, 1.4 Basic Syntax 1.5 Variable and 1.6 Data Types 1.7 Conditional Statements. 1.8 Looping 1.9 Control Statements 1.10 Control Statements 1.11 String manipulation 1.12 EXAMPLES	1. Implement looping, control statement and string manipulation

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss history and features of Python and R

b. Presentation

c. Constructing Python script using string manipulation

TMCA14A.2: The student will explore list, tuple and dictionary with associated functions.

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 the data types, loops, control statement and string manipulation **SO2.2** To learn functionality of list, tuple and dictionary **SO2.3** To understands the concept of File handling and Exception handling. **SO2.4 A**pply Python libraries to create complex programs **SO2.**5 Apply R functions to implement data visualization	4. Write a program in Python to demonstrate the Parameterized Constructor. 5. Write a program in Python to demonstrate an Array of objects. 6. Write a program in Python to demonstrate multiple inheritance..	Unit-2 **Lists, Tuple, Dictionaries** 2.1 Accessing list, 2.2 Operations 2.3 Operations EXAMPLES 2.4 Working with lists 2.5 Function and Methods 2.6 Accessing Tuples, 2.7 Operations 2.8 Working, Functions and Methods. 2.9 Accessing valu dictionaries 2.10 Properties, 2.11 Functions. 2.12 Examples	1. Write Python script using List, Tuple and Dictionary.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain the applications of List, Tuple and Dictionary

b. Presentation

c. Write function and methods for list, tuple and dictionary

TMCA14A.3: The student will implement input-output functions for reading and writing files. Student will also apply Exception handling functionality in Programs

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning g (LS)
SO3.1 To understand file handling. SO3.2 Apply file reading and writing operations SO3.3 Apply exception handling SO3.4 Know about user defined exceptions, SO3.5 Apply OOPs concepts in script	7. Write a program in Python to demonstrate Overriding Methods. 8. Write a program in Python to demonstrate Exception Handling. 9. Write a NumPy program to compute the cross-product of two given vectors	**Unit-3: Input-Output, Exception Handling and OOPs**: 3.1 Opening and closing file for I/O 3.2 Reading and writing operations on file 3.3 Creating and Accessing Modules 3.4 Exception, 3.5 Exception Handling 3.6 User Defined Exceptions 3.7 OOPs concept 3.8 Class and object 3.9 Attributes, 3.10 Inheritance 3.11 Overloading, Overriding 3.12 Data hiding	**i.** Draw the steps of file handling and exception handling

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain the concept of file and exception handling

b. Presentation

c. Program or script representing OOPs concepts:

TMCA14A.4: The student will Python libraries for data analytics.

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)
SO4.1 Explain NumPy arrays **SO4.2 To u**nderstand Indexing and slicing in NumPy **SO4.3 Explain** Create function, modules of SciPy **SO4.4 Apply** Series and Data Frames **SO4.**5 Explain Basic plots in Matplotlib, Working with Images.	10. Write a Pandas program to convert a Panda Module Series to a Python list and its type. 11. Write a Pandas program to convert a NumPy array to a Pandas series 12. Write a NumPy program to calculate the QR Decomposition of a given matrix.	**Unit-4 : Libraries for Data Analytics Numpy, Scipy, Pandas and Matplotlib** 4.1 Creating NumPy arrays 4.2 Indexing and slicing in NumPy 4.3 Scipy: 4.4 Create function 4.5 Examples 4.6 modules of SciPy 4.7 Pandas: Series and 4.8 Data Frames 4.9 Using multilevel series 4.10 Basic plots n Matplotlib. 4.11 Working with Images. 4.12 Examples	Preparation of Python script for data anlytics using libraries

SW-4Suggested Sessional Work (SW):

a. **Assignments:**

(i) Explain Numpy, Scipy and Pandas.

(ii) Discuss Data Visualization, Statistics and Matplotlib

b. **Presentation**

TMCA14A.5: The student will develop R script using functions and data visualization tools.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understand Advantages and Disadvantages **SO5.2 Explain** Data Structures of R **SO5.3 Explain** Variables and Operators in R, **SO5.4 Discuss** for loop, while loop, R repeat loop, R Functions **SO5.**Discuss Data Visualization and Statistics	1. Write a program for reading different types of data sets (.txt, .csv) from the web and disk and writing in a file in a specific disk location. 2. Write a program to read Excel data in R. 3. Write an R program to take input from the user (name and age) and display the values.	**Unit5: R Programming** 5.1 Introduction 5.2 Advantages and 5.3 Disadvantages 5.4 Basic Syntax 5.5 Data Structures 5.6 Variables and 5.7 Operators in R 5.8 R if Statement 5.9 for loop, while loop 5.10 R repeat loop 5.11 R Functions 5.12 Data Visualization and Statistics.	1. Draw charts or graphs using data visualization tools

SW-5Suggested Sessional Work(SW):

a. Assignments:

1. Explain Anti-Malware Software

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)
TMCA14A.1: The student will recall and implement variable and data types with looping statement	12	2	1	15
TMCA14A.2: The student will explore list, tuple and dictionary with associated functions.	12	2	1	15

TMCA14A.3: The student will implement input- output functions for reading and writing files. Student will also apply Exception handling functionality in Programs	12	2	1	15
TMCA14A.4: The student will Python libraries for data analytics.	12	2	1	15
TMCA14A.5: The student will develop R script using functions and data visualization tools.	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	
TMCA14A.1	Introduction & History	02	05	01	08
TMCA14A.2	Lists, Tuple, Dictionaries	02	03	05	10
TMCA14A.3	Input-Output, Exception Handling and OOPs	02	03	07	12
TMCA14A.4	Libraries for Data Analytics Numpy, Scipy, Pandas and Matplotlib	1	3	7	10
TMCA14A.5	R Programming	1	05	05	10
Total		08	19	25	50

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

The end of semester assessment for Mobile Application Development will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Python and R for the Modern Data Scientist	Rick J. Scavetta Rick J. Scavetta	**O'Reilly Media**	**31 August 2021**
2	Python for R Users: A Data Science Approach	John Wiley & Sons	John Wiley and Sons U.S.A.	2017
3	Lecture note provided by Dept. of CS&E, AKS University ,Satna.			

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: MCA
Course Code : TMCA14A
Course Title: Python and R 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
	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
CO 1: The student will recall variables and data types.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
CO 2: Do research in the emerging areas of Python and R programming.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
CO 3: Implement conditional and looping statements to solve computational Problem.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
CO 4: Implement Python libraries to create complex Programs.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
CO 5: Provide data visualization and statistics using R for exploratory analysis	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3	CO 1: The student will recall variables and data types	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI.1.1,LI1.2,Li1.3	Unit-1 Introduction to programming 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 above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3	CO 2 : Do research in the emerging areas of Python and R programming	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI2.3	Unit-2 Lists, Tuple, Dictionaries 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	CO 3: Implement conditional and looping statements to solve computational problem	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3.3	Unit-3 Input-Output, Exception Handling and OOPs 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	CO 4: Implement Python libraries to create complex programs.	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2,Li4.3	Unit-4 Libraries for Data Analytics Numpy, Scipy, Pandas and Matplotlib 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	CO 5: Provide data visualization and statistics using R for exploratory analysis.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2,Li5.3	Unit-5 R Programming 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 and Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum of MCA (Master in Computer Application) Program

Semester-III

Course Code: TMCA14B

Course Title : Mobile Application Development

Pre-requisite: None

Rationale: The main goal of any mobile application should be to provide real and meaningful value to users. This involves solving problems, simplifying tasks, or providing quality entertainment. A valuable app will be one that users use regularly and that improves their quality of life in some way.

Course Outcomes:

TMCA14B.1: Student will understand the basics of Mobile App Development.
TMCA14B.2: Student will learn how to use Android Virtual device.
TMCA14B.3: Student will acquire skills in designing and creating user interfaces.
TMCA14B.4: Student will explore database-based services in Android.
TMCA14B: Student will learn how to use API in Mobile Application Development.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA14B	Mobile Application Development	4	2	1	1	8	5

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

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

Scheme of Assessment:

Theory

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	Class Test 2 (2 best out of 3) 10 marks	Seminar one (SA)	Class Activity any one	Class Attendance	Total Marks (CA+CT+		
TMCA14B	Mobile Application Development	15	20	5	5	5	50	50	100

Scheme of Assessment:

Practical

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)		
TMCA14B	Mobile Application Development	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 the Mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) up on the course's conclusion.

A K S University

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Department of Computer Application & Information Technology

Curriculum of MCA (Master in Computer Application) Program

TMCA14B.1: Demonstrate knowledge of the fundamental principles of android.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
1.1. Understand the concept of mobile app development. **SO1.2.** Use the different technology for mobile app development **SO1.3.** Apply changes in app for real life problems	**LI.1.1.** Create ―Hello World application. That will display ―Hello World in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone **LI.1.2.** Create a simple calculator **LI.1.3.** Create a menu with 5 options and selected option should appear in text box	**Unit-1** **Introduction to Mobile App Development** **1.1** Java Concepts **1.2** Introduction to Java **1.3** OOPS refreshing concept **1.4** Introduction to Mobile Application development **1.5** Introduction to Android, **1.6** what is Android **1.7** History of Android, **1.8** Android versions – History, **1.9** what is Android Manifest file **1.10** what is build Gradle file, Introduction to Android Apps Development TOOL **1.11** Basic	1.Learn advanced technology To develop the app

		Components of Android I **1.12** ntroduction to IDE	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Demonstrate IDE of android
c. Introduction of java
d. Introduction of android

TMCA14B.2: Basic Building Blocks

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. Basic Building Blocks **SO2.2.**	**LI.2.1.** Create simple application to call a fragment. **LI.2.2.** Create an application to run background services prints its sum. **LI.2.3.** Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen	**Unit-2 Basic Building Blocks.** 1.1. What is Android Virtual device (AVD) 1.2. How to create Android Virtual Device (AVD) 1.3. Uses permission 1.4. Activity registration 1.5. Example 1.6. How to run our App on our own Android device 1.7. creating a simple Toast Message	1. How android works 2. Android virtual device

		1.8. Application on click of a button 1.9. Example 1.10. Android Activity Lifecycle 1.11. Passing Data between Activities 1.12. Web View	

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

a. Assignments:

1. What is Android Virtual device (AVD)
2. Creating a simple Toast Message Application on click of a button
3. Android Activity Lifecycle.

TMCA14B 3: Use various AI algorithms

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Understand the Android Control **SO2.2** Use various control **SO2.3** Apply various Control	**LI.3.1.** Create an Application to show images using recycler view. **LI.3.2.** Create an application to insert and delete by using shared preferences. **LI.3.3.** Create an application to Create, Insert, update, Delete and retrieve operations on the SQLite database	**Unit-3 : UI Design** 3.1. Learning Button controls 3.2. event handling 3.3. Examples 3.4. android Menus 3.5. Examples 3.6. Creating Alert dialog box in Android 3.7. Date and Time picker 3.8. Playing Audio and Video in android , Start Activity for result 3.9. Example 3.10. Types of Intent 3.11. List view Spinner, 3.12. Fragments	1.Learn different types of control

SW-3 Suggested Sessional Work(SW):

a. Assignments:

1. Button control
2. Creating dialog box in android
3. Spinner and fragments

TMCA14B 4: Content Providers.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	1
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Understand the concept of firebase **SO2.2.**Use of shared database **SO2.3.** Apply crud operation	**LI.4.1.** Create an application for cameras with flash and other options. **LI.4.2.** Create an application to retrieve data from server. **LI.4.3** Create an application for music player**.**	**Unit-4:Content Providers** 4.1 Creating Notifications in Android 4.2 Sensors in android 4.3 Examples 4.4 Introduction to Database in android programming , 4.5 shared preferences database 4.6 CRUD operations using shared preferences 4.7 SQLite Database 4.8 Examples 4.9 CRUD operations using SQLite Database 4.10 Introduction to Firebase database 4.11 CRUD operation using Firebase 4.12 Examples	1. Learn crud Operation on firebase

SW-4 Suggested Sessional Work(SW):

a. Assignments:

1. Database for android programming

2. Shared database implementation
3. Crud operation in android programming

TMCA14B.5: **Advance in Mobile App Development.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	2
SL	1
Total	20

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the concept of API **SO2.2**Demonstrate the use of learning techniques	**LI.5.1.**Create an application for video player. **LI.5.2.**Create an application to Create, Insert, update, Delete using firebase **LI.5.3.**Create an application for user login and signup using local server. On successful login, pop up the message should display.	**Unit 5: Advance Mobile App Development** 5.1. 5. Introduction to API 5.2. how to use API in APP 5.3. Domains and 5.4. servers 5.5. Get and Post method 5.6. Java Script Object Notation (Json) 5.7. Examples 5.8. How to upload app in play store 5.9. , introduction to cross platform for mobile app development 5.10. Flutter and 5.11. Examples 5.12. Xamarin	1.API for android programming

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Introduction to API
2. Use of API

.

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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)
TMCA14B.1**:**Introduction To Mobile App Development	12	6	1	1	14
TMCA14B.2**:**Basic Building Blocks	12	6	1	1	14
TMCA14B.3: UI Design.	12	6	1	1	14
TMCA14B.4: Content Providers	12	6	1	1	14
TMCA14B.5: Advance in Mobile App Development	12	6	1	1	14
Total Hours	60	30	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table(ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA14B.1	Introduction To Mobile App Development	02	05	01	08
TMCA14B.2	Basic Building Blocks	02	03	05	10
TMCA14B.3	UI Design	02	03	07	12
TMCA14B.4	Content Providers	1	3	7	10
TMCA14B.5	Advance in Mobile App Development	1	05	05	10
Total		08	19	25	50

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

The end of semester assessment for Mobile Application Development will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Android Programming: : Pushing the Limits	Erik Hellman	Wiley publications	2019
2	Android Programming :Android application	James C. Sheusi	Cengage Learning	2003

	development for java programmers			
3	Lecture note provided by Dept. of CS&E, AKS University ,Satna.			

Curriculum Development Team

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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. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: MCA Course
Code : TMCA14B
Course Title: Mobile Application Development

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
	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.
TMCA14B 1: Student will understand the basics of Mobile App Development.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA14B 2: Student will learn how to use Android Virtual device.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA14B 3: Student will acquire skills in designing and creating user interfaces.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2
TMCA14B 4: Student will explore database-based services in Android.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA14B 5: Student will learn how to use API in Mobile Application Development.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Student will understand the basics of Mobile App Development.	SO1.1 SO1.2 SO1.3 SO1.4	LI.1.1,LI1.2	Unit-1 Introduction to Mobile App Development 1.1,1.2,1.3,1.4,1.5,1.6,1.7	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	CO 2: Student will learn how to use Android Virtual device.	SO2.1 SO2.2 SO2.3 SO2.4	LI.2.1,LI2.2,LI 2.3,LI.2.4,LI.2. 5	Unit-2 Basic Building Blocks 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: Student will acquire skills in designing and creating user interfaces.	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3 .3,LI.3.4	Unit-3 UI Design 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 explore database-based services in Android.	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI.4.2	Unit-4 Content Providers: 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: Student will learn how to use API in Mobile Application Development.	SO5.1 SO5.2 SO5.3 SO5.4	LI.5.1,LI5.2	Unit-5 Advance in Mobile App Development 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

Curriculum of MCA Program

(Revised as on 01 August 2023

Semester-III

Course Code: TMCA15D

Course Title: Data Science and Visualization

Pre-requisite: Strong foundation in mathematics and statistics, programming skills, and familiarity with data manipulation.

Rationale: This course is designed to foster critical thinking, problem-solving abilities, and a deep understanding of data, enabling students to extract valuable insights and make data-driven decisions in today's data-driven world by including statistical analysis, programming, data manipulation, and data visualization, as these skills are in high demand across various industries.

Course Outcomes:

TMCA15D.1: Student will understand the fundamentals of data science.
TMCA15D.2: Student will learn techniques to explore and preprocess data.
TMCA15D.3: Student will understand the fundamentals of R Language.
TMCA15D.4: Student will understand the fundamentals of Python Language.
TMCA15D.5: Student will acquire various techniques of Data Analytics.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA15D	Data Science and Visualization	4	0	1	1	6	4

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

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

Scheme of Assessment:

Theory

Couse Code	Course Title	Scheme of Assessment (Marks)							
		Progressive Assessment (PRA)						End Semester Assessment	Total Marks
		Class/HomeAssign ment5 number 3 marks each (CA)	Clas s Test 2 (2 best out Of 3) 10 mar ks eac h (CT)	Semin ar one (SA)	Class Activi ty any one (CA T)	Class Attenda nce (AT)	Total Marks (CA+CT+SA+CAT +AT)	(E SA)	(PRA+E SA)
TMCA 15D	Data Science and Visualizat ion	15	20	5	5	5	50	5 0	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.

TMCA15D.1: Student will understand the fundamentals of data science.

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 Recall the key concepts and definitions of data science, including the types of data, sources, and the data analytics life cycle. **SO1.2** Explain the impact of data science in various fields and the significance of structured, semi-structured, and unstructured data. **SO1.3** Demonstrate an Understanding of the various data types and sources by classifying and describing real-world examples. **SO1.4** Evaluate the stages in the data analytics life cycle and assess their relevance to data science projects. **SO1.**5 Formulate a Comprehensive overview of the fundamental principles of data science for effective communication. .		**Unit-1.0 Foundation of data science** 1.1 Introduction to data science. 1.2 Data science in various fields 1.3 Impact of Data Science 1.4 Data science Toolkit 1.5 Understanding data 1.6 Types of data: Numeric, Categorical, Graphical and multidimensional data 1.7 Classification of digital data: Structured, Semi-structured, Unstructured 1.8 Sources of Data: Time Series, Transactional data, biological data, Spatial data, social network data 1.9 Data analytics life cycle	1. Understand the real-world impact of data science in diverse fields. 2. Investigate various data sources (Time Series, Spatial, Social Network). 3. Learn how to work with these data types in data science projects.

SW-1 Suggested Sessional Work (SW):

a. **Assignments**:
   1. Demonstrate understanding of digital data classification: Structured, Semi-structured, Unstructured.

b. **Mini Project**:
   1. Work on a real-world dataset following the Data Analytics Life Cycle.

c. Other Activities (Specify):
   1. Participate in a collaborative project involving different data sources: Time Series, Transactional, Biological, Spatial, Social Network data

TMCA15D.2: Student will learn techniques to explore and preprocess data.

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)**
SO1.1 Recall the steps involved in data pre-processing, such as data cleaning, integration, transformation, and reduction. **SO1.2** Explain the concepts of classification and prediction and their applications in data science. **SO1.3** Implement data cleaning and reduction techniques on real datasets, and apply various classification algorithms. **SO1.4** Evaluate the accuracy of classification models and make informed model selection decisions. **SO1.**5 Develop a complete data pre-processing and classification pipeline for a given dataset.		**Unit-2.0 Data Pre-Processing and Predictive Analysis** 2.1. Data collection strategies 2.2. Data pre-processing overview 2.3. Data cleaning 2.4. Data integration and transformation 2.5. Data reduction: Feature selection and Dimensionality reduction 2.6. Data Discretization 2.7. Basic concepts of classification and prediction 2.8. General approach to solving a classification problem: Logistic regression Decision tree, Random Forest, Bayesian classification, 2.9. Evaluating the accuracy of the classifier/predictor 2.10. Model selection.	1. Self-assessment quizzes and case studies for applying predictive modeling in Real-world scenarios. 2. Interactive tools and datasets for students to practice evaluating the accuracy and performance of classification models.

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

a. **Assignments**:

1. Apply various techniques such as cleaning, integration, transformation, and reduction

b. Mini Project:

1. Develop a predictive analysis project using classification algorithms.
2. Implement logistic regression, decision tree, and random forest models for a real-world Dataset

c. Other Activities (Specify):

1. Collaborate with peers on a group project involving feature selection and dimensionality reduction.
2. Contribute to a shared repository of data science resources, fostering a collaborative learning environment

TMCA15D.3: Student will understand the fundamentals of R Language.

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 Recall the basic data structures and control structures in R. **SO3.2** Explain the role of R packages like tidyverse, dplyr, and tidyr in data manipulation and analysis. **SO3.3** Utilize R Markdown for reproducible data analysis and demonstrate version control using Git and GitHub. **SO3.4** Perform inferential statistics and create meaningful data visualizations in R. **SO3.**5 Generate advanced 3D plots and complex data visualizations in R for effective data communication.		**Unit-3: Basics of R Programming** 3.1. Introduction to R 3.2. Data Structures: vectors, arrays, matrices, data frames, tuples, dictionary 3.3. Decision making and Control structures 3.4. Functions 3.5. Statistical analysis of data 3.6. Packages: tidy verse, dplyr, tidyr, stringr, rgl, etc. R Markdown, Version control, Git and GitHub. Inferential statistics with R. Regression, Correlation matrix 3.7. Data Visualization in R: Types of visualization 3.8. Packages for visualization 3.9. Basic visualization, Advanced visualization 3.10. Creating 3D plots	1. Practice writing data analysis reports using R Markdown to communicate your findings and insights clearly and professionally. 2. Explore Git and GitHub to collaborate with others on coding projects, track changes, and manage version control for your data science work.

SW-3 Suggested Sessional Work (SW):

1. **Assignments:** Implement inferential statistics with R, focusing on regression and correlation matrix.

b. Mini Project:

1. Incorporate version control with Git and GitHub to track project evolution.

c. Other Activities (Specify):

1. Experiment with creating 3D plots using appropriate packages

TMCA15D.4: Student will understand the fundamentals of Python Language.

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 Recall fundamental Python concepts such as data types, variables, and basic I/O operations. **SO4.2** Explain the significance of Python libraries like NumPy, Pandas, and Matplotlib in data science. **SO4.3** Utilize Python for reading and processing data in various formats and apply basic and specialized visualization tools. **SO4.4** Evaluate the suitability of different Python libraries for specific data science tasks. **SO4.5** Develop Python scripts and utilizes data science libraries to perform complex data analysis and visualization.		**Unit-4: Basics of Python Programming:** 4.1 Introduction to Python language 4.2 Data types, Variables 4.3 Basic input-output operations 4.4 Operators 4.5 Conditional execution 4.6 loops 4.7 List and list processing 4.8 Dictionaries 4.9 Tuples 4.10 Strings 4.11 Functions 4.12 Data Processing, Reading and writing data in various formats 4.13 Python libraries for data science: TensorFlow, SciPy, NumPy, Pandas, Matplotlib, Seaborn, PyTorch, Scikit-learn 4.14 Basic and specialized visualization tools, ggplot, Folium.	1. Core Libraries: Utilizing NumPy, Pandas, Matplotlib, and Seaborn for data manipulation and visualization. 2. Advanced Tools: Exploring TensorFlow, SciPy, PyTorch, Scikit-learn, ggplot, and Folium for specialized tasks and visualization.

SW-4 Suggested Sessional Work (SW):

a. **Assignments**:

1. Demonstrate proficiency in Python basics: data types, variables, operators, conditional statements, loops, and functions.
2. Complete tasks involving list processing, dictionaries, tuples, and string manipulation

b. **Mini Project**:
   1. Develop a small-scale data science project incorporating TensorFlow or PyTorch for machine learning.

c. Other Activities (Specify):
   1. Research and present a brief on specialized visualization tools: ggplot, Folium.

TMCA15D.5: Student will acquire various techniques of Data Analytics.

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 Recall the key descriptive statistics and central tendency measures. **SO5.2** Explain the concepts of probability, sampling, and hypothesis testing in the context of data analytics. **SO5.3** Utilize Python or R to perform hypothesis tests, correlation analysis, and feature engineering. **SO5.4** Evaluate the performance of supervised and unsupervised machine learning algorithms and ensemble methods. **SO5.**5 Develop predictive models and apply machine learning techniques to real-world data for forecasting and Recommendation systems.		**Unit5: Data Analytics and Machine Learning:** 5.1 The Descriptive Statistics 5.2 Central Tendency 5.3 Mean, Median, Range 5.4 Variance 5.5 handling missing values and Outliers 5.6 Probability and Linear Algebra 5.7 Distribution, Sampling 5.8 Hypothesis testing, Flask, Correlation matrix 5.9 F-Statistics 5.10 Target variables Vs Predictors 5.11 Feature Engineering 5.12 Supervised and Unsupervised Machine Learning 5.13 Ensemble learning 5.14 Factor analysis 5.15 Predictive modelling and forecasting 5.16 Recommender systems	1. Explore advanced concepts like machine learning, feature engineering, and predictive modeling independently. 2. Dive into specialized areas, including recommender systems, to enhance your data science skills.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Conduct a thorough analysis using Flask to create interactive visualizations of a given dataset, emphasizing the application of Correlation matrix and F-Statistics.
2. Submit a comprehensive report on the findings, insights, and challenges encountered during the visualization process.

b. Mini Project:

1. Develop a predictive model employing Feature Engineering techniques on a real-world dataset, implementing Supervised and Unsupervised Machine Learning

c. Other Activities (Specify):

1. Participate in a group-based collaborative effort to discuss and present Target variables vs Predictors, emphasizing the importance of Predictive Modeling and Forecasting in the context of Data Science and Visualization.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA15D.1: Student will understand the fundamentals of data science.	9	2	1	12
TMCA15D.2: Student will learn techniques to explore and preprocess data.	10	2	1	13
TMCA15D.3: Student will understand the fundamentals of R Language.	12	2	1	15
TMCA15D.4: Student will understand the fundamentals of Python Language.	14	2	1	17
TMCA15D.5: Student will acquire various techniques of Data Analytics.	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	
TMCA15D -1	Foundation of data science	03	01	01	05
TMCA15D -2	Data Pre-Processing and Predictive Analysis	02	02	01	05
TMCA15D -3	Basics of R Programming	03	07	05	15
TMCA15D -4	Basics of Python Programming	04	06	05	15

TMCA15D -5	Data Analytics and Machine Learning	03	04	03	10
Total		15	20	15	50

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

The end of semester assessment for Data Science and Visualization 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	Doing Data Science	Cathy O'Neil and Rachel Schutt	O'Reilly	2015
2	Data Science and Big Data Analytics:	David Dietrich, Barry Heller, Beibei Yang	EMC	2013
3	Handbook of Research on Cloud Infrastructures for Big Data Analytics	Pethuru Raj	IGI Global	
4	Python Data Science Handbook	Jake Vander Plas	O'Reilly	2016
	Python for Data Analysis	Wes McKinney	O'Reilly	2017
7	Lecture note provided by Dept. Of CSE, AKS University, Satna.			

Curriculum Development Team

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7. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Course: M.C.A.
Course Code: TMCA15D
Course Title: Data Science and Visualization

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
	Engineering knowledge	Problem analysis	Design/development of	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.
TMCA15D 1: Student will understand the fundamentals of data science.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA15D 2 : Student will learn techniques to explore and preprocess data.	3	3	2	2	1	2	1	1	1	1	1	3	2	3	2
TMCA15D 3: Student will understand the fundamentals of R Language.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	2
TMCA15D 4: Student will understand the fundamentals of Python Language.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3
TMCA15D .5: Student will acquire various techniques of Data Analytics.	3	3	2	2	1	2	1	1	1	1	1	3	2	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1. Student will understand the fundamentals of data science.	SO1.1 SO1.2 SO1.3 SO1.4		Unit 1: Foundation of data science 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. Student will learn techniques to explore and preprocess data.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2: Data Pre-Processing and Predictive Analysis 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3. Student will understand the fundamentals of R Language.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3.0 Basics of R Programming 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. Student will understand the fundamentals of Python Language.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4.0 Basics of Python Programming 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5. Student will acquire various techniques of Data Analytics.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5.0 Data Analytics and Machine Learning 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of MCA (Master of Computer Application)

(Revised as on 01 August 2023)

Semester-III

Course Code: TMCA16

Course Title : Theory of Computation & Compiler Design

Pre-requisite: Basic knowledge of set theory and its properties.

Rationale: Studying this subject will help students develop critical thinking skills, enabling them to determine whether a problem can be solved or not. Learning about models such as DFA, NFA, PDA and Turing Machines will equip students with problem-solving skills for new challenges. Additionally, studying parsing techniques will increase students' understanding of compilers.

Course Outcomes:

TMCA161.1: Students will understand the fundamentals of Computational Science.

TMCA16.2: Student will acquire to represent regular expression and Finite State Automata.

TMCA16.3: Students will acquire to represent CFL and Pushdown Automata.

TMCA16.4: Student will recall Turing machines and the concept of computability, including Decidability and un-decidability.

TMCA16.5: Student will acquire working of parsing techniques

Scheme of Studies:

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)	
TMCA16	Theory of Computation & Compiler Design	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 teachers to ensure the outcome of Learning.

Scheme of Assessment:

Theory

Couse Code	Course Title	Scheme of Assessment (Marks)							
		Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
		Class/Home Assignment	Class Test 2 (2 best out of 3)	Seminar one	Class Activity	Class Attendance	Total Marks		
TMCA16	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.

TMCA16.1: Students will understand the fundamentals of Computational Science.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	00
SW	2
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom 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.** List the closure properties **SO1.5** Recall the phases of compiler and symbol table		**Unit-1** **Introduction to Computational Science** 1.1 Definition of Alphabet, String, Language 1.2 Automata and its Types 1.3 Grammar and its Types 1.4 Additional forms of proof, Inductive proofs 1.5 Chomsky Hierarchy for Formal Languages and Automata 1.6 Closure Properties 1.7 Introduction to Compilers 1.8 Cousins of Compiler 1.9 Phases of Compiler 1.10 Symbol table 1.11 Error handling	1. Study of Set Theory Basics and properties 2. List different types of Compilers.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Chomsky Hierarchy with example.
2. Discuss Phases of Compiler.
3. Explain Error Handling and Symbol table.

b. Other Activities (Specify):

Seminar and Tutorial

TMCA16.2: Student will acquire to represent regular expression and Finite State Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	00
SW	2
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Acquire knowledge of Finite Automata and its types **SO2.2.** Differentiate NFA and DFA **SO2.3.** Solve different problems on DFA **SO2.4.** Convert Regular expression to FA and vice versa **SO2.5**. Use of Pumping Lemma to prove language is not Regular		**Unit-2 Finite Automata and Regular Expression** 2.1 Representation of Finite State Automata 2.2 String/Language Acceptability in Finite State Automata 2.3 String/Language Acceptability in Finite State Automata Examples 2.4 NFA to DFA Conversion 2.5 NFA to DFA Conversion Practice problems 2.6 Minimization of DFA 2.7 Minimization of DFA practice problems 2.8 Regular Expression: Rules, Identities	1. Study of different minimization techniques. 2. Applications of Finite automata and Regular expression.

		2.9 Arden's Theorem 2.10 Arden's Theorem practice problem 2.11 Simplification of Regular Expression using Identities 2.12 DFA to Regular Expression Transformation 2.13 DFA to Regular Expression Transformation practice problem 2.14 Regular Expression to FA 2.15 Regular Expression to FA practice problem 2.16 Pumping Lemma for Regular Language	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Pumping Lemma with an example.
2. Discuss Minimization Techniques.
3. Explain closure properties of Regular languages.

b. Other Activities(Specify):

Seminar and Tutorial

TMCA16.3: Students will acquire to represent CFL and Pushdown Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. Design PDA for CFL. **SO3.2.** Differentiate DPDA and NPDA. **SO3.3.** Derive Parse Tress and identify Ambiguity in Grammar. **SO3.4.** Use of Pumping Lemma to prove language is not Context-free. **SO3.5.** Discuss Normal forms.		**Unit-3 : Context free Grammar** 3.1 Introduction Context free Grammar 3.2 Parse Trees: Let Most Derivation and Right Most Derivation 3.3 Ambiguities in Context-Free Grammar 3.4 Examples of Ambiguity of Grammar 3.5 Simplification of Grammars 3.6 Removal of Null Production 3.7 Removal of Unit Productions, Removal of Useless Symbols 3.8 Definition of the Pushdown automata 3.9 Languages accepted by Pushdown Automata 3.10 String/Language Acceptability by PDA 3.11 Comparison between Non- Non-deterministic PDA and Deterministic PDA 3.12 Equivalence of CFG to PDA 3.13 Equivalence of PDA To CFG 3.14 Pumping Lemma for CFL	1. Design PDA for different languages. 2. Applications of Derivation trees.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Design PDA for CFLs.
2. Convert CFG to PDA.
3. Differentiate DPDA and NPDA

b. Other Activities(Specify):

Seminar and Tutorial

TMCA16.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Design LBA for the Languages **SO4.2.** Design Turing Machine for Languages **SO4.3.** Discuss Types of Turing Machine **SO4.4.** Recognize the Decidability and Undesirability and Halting problems of the Turing Machine. **SO4.5.** Recall concept of Universal Turing Machine.		**Unit-4 : Linear Bounded Automata and Turing Machine** 4.1 Representation of Linear Bounded Automata 4.2 String/Language Acceptability By LBA 4.3 Representation to Turing Machine 4.4 Example on Turing Machine 4.5 More Examples on Turing Machine 4.6 Universal Turing Machine 4.7 Decidability 4.8 Halting problem in Turing machine	1. Study different Types of Turing Machine 2. Study of different problems which are undecidable

		4.9 Post correspondence problem	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss LBA with example.
2. Discuss different modifications in Turing machine.
3. Explain Universal Turing Machine.

b. Other Activities(Specify):

Seminar and Tutorial

TMCA16.5: **Student will acquire working of parsing techniques.**

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	2
SL	2
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1. Recall Parsing and Its Types **SO5.2.** Differentiate Bottom-up and top-down parsing **SO5.3.** Use of first and follow in the Parsing technique **SO5.4.** Designing of Top Down		**Unit 5** : **Parsing in Compilers** 5.1 Parsing and its Types 5.2 Associativity and precedence rule 5.3 Left recursion 5.4 Left factoring 5.5 First and follow of Grammar 5.6 Problems on First	1. Solving Different problems on parsing techniques 2. Study and compare top down and bottom up parsers

Parsers. **SO5.5.** Designing of Bottom Up Parsers.		and follow 5.7 Top-Down Parsing: Recursive Descent	
		5.8 Backtracking 5.9 Non – Backtracking 5.10 Predictive Parser/LL (1) Parser 5.11 Bottom-Up Parsing: Shift-Reduce 5.12 LR parsers 5.13 LR(0) parsing 5.14 LR(1) parsing 5.15 LALR Parser 5.16 CLR(1) Parser	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss different types of parsers.
2. Which parser is more powerful in the bottom of parsers? Explain with reason.
3. Define left recursion and left factoring.

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)
TMCA16.1: Students will understand the fundamentals of Computational Science.	11	2	2	15
TMCA16.2: Student will acquire to represent regular expression and Finite State Automata	13	2	2	17
TMCA16.3Students will	13	2	2	17

acquire to represent CFL and Pushdown Automata.				
TMCA16.4: Student will recall Turing machines and the concept of computability, including Decidability and un-decidability.	10	2	2	14
TMCA1.5: Student will acquire working of parsing techniques.	13	2	2	17
Total Hours	60	10	10	80

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
TMCA16.1	Students will understand the fundamentals of Computational Science.	05	02	02	09
TMCA16.2	Student will acquire to represent regular expression and Finite State Automata	02	03	05	10
TMCA16.3	Students will acquire to represent CFL and Pushdown Automata.	02	03	06	11
TMCA01.4	Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	02	03	05	10
TMCA16.5	Student will acquire working of parsing techniques.	-	05	05	10
Total		11	16	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	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	Principles of Compiler Design	Alfred V. Aho , Jeffrey D. Ullman	Addison-Wesley	Reprint

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COs, POs and PSOs Mapping

Program: MCA
Course Code: TMCA16
Course Title: Theory of Computation and Compiler Design

Course Outcomes	Program Outcomes												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	Engineering knowledge	Problem analysis	Design/developme nt 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
TMCA161: Students will understand the fundamentals of Computational Science.	2	3	2	1	1	2	1	1	1	1	1	2	**2**	**3**	**1**
TMCA162: Students will acquire to represent regular and Finite State Automata.	2	2	2	2	1	2	1	1	1	1	1	3	**2**	**2**	**2**
TMCA163: Student will acquire to represent CFL and Pushdown Automata	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**
TMCA164: 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**	**3**	**1**
TMCA165: Student will acquire working of parsing techniques.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**

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: Students will understand the Fundamentals of Computational Science.	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	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Students will acquire to represent regular and Finite State Automata.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Finite Automata Regular Expression 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: 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	CO4: 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	CO5: Student will acquire working of parsing techniques.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Parsing in Compilers 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	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of MCA (Master of Computer Application)

(Revised as on 01 August 2023)

Semester-III

Course Code: TMCA17

Course Title : Software Engineering

Pre-requisite: Computer Fundamental.

Rationale: The aim of the course is to introduce to the field of Software Development with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional approach.

Course Outcomes:

TMCA17.1: Student will identify and decompose the given problem into analysis, designing Implementation, testing and maintenance phase.
TMCA17.2: Student will compare various process models in the software industry according To give circumstances.
TMCA17.3: Student will design solutions for complex engineering problems related to Computer Science and engineering that meet the specified needs.
TMCA17.4: Students will evaluate various functional and non-functional software testing approach.
TMCA17.5: Student will identify various software quality assurance approach to ensure production of a good quality software.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA17	SOFTWARE ENGINEERING	3	0	1	0	4	4

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

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,

field or other locations using different instructional strategies)

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

SL: Self-Learning,

C: Credits.

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

Scheme of Assessment:

Theory

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+		
TMCA17	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.

TMCA17.1: Student will identify and decompose the given problem into analysis, designing implementation, testing and maintenance phase.

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Curriculum of MCA (Master of Computer Application)

(Revised as 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)**
SO1.1 Understand about Software **SO1.2** Understand about SDLC in Software Development **SO1.3** Understand the role of system analyst. **SO1.4** Understand about legacy software. **SO1.5** Understand about principles of software engineering. **SO1.6** Understand about requirement analysis. **SO1.7** Understand about requirement analysis tasks **SO1.8** Understand about software prototyping.		**Unit-1.0** 1.1. Introduction to Software, 1.2. Characteristics, 1.3. Components of System, 1.4. SDLC 1.5. The Role of System Analyst 1.6. Legacy Software, 1.7. The Software Crisis 1.8. Principles of 1.9. Software Engineering. Requirement 1.10. Analysis, Requirement 1.11. Analysis Tasks, 1.12. Software Prototyping	1.Study software Using existing system.

SW-1 Suggested Sessional Work (SW):

Assignments:

1. Define Software and component Of System.
2. Define SDLC in detail.

3. What is role of System Analyst?

TMCA17.2: Student will compare various process models in the software industry according to given circumstances.

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 Understand the Concept of Process Model. **SO2.2** Understand the waterfall and Incremental models. **SO2.3** Understand spiral and Concurrent. **SO2.4** Understand agility and Agile process model. **SO2.5** Understand the Objectives of software project management. **SO2.6** Understand resources and their estimations. **SO2.7** Understand LOC and FP Estimation. **SO2.8** Understand cocomo estimation		. **Unit-2.0 Process Models:** 2.1.The Process of Software Development 2.2.Waterfall, 2.3. Incremental 2.4. Spiral,' 2.5. Concurrent Development. 2.6. Agility, 2.7 Agile Process Models. **2.8. Software Project Management:** 2.9. Objectives, 2.10. Resources and Their Estimation, 2.11LOC and FP	1. Study about difference between process models Using Existing System.

SO2.9 Understand risk Analysis.		Estimation, 2.12. Effort Estimation, COCOMO Estimation Model, Risk Analysis.	

SW-2 Suggested Sessional Work (SW):

Assignments:

1. What is Water Fall Model?
2. Define term LOC and FP.
3. Define Risk Analysis.

TMCA17.3: Student will design solutions for complex engineering problems related to Computer Science and engineering that meet the specified needs. Approximate Hours

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 Understand the concept of software Design principles. **SO3.2** Understand abstraction and modularity **SO3.3** Discuss about software architecture. **SO3.4** Discuss about		**Unit-3.0 Software Design:** 3.1.Principles, 3.2 Abstraction, 3.3 Modularity 3.4 Software Architecture, 3.5 3.4 Cohesion and 3.6 Coupling, 3.7 Refactoring Structured	. Compare and analyze all Software Design model

cohesion and coupling. **SO3.5** Discuss about refactoring **SO3.6** Discuss about Structured analysis **SO3.7** Discuss about Evolution of object models **SO3.8** Discuss about UML. **SO3.9** Discuss about views and diagrams. **SO3.10** Discuss about uml tools.		Analysis 3.8 Evolution of Object Models. 3.9 Unified Modeling Language: 3.10 Introduction 3.11 Views and Diagrams, 3.12 UML Tools (VISIO, Lucid chart, Gliffy).	

SW-3 Suggested Sessional Work (SW):

Assignments:

1. Define Software Design.What is cohesion and coupling?
2. What is the Use of UML diagram?

TMCA17.4: Students will evaluate various functional and non-functional software testing approach.

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)
SO4.1 Understand the concept of Software Testing. **SO4.2** Discuss about white and black box testing. **SO4.3** Discuss about Static Testing **SO4.4** Discuss about desk checking. **SO4.5** Discuss about stress and code inspection. **SO 4.6** Discuss about code complexity. **SO4.7** Discuss about function coverage. **SO4.8** Discuss about integration. **SO4.9** Discuss about acceptability. **SO4.10** Discuss about testing tools.		**Unit-4.0** Software Testing: 4.1. Software Testing, 4.2. Functional and Non- Functional Testing: 4.3. White Box and Black Box Testing, 4.4. Static Testing Strategies: Static, Structural 4.5. Desk Checking, Code Walk Through, Beta 4.6. Stress, Code Inspection, Code Coverage, 4.7. Code Complexity, Statement, Path, Condition, 4.8. 4.7.Function Coverage, 4.9. Cyclomatic	1. Compare and analyze all type of testing.
		Complexity, 4.10. Compatibility, Integration, 4.11. Acceptability, 4.12. Testing Tools (Selenium, Ranorex,	

SW-4 Suggested Sessional Work (SW):

Assignments:

1. Define Use of Software Testing.
2. Difference between White box and Black Box Testing.

3. Define Testing Tools.

TMCA17.5: Student will identify various software quality assurance approach to ensure production of a good quality software**.**

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)**
O5.1 Understand the Concept of Software Quality Assurance. **SO5.2** Demonstrate the quality factors. **SO5.3** Discuss about software reviews. **SO5.4** Discuss Software Quality Standards (ISO 9000 Model, **SO5.5.**Discuss SEI CMM Model). **Software Maintenance:** **SO5.6.** Discuss about Need, Categories, Problems & Cost Factors. **SO5.7.**Discuss Software Re-Engineering. **SO5.8.** Discuss. Reverse Engineering, Case Study.		**Unit-5.0** **Software Quality Assurance:** 5.1. SQA Concepts, 5.2. Garvin's Quality Dimensions, 5.3. McCall's Quality Factors 5.4. Software Reviews, 5.5. Software Reliability, 5.6. Software Quality Standards **(**ISO 9000 Model, 5.7. SEI CMM Model**).** 5.8. Software Maintenance**:** 5.9. Need, Categories, Problems & Cost Factors, 5.10. Software Re-engineering, 5.11. Reverse Engineering, 5.12. Case Study	**1.** . Compare and analyze all quality assurance factors**.**

SW-5 Suggested Sessional Work (SW):

Assignments:

1. Different types of SQA Factor.
2. Define Use of Software Maintenance.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
TMCA17.1 Student will identify and decompose the given problem into analysis, designing, implementation, testing and maintenance phase	12	02	01	15
TMCA17.2: Student will compare various process models in the software industry according to given circumstances.	12	02	01	15
TMCA17.3 Student will design solutions for complex engineering problems related to Computer Science and Engineering that meet the specified needs.	12	02	01	15
TMCA17.4: Students will evaluate various functional and non-functional software testing approach.	12	02	01	15
TMCA17.5: Student will identify various software quality assurance approach to ensure production of a good quality software.	12	02	01	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	
TMCA17-1	Introduction to Software	03	02	03	08
TMCA17-2	Process Models	03	01	05	09
TMCA17-3	Software Design Principles	03	07	02	12
TMCA17-4	Software Testing and software testing Strategy.	03	05	05	13
TMCA17-5	Software Quality Assurance and software Maintenance	03	02	03	08
Total		15	17	18	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	An Integrated Approach to Software Engineering	Pankaj Jalote	Narosa Publishing House	IIIrd Edition
2	Software Engineering: A Practitioner's Approach	Roger S. Pressman	McGraw-Hill.	Vth Edition
3	Software Engineering	K.K. Aggarwal	New Age.	IInd Edition

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5. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
6. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: MCA

Course Code : TMCA17

Course Title: Software Engineering

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
	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.		
TMCA17.1: Student will identify and decompose the given problem into analysis, designing, implementation, testing and maintenance phase.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3		
TMCA17. 2 : Student will compare various process models in the software industry according to given circumstances.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2		
TMCA17.3: Student will design solutions for complex engineering problems related to Computer Science and Engineering that meet the specified needs.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2		
TMCA17.4: Students will evaluate various Testing approach	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3		
TMCA17.5: Student will identify various software quality assurance approach	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1		

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: Student will identify and decompose the given problem into analysis, designing, implementation, testing and maintenance phase.	SO1.1, SO1.2 SO1.3 ,SO1.4 SO1.5, SO1.6 SO1.7 ,SO1.8	Unit-1.0 Introduction to Software 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 above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4,	CO 2: Student will compare various process models in the software industry according to given circumstances.	SO2.1,SO2.2,S O2.3,SO2.4,S0 2.5,SO2.6, SO2.7,SO2.8, SO2.9	Unit-2 Process Models 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,	CO 3: Student will design solutions for complex engineering problems related to Computer Science and Engineering that meet the specified needs.	SO3.1,SO3.2 SO3.3,SO3.4 SO3.5,SO3.6 SO3.7,SO3.8 SO3.9,SO3.10	Unit-3 : Software Design Principles 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,	CO 4: Students will evaluate various functional and non-functional software testing approach.	SO4.1,SO4.2 SO4.3,SO4.4 SO3.5,SO3.6 SO3.7,SO3.8 SO3.9,SO3.10	Unit-4 : Software Testing and software testing Strategy. 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,	CO 5: Student will identify various software quality assurance approach to ensure production of a good quality software.	SO5.1 SO5.2 SO5.3 ,SO5.4 SO 5.5,SO5.6 SO5.7,SO5.8	Unit5: Software Quality Assurance and software Maintenance 5.1,5.2,5.3,5.4,5.5,5,5.6,5.7,5.8,5.9,5.10,5.1 1,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of MCA (Master of Computer Application)

(Revised as on 01 August 2023)

Semester-III

Course Code: **TMC18**
Course Title : CRYPTOGRAPHY AND NETWORK SECURITY
Pre-requisite: Student should have basic knowledge of computer network
Rationale: Student should have basic knowledge of computer network and the different methods of network security.

Course Outcomes:

TMCA18.1: The Student will recall types of security attacks.
TMCA18.2: Do research in the emerging areas of cryptography and network security.
TMCA18.3: Implement Confidentiality, Integrity and Availability of data throughout various networking protocols.
TMCA18.4: Protect any network from the threats in the world.
TMCA18.5: Provide security of the data over the network.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
TMCA18	CRYPTOGRAPHY AND NETWORK SECURITY	4	0	1	1	6	4

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

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)
TMCA 18	CRYPTOGRAPHY AND NETWORK SECURITY	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.

TMCA18.1: The Student will recall types of security attacks.

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 Cryptography **SO1.2 Explain** Key Management and Key Distribution **SO1.3Explain** Security Attacks **SO1.4 Discuss** Conventional Encryption, Classical encryption techniques **SO1.**5 **Explain** substitution ciphers and transposition ciphers, steganography.	.	**Unit-1. Introduction-** 1.1Cryptography, 1.2 Key Management and Key 1.3Distribution, Services and mechanisms 1.4Functional Units. 1.5Introduction to Security Attacks 1.6Conventional Encryption, 1.7Classical encryption techniques 1.8 substitution ciphers 1.9 transposition ciphers, 1.10 Steganography 1.11 Case study 1.12 Learning by example	1. Draw Key distribution diagram

SW-1Suggested Sessional Work (SW):

a. Assignments:
  (i) Discuss about different types of computer system
b. Presentation
c. Pictorial representation of different components of computer

TMCA18.2: The student will Do research in the emerging areas of cryptography and network security.

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 the **S**tream and block ciphers **SO2.2**To learn Modern Block Ciphers **SO2.3**To understands Shannon's theory of confusion and diffusion. **SO2.4** apply Data Encryption Standard (DES) **SO2.**5 apply AES	.	Unit-2 **Block Ciphers** **2.1 S**tream and block ciphers, **2.2** Modern Block Ciphers **2.3** Block ciphers principals **2.4** Shannon's theory of confusion and diffusion, **2.5** festal structure, **2.6** Data Encryption Standard (DES), **2.7** (DES) Solve by example **2.8** Block cipher modes of operations. **2.9** Triple DES **2.10** AES **2.11** (AES) Solve by example **2.12** Case study	1. Solve DES and DES related problems.

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) **Draw festal structure**
b. **Presentation**
c. **Pictorial representation of different steps of AES and DES encryption:**

TMCA18.3: The student will implement Confidentiality, Integrity and Availability of data throughout various networking protocols.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Tota l	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 To understand Public-Key Cryptography. SO3.2 Apply RSA algorithm SO3.3 Apply Deffie hellman algorithm SO3.4 know about Elliptic curve cryptography, SO3.5 Apply Hash Function		**Unit-3: Public-Key Cryptography:** 3.1 Principles of public-key cryptosystems 3.2 RSA algorithm 3.3 Security of RSA, 3.4 Diffie-Hellman key exchange algorithm 3.5 The idea of Elliptic curve cryptography, 3.6 , Elgamel encryption 3.7 Hash Function, 3.8 Security of hash functions 3.9 MACS 3.10 Elgamel encryption solve by example 3.11 Hash Function solve by example. 3.12 RSA solve by example	i. Draw the steps of deffie hellman algorithm

SW-2 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) **Explain public key concept**
b. **Presentation**
c. **Pictorial representation of different steps of RSA algorithms:**

TMCA18.4: The student will protect any network from the threats in the world.

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)
SO4.1 Explain MD5 message-digest algorithm **SO4.2 To u**nderstand Digital Signatures Certificate **SO4.3 Explain** Digital signature standards (DSS), **SO4.4 apply** electronic mail security **SO4.**5 Explain Authentication protocols	.	**Unit-4 : Integrity Checks and Authentication Algorithms**: 4.1 MD5 message-digest algorithm 4.2 Secure hash algorithm (SHA 4.3 Digital Signatures 4.4 Digital Signatures Certificate, 4.5 Authentication protocols 4.6 Digital signature standards (DSS), 4.7 Authentication Applications 4.8 Kerberos, X.509, 4.9 Directory authentication service 4.10 Electronic mail security 4.11 Secondary , pretty good privacy (PGP) 4.12 S/MIME.	i. Preparation of authentication application

SW-4Suggested Sessional Work(SW):

a. **Assignments:**
   (i) Explain Kerberos
   (ii) Discuss Authentication protocols
b. **Presentation**

TMCA18.5: **The student will develop security of the data over the network.**

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Tota l	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understand Secure socket layer **SO5.2 Explain** Secure electronic transaction (SET) **SO5.3 Explain** Intruders, **SO5.4** Discuss about Firewall Design Principles **SO5.**Discuss Intrusion Detection Systems (IDS)		**Unit5: Web Security** 5.1 Secure socket layer 5.2 Transport layer security 5.3 Secure electronic transaction (SET) 5.4 Intruders, 5.5 Viruses and related threads 5.6 IP and MAC address. 5.7 Network 5.8 Firewall Design Principles 5.9 Intrusion Detection Systems (IDS) 5.10 Virtual Private Network (VPN) 5.11 Anti-Malware Software. 5.12 Case study	1. Draw a layered structure of computer network

SW-5Suggested Sessional Work (SW):

a. Assignments:

(i) Explain Anti-Malware Software

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 (S)	Self-Learning (Sl)	Total hour (Cl+SWSl)
TMCA18.1: The student will recall types of security attacks.	12	2	1	15

TMCA18.2: Do research in the emerging areas of cryptography and network security.	12	2	1	15
TMCA18.3: Implement Confidentiality, Integrity and Availability of data throughout various networking protocols.	12	2	1	15
TMCA18.4: Protect any network from the threats in the world.	12	2	1	15
TMCA18.5: Provide security of the data over the network.	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	
TMCA18-1	Introduction-Cryptography	03	02	03	08
TMCA18-2	Block Ciphers	03	01	05	09
TMCA18-3	Public-Key Cryptography	03	07	02	12
TMCA18-4	Integrity Checks and Authentication Algorithms:	03	05	05	13
TMCA18-5	Web Security	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	Computer Organization and Architecture	Rajaraman V. and T. Radhakrishnan	Prentice Hall	2011
2	Digital Logic & Computer Design	Mano M. M	Pearson Education	2013
	Computer Organization and Design	Patterson D.A. and J. L. Hennessey	Morgan Kauffmann Publishers	2013

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

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: MCA
Course Code: TMCA17
Course Title: Cryptography and network 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
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and	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	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.
TMCA18.1: The student will recall types of security attacks.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA18.2: Do research in the emerging areas of cryptography and network security.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3
TMCA18.3: Implement Confidentiality, Integrity and Availability of data throughout various networking protocols.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2
TMCA18.4: Protect any network from the threats in the world.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3
TMCA18.5: Provide security of the data over the network.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1:** The Student will recall types of security attacks.	SO1.1 SO1.2 SO1.3 SO1.4		UNIT – I: Introduction-Cryptography 1.1,1.2,1.3,1.4,1.5,1.6,1.7	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:** Do research in the emerging areas of cryptography and network security.	SO2.1 SO2.2 SO2.3 SO2.4		UNIT – II: Block Ciphers 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:** Implement Confidentiality, Integrity and Availability of data throughout various networking protocols.	SO3.1 SO3.2 SO3.3 SO3.4		UNIT – III: Public-Key Cryptography 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:** Protect any network from the threats in the world.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: Integrity Checks and Authentication Algorithms: 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	**CO5:** Provide security of the data over the network.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5: Web Security 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

Semester-III

Course Code: PMCA08

Course Title: Minor Project- LAB

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:

PMCA08.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
PMCA08.2: - The student will be able to implement the project plan and manage the project.
PMCA08.3: - The student will be able to present the completed project work.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PMCA08	Minor Project-LAB	0	2	0	1	2	1

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 (1to 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: MCA
Course Code: PMCA08
Course Title: Minor Project- LAB

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.
PMCA08 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
PMCA08 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
PMCA08 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	PMCA08 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	PMCA08 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	PMCA08 3: The student will be able to present the completed project work.				

Semester-IV

Course Code: PMCA09
Course Title: Review of Literature/ Seminar and Presentation
Pre- requisite: Students should be thoroughly conversant with the literature of their intended area of study and understand the major theories, methodological assumptions, key concepts, issues, problems, areas of neglect, and newly acquired knowledgewithin their selected and related areas of study.

Rationale: Students should identify the elements of a literature review and can state in writing the purpose and process of the literature review as they relate to the research process. They can search for and access information in multiple formats and use found sources to minefor additional sources and manage information resources and a workflow process in support of the literature review process.

Course Outcomes:
PMCA09.1. Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.

Scheme of Studies:

Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
		CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
PMCA09	**Review of Literature**	0	4	1	1	4	2

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),**LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)**SW:** Sessional Work (includes assignment, seminar, mini project etc.),**SL:** Self Learning, **C:**Credits.
Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Course Code	Course Title	Scheme of Assessment (Marks)							
		Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks(PRA + ESA)
		Class/Home Assignment 5 number3 marks each(CA)	Class Test 2(2 best outof3)10 marks each(CT)	Seminar one	Class Activityanyone(CAT)	Class Attendance (AT)	Total Marks(CA+CT+SA+ CAT+AT)		
PMCA09	**Review of Literature**	0	0	0	0	0	0	50	50

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.

PMCA09 1. Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.

Approximate Hours

Item	Approximate Hours
CI	**0**
LI	**30**
SW	**1**
SL	**1**
Total	**32**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Student should be able to articulate a specific purpose and a clear set of objectives to guide the writing of their literature review **SO1.2.** Student should be able to demonstrate an in-depth understanding of the importance and various roles of the literature review in research **SO1.3.** Able to demonstrate the ability to apply a broad range of strategies for developing a literature review to a specific body of knowledge or practice and evaluate criticallycomplex ideas at an abstract level. **SO1.4.** Able to demonstrate advanced critical skills to investigate, analyse and synthesize complex literature, problems, concepts and theories in a professional context **SO1.5.** Student should be able to select, evaluate and synthesise appropriate literature for their chosen topic area and develop this into a review	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process **6.** Writing the literature review		**1.**Software(s) to be used, laboratory planning, data survey etc for the proposed research work.

which critically explores the issues in their chosen topic area in depth and with balance			

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i) Writing a review paper relevant to the proposed research work

b. Mini Project:

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)
PMCA09 1. Students will able to produce his/her research outcome on writing a review of literature in respect ofrecent trends and technologies.	**30**	**1**	**1**	**32**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
PMC A09 1	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process **6.** Writing the literature review	**20**	**40**	**40**	**100**

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

The end of semester assessment for **Review of Literature** will be 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. Group Discussion
3. Demonstration
4. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter,

WhatsApp, Mobile, Online sources)

5. Brainstorming
6. Smart board

Suggested Learning Resources:

(a) Books

S. No.	Title	Author	Publisher	Edition & Year
1	The Literature Review: A Step-by-Step Guide for Students.	Ridley, Diana.	SAGE Publications,	2012.
2	Writing the Literature Review: A Practical Guide.	Efron, S. E., Ravid, R	: Guilford Publications.	2018

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Cos, POs and PSOs Mapping

Course Code: PMCA09
Course Title: - Review of Literature

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11
	Student will identify the current scenario, crop diversity, climatic requirement and breeding techniques of different vegetable and flower crops.	Student will expertise in latest vegetable production technologies, vegetable breeding techniques and post-harvest management of vegetables	The student will have expertise in nursery-raising techniques and protected cultivation of vegetables and flower crops.	The student will have expertise in different climatic conditions required for common vegetable as well as underutilized vegetable cultivation.	Student will plan about the big scale commercial project and also manage the research trails under vegetable and flower crops	Student will apply various statistical methods to analyze their master research work	Student will understand about library techniques, technical writing skill, IPR, laboratory techniques and research ethics in manuscript writing	Student will identify different cool season, warm season and underutilized vegetable crops	Student will practice different breeding techniques used in vegetable and flower production	Student will recognize different underutilized vegetable and spice crops	Student will apply different vegetable processing and post - harvest - handling methods for vegetables and flowers	Student will understand role of microclimate in vegetable and flower crop production under different protected structures	After gaining experience, they will get the positions of specialists for handling plantation, nurseries and other protected cultivation projects	Student will recognize different flower, ornamental crops and their nursery management	Student will practice turf grass, indoor plant and interiscaping management	Student will apply various information services, technical writings and communication skills in their academics	Student will apply basic concepts in laboratory techniques during their research work	Student will apply basic statistical tools during their research work
PMCA09.1 Studentswill able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.	2	2	1	1	2	3	3	1	1	1	1	2	1	1	1	1	3	3

Legend: 1- Low,2 – Medium, 3- High

Course Curriculum Map:

Course Title :Review of Literature

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 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	PMCA09 1: Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process **6.** Writing the literature review		As mentioned, above

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of MCA (Master of Computer Application)

(Revised as on 01 August 2023)

Semester-IV

Course Code: PMCA10

Course Title: **Major Project-Internship**

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

PMCA10.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
PMCA10.2: - The student will be able to implement the project plan and manage the project.
PMCA10.3: - The student will be able to present the completed project work.

Scheme of Studies:

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
		CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PMCA10	Major Project-Internship	0	24	0	0	24	12

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: MCA
Course Code: PMCA10
Course Title: Major Project 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.
PMCA10 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
PMCA10 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
PMCA10 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

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	PMCA10 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	PMCA10 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	PMCA10 3: The student will be able to present the completed project work.				