

Curriculum Structure and Curriculum Content for the Academic Year 2025-27
--

Department of Computer Applications
--

Program: Master of Computer Applications

Table of Contents

<i>Vision and Mission of KLE Technological University.....</i>	<i>3</i>
<i>Vision and Mission Statements of the School / Department.....</i>	<i>4</i>
<i>Program Educational Objectives/Program Outcomes and Program-Specific Objectives..</i>	<i>5-6</i>
<i>Curriculum Structure-Overall.....</i>	<i>7</i>
<i>Curriculum Structure-Semester wise</i>	<i>8</i>
<i>Semester - I</i>	<i>8</i>
<i>Semester - II.....</i>	<i>9</i>
<i>Semester- III</i>	<i>10</i>
<i>Semester- IV.....</i>	<i>11</i>
<i>List of Program Electives</i>	<i>12</i>
<i>Curriculum Content- Course wise.....</i>	<i>13-100</i>

Vision and Mission of KLE Technological University

Vision

KLE Technological University will be a national leader in Higher Education—recognised globally for innovative culture, outstanding student experience, research excellence and social impact.

Mission

KLE Technological University is dedicated to teaching that meets highest standards of excellence, generation and application of new knowledge through research and creative endeavours.

The three-fold mission of the University is:

- To offer undergraduate and post-graduate programs with engaged and experiential learning environment enriched by high quality instruction that prepares students to succeed in their lives and professional careers.
- To enable and grow disciplinary and inter-disciplinary areas of research that build on present strengths and future opportunities aligning with areas of national strategic importance and priority.
- To actively engage in the Socio-economic development of the region by contributing our expertise, experience and leadership, to enhance competitiveness and quality of life.

As a unified community of faculty, staff and students, we work together with the spirit of collaboration and partnership to accomplish our mission.

Vision and Mission Statements of the Department

Vision

To be a premier center of integrated computer application studies and research towards developing competent professionals equipped with cutting-edge technological skills and knowledge to provide sustainable solutions for the evolving needs of society.

Mission

1. To provide high quality education through outstanding teaching and industry relevant curricula to enable students to accomplish a successful career in Computer Science and applications.
2. To contribute to advancing knowledge in both fundamentals and applied areas of Computer Science.
3. To provide a scholarly environment that enables faculty and students to achieve academic and professional growth.
4. To provide valuable services to society through education, research, and entrepreneurship, in the field of Computer Science and applications.

Program Educational Objectives/Program Outcomes and Program-Specific Objectives

Program Educational Objectives -PEO's	
PEO 1:	Have a strong foundation and ability to apply knowledge of Computer Science, Mathematics, and Humanities to conceive, analyse, design, and implement IT solutions to problems in real-life applications.
PEO 2:	Have a comprehensive background to practice Software Engineering Principles in various domains that require software architecture, design, development, and testing practices.
PEO 3:	Understand the professional and ethical obligations of a software engineer towards society and the need for lifelong learning.
PEO 4:	Have the ability to participate in multi-disciplinary teams using ICT effectively.
Program Outcomes-PO's	
PO 1. : Computational knowledge:	Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
PO 2. : Problem analysis:	Identity, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.
PO 3. : Design/Development of Solutions:	Design/development of solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO 4. : Conduct investigations of complex problems:	Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5. : Tool usage:	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
PO 6. : Computing Professional and Society:	Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
PO 7. : Ethics:	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.
PO 8. : Individual and Collaborative Team work:	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary environments.
PO 9. : Communication:	Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations and give and understand instructions clearly.
PO 10. : Project management and finance:	Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 11. : **Life-long learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

Program Specific Objectives -PSO's

PSO 12: **IT skills:** An ability and capacity acquired through deliberate, systematic and sustained effort to carry out complex IT activities involving innovative ideas technical skills and interpersonal skills.

PSO 13: **Professional Competency:** Apply computing concepts, skills, and processes to produce a product/project in the domain demonstrating professional knowledge and attitude.

Curriculum Structure-Overall 2025-27

Course with course code	I	II	III	IV	Elective 1 & 2	Elective 3 (MOOC)
	Data Structures using C 25ECAC701 (3-0-0)	OOPS using Java 24ECAC705 (3-0-0)	Natural Language Processing and GenAI 25ECAC801 (2-0-2)	Capstone Project Work 23ECAP803 (0-0-17)	Linux Administration 23ECAE801 (3-0-0)	Deep Learning 23ECAE809 (2-0-1)
	Database Management System 25ECAC702 (3-0-0)	Machine Learning 25ECAC703 (3-0-1)	Big Data Analytics 24ECAC802 (3-0-1)	Elective-3 (MOOC) 23ECAE8XX (3-0-0)	DevOps 23ECAE802 (2-0-1)	Blockchain Technologies 23ECAE810 (3-0-0)
	Computer Networks 24ECAC703 (3-0-1)	Software Engineering 24ECAC707 (3-0-0)	Advanced JAVA Programming 24ECAC803 (3-0-1)		User Interface Design 23ECAE803 (3-0-0)	Big Data Analysis with PySpark 23ECAE811 (3-0-0)
	Operating Systems 24ECAC704 (3-0-1)	Cloud Computing 24ECAC708 (3-0-1)	Elective-1 23ECAE8XX (3-0-0)		Cyber Security 23ECAE804 (3-0-0)	Software Practices & Testing 23ECAE812 (2-0-1)
	Mathematical Thinking & Logical Reasoning 15EHSC701 (3-0-0)	Design and Analysis of Algorithms 24ECAC709 (3-0-1)	Elective-2 23ECAE8XX (3-0-0)		Information Security 23ECAE805 (3-0-0)	Virtual Reality Systems 23ECAE813 (3-0-0)
	Data Structures using C Lab 25ECAP701 (0-0-1.5)	Java Programming Lab 24ECAP701 (0-0-2)	Mobile Application Development 24ECAP801 (0-0-2)		C# Programming with .Net 23ECAE806 (3-0-0)	Internet of Things 23ECAE814 (3-0-0)
	Database Lab 25ECAP702 (0-0-1.5)	Mini Project-1 24ECAP702 (0-0-2)	Mini Project-2 23ECAP802 (0-0-2)		Statistical Foundation for Data Science 23ECAE808 (3-0-0)	Wireless Mobile Computing 23ECAE815 (3-0-0)
	Web Technology 23ECAP704 (0-0-2)				Full Stack Development with MERN 23ECAE807 (2-0-1)	Web Content Management 23ECAE816 (3-0-0)
	Critical Thinking and Problem-Solving Skills 24EHSC701 (1-0-0)	Communication and Leadership Skills 24EHSC702 (1-0-0)				
Credits	23	23	22	20		

Curriculum Structure-Semester wise

Semester - I

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	25ECAC701	Data Structures using C	PSC	3-0-0	3	3	50	50	100	3 hours
2.	25ECAC702	Database Management System	PSC	3-0-0	3	3	50	50	100	3 hours
3.	24ECAC703	Computer Networks	PSC	3-0-1	4	5	63	37	100	3 hours
4.	24ECAC704	Operating Systems	PSC	3-0-1	4	5	63	37	100	3 hours
5.	15EHSC701	Mathematical Thinking & Logical Reasoning	HSC	3-0-0	3	3	50	50	100	3 hours
6.	25ECAP701	Data Structures using C lab	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
7.	25ECAP702	Database Lab	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
8.	23ECAP704	Web Technology	PSC	0-0-2	2	4	80	20	100	3 hours
9.	24EHSC701	Critical Thinking and Problem Solving Skills	HSC	1-0-0	1	1	100	--	100	3 hours
TOTAL				16-0-7	23	30	616	284	900	

Semester - II

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1	24ECAC705	OOPS using Java	PSC	3-0-0	3	3	50	50	100	3 hours
2	25ECAC703	Machine Learning	PSC	3-0-1	4	5	63	37	100	3 hours
3	24ECAC707	Software Engineering	PSC	3-0-0	3	3	50	50	100	3 hours
4	24ECAC708	Cloud Computing	PSC	3-0-1	4	5	63	37	100	3 hours
5	24ECAC709	Design and Analysis of Algorithms	PSC	3-0-1	4	5	63	37	100	3 hours
6	24ECAP701	Java Programming Lab	PSC	0-0-2	2	4	80	20	100	3 hours
7	24ECAP702	Mini Project-1	PSC	0-0-2	2	4	50	50	100	3 hours
8	24EHSC702	Communication & Leadership skills	HSC	1-0-0	1	1	100	--	100	3 hours
TOTAL				16-0-7	23	30	519	281	800	

Semester- III

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	25ECAC801	Natural Language Processing and GenAI	PSC	2-0-2	4	6	50	50	100	3 hours
2.	24ECAC802	Big Data Analytics	PSC	3-0-1	4	5	63	37	100	3 hours
3.	24ECAC803	Advanced JAVA Programming	PSC	3-0-1	4	5	63	37	100	3 hours
4.	23ECAE8XX	Elective-1	PSE	3-0-0	3	3	50	50	100	3 hours
5.	23ECAE8XX	Elective-2	PSE	3-0-0	3	3	50	50	100	3 hours
6.	24ECAP801	Mobile Application Development	PSC	0-0-2	2	4	80	20	100	3 hours
7.	23ECAP802	Mini Project-2	PSC	0-0-2	2	4	50	50	100	3 hours
TOTAL				14-0-8	22	30	406	294	700	

Semester- IV

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	23ECAP803	Capstone Project Work	PW	0-0-17	17	34	100	150	250	3 hours
2.	23ECAE8XX	Elective-3 (MOOC)	PSE	3-0-0	3	3	100	--	100	3 hours
TOTAL				3-0-17	20	37	200	150	350	

Semester	I	II	III	IV	Total
Credits	23	23	22	20	88

List of Program Electives 1 &2 III-Semester

Sr. No	Name of the Course	Course Code
1.	Linux Administration	23ECAE801
2.	DevOps	23ECAE802
3.	User Interface Design	23ECAE803
4.	Cyber Security	23ECAE804
5.	Information Security	23ECAE805
6.	C# Programming with .Net	23ECAE806
7.	Statistical Foundation for Data Science	23ECAE807
8.	Full Stack Development with MERN	23ECAE808

List of Program Electives-3 IV-Semester

Sr. No	Name of the Course	Course Code
1.	Deep Learning	23ECAE809
2.	Blockchain Technologies	23ECAE810
3.	Big Data Analysis with PySpark	23ECAE811
4.	Software Practices & Testing	23ECAE812
5.	Virtual Reality Systems	23ECAE813
6.	Internet of Things	23ECAE814
7.	Wireless Mobile Computing	23ECAE815
8.	Web Content Management	23ECAE816

Semester - I

Program: Master of Computer Applications		Semester: I
Course Title: Data Structures using C		Course Code: 25ECAC701
L-T-P : 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Examination Duration: 3 Hrs
Unit I		
1	Overview of C History of C, Features of C, Why to learn C Programming, Basic structure of a C program, Compilation Process in C, Compile time Vs Runtime, Variables, Constants, ASCII value, Data Types, Storage Classes, Operators, Decision Making, Loops, Functions, Scope Rules, Passing arrays to functions, Passing structures to Functions, Character arrays, Pointers, malloc(), calloc(), realloc() and free() functions in C	8 Hrs
2	Stacks Definition and examples, Primitive operations, Example, Representing stacks in C, Implementing the pop operation, Testing for exceptional conditions, Implementing the push operation, Examples for infix, postfix, and prefix expressions, Basic definition and examples, Program to evaluate a postfix expression, Converting an expression from infix to postfix, Program to convert an expression from infix to postfix.	4 Hrs
3	Recursion Recursive definition and processes, Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. Recursion in C, Factorial in C, Fibonacci numbers in C, Binary search in C, Towers of Hanoi problem	4 Hrs
Unit II		
4	Queues and Lists The queue and its sequential representation, C implementation of queues, Insert operation, Priority queue, and array implementation of a priority queue. Linked lists, Inserting and removing nodes from a list, Linked implementation of stacks, get node and free node operations, Linked implementation of queues, Linked list as a data structure, Example of list operations, Header nodes, Lists in C, Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, Linked lists using dynamic variables, Queues as lists in C, Examples of list operations in C, Non integer and non- homogeneous lists, Other list structures: Circular lists, Stack as a circular list, Queue as a circular list, Primitive operations on circular lists, doubly linked lists	8 Hrs
5	Trees and Graphs Binary trees, operations on binary trees, Applications of binary trees, Binary tree representation, Node representation of binary tree, Internal and external nodes, Implicit array representation of binary trees, Choosing a binary tree representation, Binary tree traversal in C, Threaded binary trees. Graphs: Definitions, Application of	8 Hrs

	graphs, and C representation of graphs, Traversal methods for graphs, Depth first traversal, and Breadth first traversal.	
Unit III		
6	Sorting Bubble Sort, Quick Sort, Selection Sort, Tree Sorting: Binary Tree Sort, Heap Sort Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge and Radix Sort.	4 Hrs
7	Searching Basic Search Techniques: Algorithmic notation, Sequential searching, Searching an ordered table, Indexed sequential search, Binary search, Interpolation search, Tree searching: Inserting into a Binary Search Tree, Deleting from a Binary Search Tree, Hashing: Resolving hash clashes by open addressing, Choosing a hash function	4 Hrs
Text Books : Yedidyah Langsam, Augenstein, M.J. and Tenenbaum, Data Structures using C and C++, Second Edition, Pearson Education Asia, 2006		
Reference Books: - Weiss, M.A., Data Structures and Algorithm Analysis in C, 2, Pearson Education Asia, 1997 - Gilberg, R.F. and Forouzan, B.A. , Data Structures A Pseudo code Approach with C, 3, Reprint,Thomson Course Technology, 2005 - Reema Thareja, Data Structures using C , 2 nd Edition, 2014, Oxford University Press		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6, 7	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: I
Course Title: Database Management System		Course Code: 25ECAC702
L-T-P : 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hrs: 40	Practical:--	Examination Duration: 3 Hrs
Unit I		
1	Introduction to Databases Introduction; An example; Characteristics of Database approach; Actors on the scene; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; When not to use a DBMS. Data models, schemas and instances; Three-schema Architecture and Data Independence; Database Languages and Interfaces.	5 Hrs
2	Conceptual Data Modeling Using Entities and Relationships Using High Level Conceptual Data Models for database Design; A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagram, Naming Conventions and Design Issues, Relationships Higher than Two.	5 Hrs
3	The Basic (Flat) Relational Model and Relational Algebra Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations. Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra. Relational Database Design using ER-to-Relational Mapping.	6 Hrs
Unit II		
4	SQL SQL Data Definition and Data Types; Specifying Constraints in SQL; Basic Retrieval Queries in SQL; Insert, Delete and Update statements in SQL; More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Action as Triggers; Views (Virtual Tables) in SQL; Schema Change Statements in SQL; Database programming issues and techniques.	7 Hrs
5	Database Design Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.	6 Hrs
6	Object and Object-Relational Databases Overview of Object Database Concepts, Object-Relational Features: Object Database Extensions to SQL.	3 Hrs
Unit III		
7	Foundations of Database Transaction Processing and Concurrency Control Introduction to Transaction Processing; Transaction and System Concepts; Desirable Properties of Transactions; Characterizing Schedules Based on Recoverability; Characterizing Schedules Based on Serializability; Transaction Support in SQL. Two-Phase Locking Techniques for Concurrency control;	4 Hrs

	Concurrency control based on Timestamp Ordering; Multiversion Concurrency control Techniques; Validation Concurrency Control Techniques; Granularity of Data Items & Multiple Granularity Locking; Using Locks for Concurrency Control in Indexes; Other Concurrency Control Issues.	
8	Introduction to Database Recovery Protocols Recovery Concepts, NO-UNDO/REDO Recovery Based on Deferred update; Recovery Techniques based on Immediate update; Shadow paging; The ARIES Recovery Algorithm; Recovery in Multi database Systems; Database Backup and Recovery from Catastrophic Failures.	4 Hrs
Text Books : 1. Ramez Elmasri, Shamkant B. Navathe, Database Systems, Sixth Edition, PEARSON, 2013		
Reference Books: 1. Carlos Coronel, Steven Morris, Database Systems, Design, Implementation & Management. Cengage 2017. 2. Elmasri and Navathe, Fundamentals of Database Systems, Fifth Edition, Addison- W, . 2007. 3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill, 2003 4. https://courses.cs.duke.edu/fall17/compsci316/lectures/03-design-notes.pdf		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications	Semester – I
Course Title: Computer Networks	Course Code:24ECAC703

L-T-P: 3-0-1		Credits: 4	Contact Hours: 5 hrs/week
ISA Marks: 63		ESA Marks: 37	Total Marks: 100
Teaching Hrs: 40		Practical: 24	Exam Duration: 03 Hrs
Unit I			
1	Computer Networks and the Internet Internet, The Network Edge and Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layer and Service Models: OSI and TCP/IP, Networks Attacks.		5 hrs
2	Application Layer Principles of Network Applications, HTTP, SMTP, DNS, DHCP, Peer-to-Peer Applications		5 hrs
3	Transport-Layer Services Introduction, Multiplexing and Demultiplexing, Connectionless Transport, Principles of Reliable Data Transfer Protocol, Connection-Oriented and Connectionless Transport, Principle of Congestion Control, TCP Congestion Control.		6 hrs
Unit II			
4	Network Layer – Data Plane Introduction to Data and Control Plane, Virtual Circuit and Datagram Networks, Internet Protocol: Datagram Format, Fragmentation, IP Addressing, NAT, IPv6		6 hrs
5	Network Layer- Routing Algorithms The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet ,intra-AS Routing in the Internet: RIP , Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP.		6 hrs
6	Data Link Layer Introduction to the Link Layer, Error-Detection and -Correction Techniques: Parity Checks, check summing Methods, Cyclic Redundancy Check (CRC), Hamming Code		4 hrs
Unit – III			
7	Data Link Layer (Continued...) Multiple Access Links and Protocols: Channel Partitioning Protocols, Random Access Protocols: Aloha, Slotted Aloha, CSMA, CSMA/CD, CSMA/CA, Taking-Turns Protocols, The Link-Layer Protocol for Cable Internet Access, Link-Layer Addressing and ARP, Ethernet and LAN standards		4 hrs
8	Security in Computer Networks What is Network Security, Principles of cryptography, Message Integrity and Digital Signatures, End point authentication, Securing E-Mail, Securing TCP Connections, Network Layer Security IPsec and VPN, Operational Security: Firewalls and Intrusion detection systems		4 hrs
Text Books: 1. Computer Networking, A Top-Down Approach, by J.F.Kurose, K.W.Ross, 7th edition Pearson Education, 2017.			
References Books: 1. TCP/IP Protocol Suite, 4th MGH 2010 by B. A. Forouzan.			

2. Kurose and Rose, Computer Networking -A top down approach featuring the internet, 3rd Edition –Pearson Education
3. “Computer Networks” by ‘Andrew S. Tanenbaum’, Pearson Education Asia, 4th Edition.

Assessment Scheme

Assessment	Weightage in Marks
ISA- 1	20
ISA- 2	20
Assignment/Quiz	10
ISA Total	50 (Scaled down to 38)
Lab ISA	25
ESA	100 (Scaled down to 37)
Total	38+25+37= 100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

Integrated Lab Practices

Sl.no	Topics	Lab Activities	Lab slots
1	Introduction to Data Communications	Overview of networks and layered communications	1
2	Physical Layer: Cable constructions and testing of different cable connectivity	1. Practice the cable construction for twisted pairs and fiber optics. 2. Test the configured cable connectivity.	1
3	Physical Layer: Analyzing the packet content using network monitoring tools	1. Understanding of packet capture using network interface. 2. Analyze the content of the packet using Wireshark tool correlated with OSI model.	2
4	Physical Layer, Data Link Layer: Understanding of network devices and protocol simulation tool	1. Understanding of different network devices used for data communication. 2. Illustrate packet tracer simulation tool for design of the network.	2
5	Data Link Layers: ARQ Protocol implementation using C Program.	Implement the different supported ARQ protocols implementation using C Program.	2
6	Network Layer: Network Operations and troubleshooting	1. Outline the network properties and testing the network connectivity. 2. Explain the addressing protocols.	2
7	Network Layer:	Simulation and Implementation of Routing Protocols.	2

[BACK](#)

Program: Master of Computer Applications		Semester - I
Course Title: Operating Systems		Course Code: 24ECAC704
L-T-P: 3-0-1	Credits: 4	Contact Hours: 5 hrs/week
ISA Marks: 63	ESA Marks: 37	Total Marks: 100
Teaching Hrs: 40	Practical : 24	Exam Duration: 03 Hrs
Unit I		
1	Introduction to Operating Systems, System structures What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure: System Booting.	6 hrs
2	Process Management--Basic concepts Process Concept, Process Scheduling, Operation on Processes, Inter process Communication, Multi-Threaded Programming: Overview; Multi-threading Models; Thread Libraries; Threading Issues.	5 hrs
3	Process Management--Process Scheduling Process Scheduling: Basic concepts; Scheduling criteria Scheduling algorithms Multiple-Processor scheduling; Thread scheduling.	5 hrs
Unit II		
4	Process Synchronization The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	4hrs
5	Deadlocks Deadlocks: System model; Deadlock characterization; methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	6 hrs
6	Memory Management Memory Management Strategies: Background; Swapping Contiguous memory allocation; Segmentation, Paging, Structure of page table; Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement, Allocation of frames; Thrashing.	6 hrs
Unit – III		
7	Implementation of File System File System: File concept; Access methods Directory structure, File system mounting File sharing; Protection. Implementing File System: File system structure File system implementation; Directory implementation; Allocation methods; Free space management.	4 hrs
8	Secondary Storage Structures, Protection Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.	4 hrs



Text Books:

1. Abraham Silberschatz, Peter Galvin and Greg Gagne, Operating System Principles, 10th Edition, Wiley-India, 2018

References Books:

- 1.D. M. Dhamdhare: Operating systems-A concept-based Approach 2nd Edition, Tata McGraw-Hill 2002.
2. P.C.P. Bhatt: Operating systems, 2nd Edition, PHI,2006.

Evaluation Scheme

Assessment	Weightage in Marks
ISA- 1	20
ISA- 2	20
Assignment/Quiz	10
ISA Total	50(Scaled down to 38)
Lab ISA	25
Theory ESA	100 (Scaled down to 37)
Total	38+25+37= 100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

Integrated Lab Practices

Sl.no	Lab Activities	Lab slots
1.	Introduction to UNIX Operating system	2
2.	The directory structure.	2
3.	Study of basic UNIX commands	2
4	Creating, compiling and executing c programs using VI Editor and gcc compilers.	2
5.	Programs to demonstrate the working of the following system calls: fork(), wait(), getpid(), getppid()	2
6.	Programs to implement scheduling algorithms.	2

[BACK](#)

Program: Master of Computer Applications		Semester: I
Course Title: Mathematical Thinking & Logical Reasoning		Course Code:15EHSC701
L-T-P : 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hrs: 40	Practical: --	Examination Duration: 1.5 Hrs

Chapter No.	Content	Hrs
1	Arithmetical Reasoning	10 Hrs
2	Analytical Thinking	4 Hrs
3	Syllogistic Logic	3 Hrs
4	Verbal Logic	9 Hrs
5	Non-Verbal Logic	6 Hrs
6	Lateral Thinking	8 Hrs

Text Books :

1. A Modern Approach to Verbal and Non – Verbal Reasoning – R. S. Aggarwal, Sultan Chand and Sons, New Delhi
2. Quantitative Aptitude – R. S. Aggarwal, Sultan Chand and Sons, New Delhi

Reference Books:

1. Verbal and Non – Verbal Reasoning – Dr. Ravi Chopra, MacMillan India
2. Lateral Thinking – Dr. Edward De Bono, Penguin Books, New Delhi

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

[BACK](#)

Program: Master of Computer Applications		Semester - I	
Course Title: Data Structures using C Lab		Course Code: 25ECAP701	
L-T-P: 0-0-1.5	Credits: 1.5	Contact Hours: 3 hrs/week	
ISA Marks:80	ESA Marks: 20	Total Marks: 100	
Teaching Hrs: --	Practical : 36	Exam Duration: 03 Hrs	
Activities			
Sl.no	Topics	Activity	Lab slots
1	Arrays, functions, pointers, structures and dynamic memory allocation in C.	Program to demonstrate the following for a given set of elements: • Array as a parameter • Structure as a parameter Process of allocating memory during program execution	1
2	Stack data structure	Program to illustrate implementation of stack using the following: • Array • Structures Functions and pointers.	1
3	Applications of stack	Implement the two application of stack. • Postfix expression evaluation Conversion of Infix expression to Postfix expression	1
4	Recursion	Write recursive functions in C program for the following: • Simple recursive functions: Tower of Hanoi, factorial, Fibonacci series. • Reverse a stack using recursion Sort a stack using recursion	1
5	Queue and Circular Queue concepts	Program to illustrate implementation of queue and circular queue using array	2
6	Queue.	Implementation of queue using Linked list	1
7	Singly Linked List and Circular Linked List.	Implementation of singly and circular linked list.	2
8	Doubly Linked List	Perform all the operations on doubly linked list	1
9	Searching and sorting techniques.	Implementation of the following searching and sorting techniques: Linear search, binary search, insertion sort, heap sort, quick sort.	1
10	Tree and graph traversal	• Construction and traversal of binary search tree	1



		• Program to demonstrate the graph traversal.	
--	--	---	--

Evaluation Scheme

Assessment	Weightage in Marks
Lab ISA	80
Lab ESA	20
Total	80+20= 100

[BACK](#)

Program: Master of Computer Applications		Semester - I	
Course Title: Database Lab		Course Code: 25ECAP702	
L-T-P: 0-0-1.5	Credits: 1.5	Contact Hours: 3 hrs/week	
ISA Marks:80	ESA Marks: 20	Total Marks: 100	
Teaching Hrs: --	Practical : 36	Exam Duration: 03 Hrs	
Activities			
Sl.no	Topics	Activity	Lab slots
1	Conceptual Data Modeling Using Entities and Relationships	Draw the ER diagrams for the following databases* i) Student-Enrolment Data base ii) Insurance Database iii) Company Database Movie Database	2
2	The Basic (Flat) Relational Model and Relational Algebra	Convert the ER diagrams mentioned in activity 1 to Relational Schema diagrams.	2
3	SQL	SQL query implementation for following schemas : i) Student-Enrolment Data base ii) Insurance Database iii) Company Database iv) Movie Database	2
4	Database Design	Assignments on Normalization	2
5	Conceptual Data Modeling Using Entities and Relationships	Draw the ER diagrams for the following databases: iv) Student-Enrolment Data base v) Insurance Database vi) Company Database Movie Database	2
6	Transaction Processing	Assignment on Transaction Processing	2

Evaluation Scheme

Assessment	Weightage in Marks
Lab ISA	80
Lab ESA	20
Total	80+20= 100

[BACK](#)

Program: MASTER OF COMPUTER APPLICATIONS		Semester - I
Course Title: Web Technology		Course Code: 23ECAP704
L-T-P: 0-0-2	Credits:2	Contact Hours: 4 Hrs/week
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hrs:--	Practical : 48	Exam Duration: 03 Hrs
1	Fundamentals of Web Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Hypertext Transfer Protocol, Security, Web Programmer's Toolbox	5 hrs
2	HTML 5 HTML5 tags, Multimedia tags, Form attributes, Meter tag, Drag and drop, Image tags, Block & inline, Geo location, Location properties, Handling errors and rejections, Google map	5 hrs
3	CSS and Bootstrap 5 Levels of Style Sheets, Style Specification Formats, Box Model, Basic layouts , Animations, Accordions, Progress bar, Validation , Borders, Fonts, Alerts, Toasts, Navbars, Card utilities, Pagination, Slideshow using carousel	8 hrs
4	Dynamic documents and JavaScript JavaScript Execution Environment, Element Access in JavaScript, Event Handling, Button, Text Box and Password Elements, Positioning Elements, Dynamic Content	12 hrs
5	PHP Programming History, Unique features, Basic development concepts, Creating your first PHP script, Writing & running the script, Understanding the scripts, Handling script errors, Storing data in variables, Understanding PHP's data types, Setting & checking variable data types, Using constant and Manipulating variables with operators, Handling form input and conditional statements, Processing arrays with loops & iterators, Creating user defined function	10 hrs
6	Working with databases & SQL Introducing databases & SQL, Using PHP MySQLi extension, Adding or modifying data, Handling errors, Building a Login form.	8 hrs
Text Books: 1. Robert W Sebesta, Programming the World Wide Web, 8th Edition, Pearson education,2020.		

Reference Books:

1. Thomas Powell, HTML & CSS: The Complete Reference, 5th Edition, McGraw-Hill, 2017
2. Eric Meyer, Estelle Weyl, CSS: The Definitive Guide : Web Layout and Presentation, 5th Edition , O' Reilly, 2023

Evaluation Scheme

In Semester Assessment (80%)	Assessment	Weightage in Marks
	Exercise (Problem execution, Viva & Observation Book)	60
	Structured Enquiry	20
	Total (ISA)	80
End Semester Assessment (20%)	Exercise	20
	Total	100

Lab Experiments

Sl.no	Experiments	Lab Slots
1	Identify components of the web: URLs, web browsers, servers, HTTP/HTTPS protocols, and explore web security tools	1
2	Design static web pages using HTML5: semantic tags, multimedia elements, forms, drag-and-drop, and geolocation features	1
3	Implement HTML5 form controls with attributes like required, placeholder, autofocus, and range/meter inputs	1
4	Apply CSS styling (inline, internal, external), box model, and custom layouts to enhance HTML5 pages	1
5	Develop responsive designs using Bootstrap 5: containers, grid system, cards, navbars, modals, and carousels	1
6	Create dynamic web pages using JavaScript: event handling, DOM manipulation, form validation, and dynamic content	1
7	PHP scripts to demonstrate variables, constants, data types, operators, and control structures	1
8	Process HTML form inputs using PHP with conditional statements, loops, and user-defined functions	1
9	Connect PHP with MySQL using MySQLi and perform CRUD operations on a sample database	2
10	Develop a login form with session management, cookie handling, and error validation using PHP and MySQL	2

[BACK](#)

Program: Master of Computer Applications		Semester: I
Course Title: Critical Thinking and Problem Solving Skills		Course Code:24EHSC701
L-T-P : 1-0-0	Credits: 1	Contact Hours: 1 hr/week
ISA Marks: 100	ESA Marks: ---	Total Marks: 100
Teaching Hrs: 16	Practical :--	Examination Duration: :---
	Content	
1	Communication Skills ▪ Brain Storing ▪ Fractionation and Suspended Judgment ▪ Out of the box thinking and creativity activities	3 Hrs
2	Perfect Presenter (PS) ▪ The Zero Presentation ▪ Overcoming Living with Stage(any) Fear ▪ Feedback matters.	3 Hrs
3	Analyze This! (AT) ▪ Human Relations ▪ Number Series ▪ Decoding the Codes ▪ Logical Venn Diagrams ▪ Clocks and Calendars ▪ Direction Tests ▪ Visual Reasoning	3 Hrs
4	The Verbal Impression (WE) ▪ Are you shy? Linguistically? ▪ Get rooty! ▪ Opposites Attract? ▪ Error Detection & Correction	3 Hrs
5	Mathematical Thinking (MT) (4 hours) ▪ Numbers ▪ Factors and Multiples ▪ The God of Math ▪ Ratio, Proportion and Variation	4 Hrs
Text Books :		
Reference Books:		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
Activities	100
Total	100

[BACK](#)

Semester-II

Program: Master of Computer Applications		Semester - II
Course Title: OOPS Using Java		Course Code:24ECAC705
L-T-P: 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical : --	Exam Duration: 03 Hrs
Unit I		
1	Introduction and Fundamental Programming Structures in Java History of java, features of java, A simple java programming, Comments, Data Types, Variables, Constants, Operators, Control Flow, Big Numbers, Arrays.	4 hrs
2	Objects and Classes Introduction to Object-Oriented Programming, Classes, Objects, Identifying Classes, Relationships between Classes, Using Predefined Classes, Objects and Object Variables, Mutator and Accessor Methods, First Steps with Constructors, Implicit and Explicit Parameters, Benefits of Encapsulation, Class-Based Access Privileges, Private Methods, Static Fields and Methods, Method Parameters, Object Construction, Overloading, Packages.	6 hrs
3	Inheritance and Java Strings Classes, Super classes, and Subclasses, Inheritance Hierarchies, Polymorphism, Dynamic Binding, Preventing Inheritance: Final Classes and Methods, Casting, Abstract Classes. Java String, Strings Are Immutable, String Buffer class, String Builder class, toString() method, String Tokenizer in Java..	5 hrs
Unit II		
4	Interfaces, Lambda Expressions and Inner Classes Interfaces, Properties of Interfaces, Interfaces and Abstract Classes, Object Cloning, Interfaces and Callbacks, Inner Classes, Use of an Inner Class to Access Object State, Special Syntax Rules for Inner Classes, Local Inner Classes, Accessing final Variables from Outer Methods, Anonymous Inner Classes, Static Inner Classes.	6 hrs
5	Exceptions and Multithreading Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, How to Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Rethrowing and Chaining Exceptions, The finally Clause; Multithreading: What Are Threads?, Interrupting Threads, Thread States, Thread Properties.	6 hrs
6	Collections Collection Interfaces, Collection and Iterator Interfaces in the Java Library, Linked Lists, Array Lists, Hash Sets, Tree Sets, Object Comparison, Queues and Dequeues, Priority Queues, Maps.	3 hrs
Unit – III		
7	Servlets Background; The life cycle of servlet, A simple servlet, The Servlet API, The javax.servlet Package ,The Servlet Interface, The ServletConfig Interface,	5 hrs

	ServletContext Interface, ServletRequest Interface, ServletResponse Interface	
8	Database Access Introduction to JDBC, JDBC API Overview, Steps to Connect to a Database, Working with Statements, ResultSet Navigation	5 hrs
Text Books: 1. Core Java Volume-I Fundamentals 10th Edition, 2016, by Cay S. Horstmann, Gray Cornell. 2. Herbert Schildt, JAVA The Complete Reference 11th edition, Tata McGraw Hill 2019.		
Reference Books: 1. Head First Java 2nd Edition by Kathy Sierra and Bert Bates, OREILLY.		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
Theory ISA- 1	20
Theory ISA- 2	20
Assignment/Quiz	10
Total	

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5, 6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7, 8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Machine Learning		Course Code: 25ECAC703
L-T-P: 3-0-1	Credits: 4	Contact Hrs: 5 hrs/week
ISA Marks: 63	ESA Marks: 37	Total Marks: 100
Teaching Hrs: 40	Practical : 24	ESA Exam Duration: 3 hrs
Unit –I		
1	Introduction to Machine Learning Introduction to Machine Learning, Applications of Machine Learning, Types of Machine Learning: Supervised, Unsupervised and Reinforcement learning, Dataset formats, Features and observations.	6 hrs
2	Supervised Learning: Linear Regression, Logistic Regression Linear Regression, Logistic Regression: Single and Multiple variables, Sum of squares error function, The Gradient descent algorithm: Application, The cost function, Classification using logistic regression, Regularization.	10 hrs
Unit –II		
3	Supervised Learning: Classification Introduction to Neural Network, Model representation, Gradient checking, Back propagation algorithm, Multi-class classification, Support vector machine, Applications & Use-cases.	7 hrs
4	Unsupervised Learning: Clustering Introduction to Clustering, K means Clustering Algorithm, Cost function, Application.	5 hrs
5	Dimensionality Reduction LDA-Linear Discriminant Analysis, Supervised Learning and LDA; PCA-Principal Component Analysis, Unsupervised Learning and PCA.	4 hrs
Unit –III		
6	Introduction to Deep Learning & CNN What is deep learning? Difference between Machine Learning and Deep Learning, When to use Deep Learning? Deep Feedforward Networks, Example: Learning XOR, Convolution Neural Networks (CNN) – Convolutional Layer: Filters, Stacking Multiple Feature Maps, TensorFlow Implementation, Pooling Layer, CNN Architectures	5 hrs
7	Recurrent Neural Networks Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Sequence Modeling.	3 hrs
Text Book: 1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Media, Inc. 2019.		
Reference Books: 1. Python Machine Learning Third Edition, 2019 Packt Publishing, Sebastian Raschka Vahid Mirjalili, December 2019. 2. The Hundred-Page Machine Learning Book, AndriyBurkov, January 13, 2019.		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Weightage in Marks
ISA- 1	15
ISA- 2	15
Assignment/Activities	20
ISA	50
ESA	50
Total	100

End semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	3,4, 5	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6, 7	Any 1 question is to be answered

Integrated Lab Practices

SI No.	Activities	Lab slots
1	Introduction to Scikit, Numpy, Scipy and TensorFlow	1
2	Linear Regression – Single Variable Linear Regression	1
3	Linear Regression – Multi Variable Linear Regression	1
4	Classification – Logistic Regression	1
5	Classification – Support Vector Machines (SVM)	1
6	Classification using Neural Networks	1

7	Unsupervised Learning – Principal Component Analysis (PCA)	2
8	Unsupervised Learning – K-Means Clustering	2
9	Deep Learning – Convolution Neural Networks Application	2

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Software Engineering		Course Code: 24ECAC707
L-T-P : 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Examination Duration: 3 Hrs
Unit I		
1	Introduction of Software Engineering process Professional software development, Software engineering ethics, Case studies, Software processes: Software process models, Process activities, Coping with change, Process improvement	6 Hrs.
2	Agile Software Development Agile methods, Agile development techniques, Agile project management. Scaling agile methods	6 Hrs.
3	Requirement Engineering Functional and Non-functional requirements, Requirements Engineering processes, Requirements elicitation, Requirement specification, Requirements validation; Requirements change.	4 Hrs.
Unit II		
4	System Modelling Context models, Interaction Models, Structural models, Behavioural models. model driven architectures	6 Hrs.
5	Architectural Design Architectural Design Decisions, Architectural views, Architectural patterns, Application Architectures	6 Hrs.
6	Design and implementation Object oriented design using UML, design patterns, Implementation Issues, Open source development.	4 Hrs.
Unit III		
7	Software Testing Development Testing, Test Driven Development, Release Testing, User Testing.	4 Hrs.
8	Configuration management Change management, Version management, System building, Release management.	4 Hrs.
Text Books : 1. Ian Sommerville, Software Engineering, 10 th ed, Pearson Ed, 2018		
Reference Books: 1. Roger S. Pressman, Software Engineering: A Practitioners Approach, 8 th e, McGraw, 2015 2. Jalote, P, An Integrated Approach to Software Engineering, 6e, willy Publications, 2015		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Cloud Computing		Course Code: 24ECAC708
L-T-P: 3-0-1	Credits:4	Contact Hours: 5 Hrs/week
ISA Marks: 63	ESA Marks: 37	Total Marks: 100
Teaching Hrs: 40	Practical :24	Exam Duration: 03 hrs
Unit I		
1	Introduction, Parallel and distributed systems Network-centric computing and network centric content, peer-to-peer systems, Cloud computing basics, delivery models and services, Ethical issues, cloud vulnerabilities, major challenges; parallel computing, parallel computer architecture, Distributed systems, communication protocol and process coordination, logical clocks, message delivery rules, casual delivery, Concurrency, atomic actions, consensus protocols, modularity: client-server paradigm.	6 hrs
2	Cloud Infrastructure Cloud computing at Amazon, cloud computing: the Google perspective, Microsoft windows Azure and online services; open-source software platforms for private clouds; Cloud storage diversity and vendor lock-in; Cloud computing interoperability: the intercloud; Energy use and ecological impact of large-scale data centers; Service and compliance level agreements; User experience; Software licensing.	6 hrs
3	Cloud Computing: Applications and Paradigms Challenges for cloud computing; Existing cloud applications and new application opportunities; Architectural styles for cloud applications; Workflows: Coordination of multiple activities; The MapReduce programming model; Case studies.	4 hrs
Unit II		
4	Cloud Resource Virtualization Virtualization; Layering and virtualization; Virtual machine monitors; Virtual machines; Performance and security isolation; Full virtualization and Para virtualization; Hardware support for virtualization; Case study; Optimization of network virtualization; vBlades; A performance comparison of virtual machines; Software fault isolation;	6 hrs
5	Cloud Resource Management and Scheduling Policies and mechanisms for resource management; Applications of control theory to task scheduling on a cloud; Stability of a two-level resource allocation architecture; Feedback control based on dynamic thresholds; Coordination of	6 hrs

	specialized autonomic performance managers; A utility-based model for cloud-based web services; Resource bundling; Scheduling algorithms for computing clouds; Fair queuing; Resource management and dynamic application scaling.	
6	Networking Support Packet-switched networks; The Internet; Internet migration to IPV6; The transformation of the Internet; Web access and the TCP congestion control window; Network resource management; Interconnection networks for computer clouds; Content-delivery networks; Overlay networks and small-world networks.	4 hrs
Unit III		
7	Storage Systems The evolution of storage technology; Storage models, file systems and databases; Distributed file systems: The precursors; General parallel file system; Google File System; Apache Hadoop; Locks and Chubby: A locking service; Transaction processing and NoSQL and databases; BigTable; Megastore.	4 hrs
8	Cloud Security Cloud security risks; Security: The top concern for cloud users; Privacy and privacy impact assessment; Trust; Operating system security; Virtual machine security; Security of virtualization; Security risks posed by shared images; Security risks posed by a management OS; A trusted virtual machine monitor.	4 hrs
Text Books 1. Dan C. Marinescu, Cloud Computing: Theory and Practice, Morgan Kaufmann publishers, Second Edition, 2018.		
Reference Books: 1. Michael Miller, Cloud Computing: Web-Based Applications that change the Way you work and collaborate Online, Pearson Publication, 2012. 2. Anthony T. Volte, Toby J. Volte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Hill, 2010. 3. Cloud Computing for Dummies: J. Hurwitz, ISBN 978-0-470-484-8 4. Dr. Kumar Sourabh, Cloud Computing, 2nd Edition, Wiley India, 2011.		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Weightage in Marks
Theory ISA- 1	20
Theory ISA- 2	20
Assignment/Quiz	10
Theory ISA Total	50(Scaled down to 38)
Lab ISA	25
Theory ESA	100 (Scaled down to 37)
Total	38+25+37= 100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

Integrated Lab Practices

Sl.no	Experiments	Lab slots
1	Create, configure, and connect to a virtual machine in the cloud.	1
2	Host a static HTML/CSS website using cloud object storage.	1
3	Set Up a Serverless Function to Process Data - create and invoke a simple serverless function.	1
4	Create a NoSQL database and perform basic CRUD operations.	1
5	Build a basic frontend using HTML/JavaScript and connect it to the cloud database.	1
6	Configure Access and IAM Roles - understand and implement cloud access control.	1
7	Monitor Resources and Set Budgets - monitor cloud usage and configure alerts.	2
8	Deploy a Simple API with Serverless Backend - expose a cloud function as a public API endpoint.	2

9	Host a Full Web App on Cloud Platform - deploy a web application in the cloud.	2
----------	--	----------

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Design and Analysis of Algorithms		Course Code: 24ECAC709
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5 hrs/week
ISA Marks: 63	ESA Marks:37	Total Marks: 100
Teaching Hrs: 40	Practical :24	Examination Duration:3 Hrs
Unit I		
1.	Introduction Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures.	5 Hrs
2.	Fundamentals of the Analysis of Algorithm Efficiency Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples	5 Hrs
3.	Brute Force Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive Search	3 Hrs
4.	Divide-and-Conquer Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties.	3 Hrs
Unit II		
5.	Decrease-and-Conquer Insertion Sort, Depth First and Breadth First Search, Topological sorting.	3 Hrs
6.	Transform-and-Conquer Presorting, Balanced Search Trees, Heaps and Heapsort, Problem Reduction	3 Hrs
7.	Space and Time Tradeoffs Input Enhancement in String Matching, Hashing	3 Hrs
8.	Dynamic Programming Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.	3 Hrs
9.	Greedy Technique Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees	4 Hrs
Unit III		
10.	Limitations of Algorithm Power Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems	4 Hrs
11.	Coping with the Limitations of Algorithm Power Backtracking, Branch-and-Bound, Approximation Algorithm for NP-Hard problems.	4 Hrs
Text Books :		
1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.		
Reference Books:		

1. Cormen T.H., Leiserson C.E., and Rivest R.L., Introduction to Algorithms, PHI, Third Edition 2009.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, Second Edition, 2008.

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Weightage in Marks
Theory ISA- 1	20
Theory ISA- 2	20
Assignment/Quiz	10
Theory ISA Total	50(Scaled down to 38)
Lab ISA	25
Theory ESA	100 (Scaled down to 37)
Total	38+25+37= 100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3,4	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	5,6,7,8,9	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	10,11	Any 1 question is to be answered



Integrated Lab Practices

Sl.no	Topics	Activity	Lab slots
1	Divide and Conquer	implement and analyze the following : ● Quick sort ● Merge sort	2
2	Decrease and Conquer	Implementation of the following : ● Insertion sort ● Depth first search ● Breadth First Search	2
3	Transform and Conquer	Implement the following: ● AVL Tree ● 2-3 tree	2
4	Dynamic Programming	Implement the following: ● Warshall's algorithm ● Floyd's Algorithm	2
5	Greedy method	Implementation of the following : ● Knapsack problem ● Kruskal's algorithm ● Prim's algorithm	2
6	Backtracking	● Program to implement 8-Queen's problem.	2

[BACK](#)

Program: Master of Computer Applications		Semester - II
Course Title: Java Programming Lab		Course Code: 24ECAP701
L-T-P: 0-0-2	Credits: 4	Contact Hours: 4 hrs/week
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hrs:--	Practical :48	Exam Duration: 03 Hrs
Sl.no.	Lab Programs	Lab slots
1	Programs to demonstrate Java fundamentals like program structure, data types and variables, constants and operators, control flow statements, big numbers and Arrays.	1
2	Programs to demonstrate classes and objects including accessor and mutator methods, constructors, objects parameters, encapsulation, static methods, method overloading and packages.	1
3	Programs to demonstrate Inheritance: Class with overridden methods. Polymorphism – Base class reference pointing to subclass object. Abstract Classes –Final Class/Methods – Create final class/methods that can't be overridden. Type Casting (Up/Down Casting) – Cast subclass object to superclass and back.	1
4	Program to demonstrate packages and Access modifiers.	1
5	Programs to demonstrate String class, StringBuffer, StringBuilder and StringTokenizer.	1
6	Programs to demonstrate Interfaces and Abstract classes.	1
7	Programs to demonstrate different types of inner classes and lambda expressions to simplify functional interface.	1
8	Program to demonstrate various types of Exception handling with try catch, throw and throws keyword.	1
9	Program to demonstrate custom exceptions.	1
10	Programs to demonstrate multithreading concept using Thread and Runnable classes, Thread life cycle and their properties.	1
11	Programs to demonstrate a program on usage of various collection types like ArrayList, LinkedList, Maps, Sets etc. and iterators.	1
12	Program to demonstrate a program on multi-threading concept.	1
13	Programs to demonstrate Servlets.	1
14	Programs to demonstrate JDBC concepts.	1



Text Books:

1. Core Java Volume-I Fundamentals 10th Edition, 2016, by Cay S. Horstmann, Gray Cornell.
2. Herbert Schildt, JAVA The Complete Reference 11th edition, Tata McGraw Hill 2019.

Reference Books:

1. Head First Java 2nd Edition by Kathy Sierra and Bert Bates, OREILLY.
2. Different websites on Java like Tutorialspoint.com, javatpoint.com etc.

Evaluation Scheme

Assessment	Weightage in Marks
Lab ISA	80
Lab ESA	20
Total	80+20= 100

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Mini Project-1		Course Code: 24ECAP702
L-T-P : 0-0-2	Credits: 2	Contact Hours: 4 hrs/week
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hrs: --	Practical :24	Examination Duration: 3 Hrs
Students can design and develop web / mobile applications using the latest technology. Objectives: Help students to utilize and strengthen the knowledge Web Technology which they have learnt in previous semester. Methodology: Students are asked to make a team of 3-4 members and can choose the different categories of projects like desktop applications, web applications, mobile application and distributed application and work once it is approved by the coordinator. The project assessment is done by an evaluation team as per the schedule.		

In-Semester Assessment	Assessment	Marks
	Problem Definition, Literature Review	05
	Synopsis and Software Requirement Specification(SRS)	05
	Design (Block Diagram, Data Flow Diagram [DFD], Entity-Relationship [ER] Diagram, and Use-case Diagrams)	10
	Coding and Implementation	10
	Integration and testing	05
	Project Report	10
	Presentation skills and Viva-voce	05
	Total	50
End-Semester Assessment	Presentation, Demonstration	30
	Modification	10
	Viva-voce	10
	Total	50

[BACK](#)

Program: Master of Computer Applications		Semester: II
Course Title: Communication and Leadership Skills		Course Code:24EHSC702
L-T-P : 1-0-0	Credits: 1	Contact Hours: 1 hr/week
ISA Marks: 100	ESA Marks:--	Total Marks: 100
Teaching Hrs: 16	Practical :--	Examination Duration: :3 Hrs
	Content	
1	Communication Skills ▪ Brain Storing ▪ Fractionation and Suspended Judgment ▪ Out of the box thinking and creativity activities	5 Hrs
2	Perfect Presenter (PS) ▪ The Zero Presentation ▪ Overcoming Living with Stage (any) Fear ▪ Feedback matters.	5 Hrs
3	Analyze This! (AT) ▪ Human Relations ▪ Number Series ▪ Decoding the Codes ▪ Logical Venn Diagrams ▪ Clocks and Calendars ▪ Direction Tests ▪ Visual Reasoning	6 Hrs
4	The Verbal Impression (WE) ▪ Are you shy? Linguistically? ▪ Get rooty! ▪ Opposites Attract? ▪ Error Detection & Correction	6 Hrs
5	Mathematical Thinking (MT) (4 hours) ▪ Numbers ▪ Factors and Multiples ▪ The God of Math ▪ Ratio, Proportion and Variation	6 Hrs
Text Books :		
Reference Books:		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
Activities	100
Total	100

[BACK](#)

Semester-III

Program: Master of Computer Applications		Semester: III
Course Title: Natural Language Processing with Gen AI		Course Code: 25ECAC801
L-T-P: 2-0-2	Credits: 4	Contact Hrs: 6 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 30	Practical : 30	Exam Duration:3 Hrs
Unit I		
1	Introduction to NLP & Preprocessing NLP overview & applications, Challenges in language understanding, Basic components of NLP systems, Text preprocessing: Tokenization, Stop word removal, Stemming, Lemmatization, POS tagging, Bag of Words, Introduction to word embeddings	5 hrs
2	Parsing and Syntax Analysis Grammar rules in NLP, Dependency and Constituency Parsing, Parsing techniques and algorithms, Introduction to neural dependency parsing	4 hrs
3	Language Models & Transformers N-grams and statistical models, Neural language models: Word2Vec, GloVe, Transformers for text understanding and generation, Sequence-to-sequence models, Attention mechanisms	6 hrs
Unit II		
4	Machine Translation & Generation Overview of Machine Translation, Statistical vs Neural Machine Translation, Seq2Seq with attention, Text generation techniques: LSTM, Transformers, Role of Autoencoders & Decoders	5 hrs
5	Generative AI and Advanced Architectures Discriminative vs Generative models, Generative Adversarial Networks (GANs) in NLP, Types of GANs, Diffusion models: concepts & types, Introduction to Chatbots and Dialogue Systems	5 hrs
6	Large Language Models (LLMs) Introduction to LLMs: GPT, BERT, Prompting techniques for GenAI, Adapters and LoRA (Low-Rank Adaptation), Applications and limitations of LLMs	5 hrs
Text Books: 1. Yoav Goldberg. A Primer on Neural Network Models for Natural Language Processing, 2022. 2. "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster. 3. "Hands-On Generative Adversarial Networks with Keras: Create Beguiling Image Generation Projects to Extend Your Generative AI Skills" by Rafael Valle		
Reference Books: 1. Daniel Jurafsky and James H. Martin, Speech and Language Processing (3rd Edition – Draft), Stanford University, 2023. 2. S. K. Dwivedi, R. K. Dwivedi, Natural Language Processing: A Textbook with Python Implementation, Springer, 2024.		

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Big Data Analytics		Course Code: 24ECAC802
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5 hrs/week
ISA Marks: 63	ESA Marks:37	Total Marks: 100
Teaching Hrs: 40	Practical : 24	Exam Duration: 3 Hrs
Unit I		
1	Introduction: What is Big Data? Data Analytics, Data Analytics Life Cycle, Big Data Characteristics, Different Types of Data.	5 Hrs
2	Big Data Storage: Clusters, File Systems and Distributed File Systems, NoSQL, Sharding, Replication, Combining Sharding and Replication. On Disk Storage Devices, In-memory Storage Devices.	5 Hrs
3	Big Data Processing: Parallel Data Processing, Distributed Data Processing, Hadoop, Map Reduce.	6 Hrs
Unit II		
4	Big Data Modeling: Data Model Structures, Data Model Operations, Processing Workloads, Processing in Batch Mode, Processing in Real-time Mode.	8 Hrs
5	Big Data Technologies: MongoDB - What is MongoDB? Why MongoDB? Terms Used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.	8 Hrs
Unit III		
6	Hive: What is Hive?, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, User-Defined Function (UDF).	4 Hrs
7	Big Data Visualization: Big Data Visualization and Interpretation, Data visualization techniques, Tools for Big Data visualization, Interpretation and analysis of visualized data, Case studies and real-world applications	4 Hrs
Text Books:		
1. Big Data Fundamentals Concepts, Drivers & Techniques by Thomas Erl, Wajid Khattak and Paul Buhler, Prentice Hall, 2015 2. Big Data and Analytics by Seema Acharya, Subhashini Chellappan, Wiley India Pvt Ltd 2014.		
Reference Books:		
1. Big Data and Analytics: Turning Big Data into Big Money by Frank J Ohlhorst, Wiley and SAS Business Series, 2012		

2. Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis by Colleen Mccue , Elsevier.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Weightage in Marks
Theory ISA- 1	20
Theory ISA- 2	20
Assignment/Quiz	10
Theory ISA Total	50(Scaled down to 38)
Lab ISA	25
Theory ESA	100 (Scaled down to 37)
Total	38+25+37= 100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2,3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6, 7	Any 1 question is to be answered

Integrated Lab Practices

Sl.no	Topics	Activity	Lab slots
1	Types of digital data and concept of big data	Identify the various types of data, such as, SD, USD and SSD present in any given business and also justify its importance for business growth. Prepare technical report for the same.	1
2	Big Data Analytics	Prepare survey paper on BDA with issues, challenges and applications.	2
3	Big data technology landscape	- Demonstration of graph database management system using Neo4j and Cypher query language. - Data set: Movie database, Twitter followers database, Twitter Sentiment Graph Data, Graph dataset in Kaggle.	3
4	Hadoop distributed file system	- Demonstration of HDFS commands - Hadoop Implementation of MapReduce programming for Word count problem, Totals sales and Max temperature problem.	2
5	MongoDB and query language	- Demonstration of CRUD operations in MongoDB. - MongoDB built-in functions and UDF - Implementation of MapReduce functions in MongoDB for log data analysis. - Integration of JavaScript with MongoDB, Loading of large data into MongoDB	2
6	Hive and query language	- Hive CRUD operations - Hive – Partitioning - Hive - View and Indexes - HiveQL operations - Hive Function: Built-in & UDF (User Defined Functions) - Hive ETL: Loading JSON, XML, Text Data Examples	2

[BACK](#)

Program: Master of Computer Applications		Semester - III
Course Title: Advanced JAVA Programming		Course Code: 24ECAC803
L-T-P: 3-0-1	Credits: 4	Contact Hours: 3 hrs/week
ISA Marks: 63	ESA Marks: 37	Total Marks: 100
Teaching Hrs: 40	Practical: 24	Exam Duration: 03 Hrs
Unit I		
1	Java Server Pages JSP Technologies, Understanding the Client-Server Model, Understanding Web server software, Configuring the JSP Server, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page	8 hrs
2	Session Management HTTP as a stateless protocol, Hidden form fields, Cookies, session tracking, Http Session, Exception handling and error pages, Directives.	3 hrs
3	Java Beans Concepts of Java Beans, Developing Java Beans, Controls and Properties of a Bean, Types of Properties.	4 hrs
Unit II		
4	Spring Framework Introduction to spring 3.0, Spring Architecture and configuration, IOC and DI, Spring HelloWorld program, Introduction to MVC Architecture	5 hrs
5	Spring Framework Advanced Spring MVC Architecture, Aspect oriented programming, Data Access using JDBC template, Spring Security and Spring integration	5 hrs
6	Spring Boot Introduction to Spring Boot, Bootstrapping, tomcat Deployment, Building RESTFUL Web Services, Exception Handling, Database Handling, Unit Testing in Spring Boot	7 hrs
Unit – III		
7	RMI RMI Architecture, Designing RMI application, Executing RMI application	4 hrs
8	Maven (Project Management Tool). What is Maven, Ant Vs Maven, Install Maven, Maven Repository (Local, Central, and Remote), Maven pom.xml, Maven web App, Maven plugin.	4 hrs
Text Books 1. Spring Boot 3 and Spring Framework 6, Christian Ullenboom, Rheinwerk Computing 2023 2. Jakarta EE Recipes by Josh Juneau, Apress 2022		
Reference Books: 1. 'Pro Spring 6' by Clarence Ho and Rob Harrop, Apress 2023 2. 'Learning Spring Boot 3.0' – 3rd Edition by Greg L. Turnquist, Packt Publishing 2022		

Integrated Lab Practices

Sl.no	Activities	Lab Slots
1	Program to demonstrate JDBC connection using Statement and Prepared Statement. Note Use Scanner class, Perform CRUD operations	1
2	Program to demonstrate JDBC connection using Prepared Statement with Scrollable result sets and row sets. Note Use Scanner class, Perform CRUD operations	1
3	Program to demonstrate dynamic page rendering using JSP, Servlet and JDBC connection Note: Use maven as build tool	2
4	Program to demonstrate usage of scripting elements, page and taglib directives in JSP	2
5	Program to demonstrate Cookies and HttpSession Session tracking techniques using JSP and Servlets Note: Use maven as build tool	2
6	Program to demonstrate Exception handling in JSP using page attributes and deployment descriptor file	1
7	Write a java bean program to validate username and password using JSP usebean action tag	1
8	Program to demonstrate Spring DI and MVC framework. Note: Use maven as build tool	2
9	Structured Query: - Program to develop a web application using Servlets, JSP, JDBC and Session management technique. Like TODO application or Employee Management System using Maven as build tool - Program to develop a web application using spring MVC framework along with DAO, AOP techniques. Like Student management system, Restaurant management system etc using Maven as build tool	

Evaluation Scheme

Assessment	Marks
ISA- 1	15
ISA- 2	15
Assignment/ Activities	10
Lab practices	23
Total ISA Marks	63
ESA	37
Total	100

End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Mobile Application Development		Course Code: 24ECAP801
L-T-P: 0-0-2	Credits: 2	Contact Hrs: 4 Hrs/week
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hrs: --	Practical : 48	Exam Duration: 3 Hrs
Unit I		
1	Introduction to Dart Getting started with Dart, The evolution of Dart, How Dart works, Hands-on Dart, Dart operators, Dart types and variables, control flow and looping, Functions, Data structures, collections, introduction to OOP in Dart.	6 Hrs
2	Intermediate Dart Programming Dart classes and constructors, Interfaces, abstract classes, and mixins, Understanding Dart libraries and packages.	7 Hrs
3	An Introduction to Flutter Comparisons with other mobile app development frameworks, Flutter compilation (Dart), Flutter rendering, Widgets introduction. Widgets: Building Layouts in Flutter: Stateful versus stateless widgets, Built-in widgets, understanding built-in layout widgets, creating a UI with widgets (favor manager app), Creating custom widgets.	6 Hrs
Unit II		
4	Handling User Input and Gestures Handling user gestures, Input widgets, Validating Input (Forms), Custom input and TextFormField. Theming and Styling: Theme widgets, Material Design, iOS Cupertino, Using custom fonts, Dynamic styling with MediaQuery and LayoutBuilder.	6 Hrs
5	Routing: Navigating between Screens Understanding the Navigator widget, named routes, Screen transitions. Firestore Plugins: Firestore overview, Firestore authentication, NoSQL database with Cloud Firestore.	6 Hrs
6	Platform Views and Map Integration Displaying a map, Adding markers to the map, Adding map interactions, Using the Google Places API	7 Hrs
Unit III		
7	Testing, Debugging, and Deployment Flutter testing – unit and widget testing, Debugging Flutter apps, Profiling Flutter apps, Preparing apps for deployment.	5 Hrs
8	Improving User Experience Accessibility in Flutter and adding translations to apps, Communication between native and Flutter with platform channels, Creating background processes, Adding Android-specific code to run Dart code in the background.	5 Hrs
Text Book:		
1. Flutter for Beginners- An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, September 2019 1 st Edition by Alessandro Biessek,		

Reference Books:

2. Flutter- A Hands On Guide To App Development by Marco L. Napoli
3. Beginning App Development with Flutter: Create Cross-Platform Mobile Apps, 1st Edition, by Rap Payne

Evaluation Scheme

In Semester Assessment (80%)	Assessment	Weightage in Marks
	Exercise (Problem execution, Viva & Observation Book)	60
	Structured Enquiry	20
	Total (ISA)	80
End Semester Assessment (20%)	Exercise	20
	Total	100

List of Experiments

Sl.No	Experiments	Lab Slots
1	Write Dart functions to implement various mathematical operations	1
2	Write dart program to implement control flow statements.	1
3	Create a UI layout using built-in widgets such as Column, Row, Container using both stateless and stateful widgets	1
4	Create custom widgets in Flutter for reusable UI components.	1
5	Create a flutter layout to handle user input and gestures.	2
6	Create a login screen layout using flutter with validations	2
7	Develop a Flutter app with a navigation drawer.	1
8	Create a flutter app and use Firebase authentication.	1
9	Create a flutter app to display and interact with Google Maps.	1
10	Develop a mobile app having features such as Launch screen, Login with validations, home screen with navigation drawer and a screen having Google maps.	1

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Mini Project-2		Course Code: 23ECAP802
L-T-P : 0-0-2	Credits: 2	Contact Hours: 4 hrs/week
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hrs: --	Practical :56(aprox.)	Examination Duration: 3 Hrs

Students can use the following tools in web and mobile applications as well as product developments:

- Struts, Spring, Hibernate and JPA
- Machine Learning & Deep Learning
- JAXB and Apache Axis 2/Java
- JSP, Servlets, JDBC, EJB, JMS, JTA and JUnit
- Apache Tomcat, JBoss and GlassFish
- JavaScript, JSF, GWT and jQuery
- Eclipse, Netbeans and JBoss tools
- TestNG
- jBPM and Drools
- JCR

Objectives:

Help students to utilize and strengthen the knowledge of java which they have learnt in previous semester.

Methodology:

Students are asked to make a team of 3-4 members and can choose the different categories of projects like desktop applications, web applications, mobile application and distributed application and work once it is approved by the coordinator.

1.1 Course Objectives:

The Mini Project being part of the course work is not only a mechanism to demonstrate the abilities and specialization but also provides the opportunity to demonstrate originality, teamwork, inspiration, planning and organization in a software project. One can put into practice the techniques that have been taught throughout the previous courses. Mini-projects develop practical skills in students. The idea is to propose a problem that one might encounter in future career (be it in academia, industry, or government). Then propose a solution and implement it.

E-commerce Objectives:

Most business houses are shifting their operations to the online world. Right from buying apparels to computers to booking tickets and renting out apartments, everything can be done through the Internet now. It is a win-win formula for both the customers and the business houses. Digital India aims to boost E-business and the E-commerce industry with the vision that it would in turn boost the economy as a whole.

Multilingual Objectives:

Language is an essential driver of enterprise growth. The user interface is the key component of any application that needs to support various language speaking audiences. Making an app that appeals to and is available for more users broadens the market and brings more revenue in the app sales and there will be more exposure to the business.

- **Evaluation:** The project assessment is done by an evaluation team as per the schedule.

In-Semester Assessment	Assessment	Marks
	Problem Definition, Literature Review	05
	Synopsis and Software Requirement Specification(SRS)	05
	Design (Block Diagram, Data Flow Diagram [DFD], Entity-Relationship [ER] Diagram, and Use-case Diagrams)	10
	Coding and Implementation	10
	Integration and testing	05
	Project Report	10
	Presentation skills and Viva-voce	05
	Total	50
End-Semester Assessment	Presentation, Demonstration	30
	Modification	10
	Viva-voce	10
	Total	50

[BACK](#)

Elective – 1 and 2

Program: Master of Computer Applications		Semester: III
Course Title: Linux Administration		Course Code: 23ECAE801
L-T-P:3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical: --	Exam Duration: 3 Hours
Unit I		
1	Basic System Configuration Opening Graphical Applications, System Locale and Keyboard Configuration: Setting the System Locale, Changing the Keyboard Layout, Managing Users and Groups; Introduction to Users and Groups, Managing Users in a Graphical Environment..	4 Hrs
2	Package Management, Services and Daemons Yum: Checking For and Updating Packages, Packages and Package Groups, Configuring Yum and Yum Repositories. Configuring Services, Running Services OpenSSH: The SSH Protocol, An Open SSH Configuration, Open SSH Clients	6 Hrs
3	Web & Mail Servers : Web Servers: The Apache HTTP Server Updating the Configuration, Running the httpd Service, Editing the Configuration Files, Working with Modules , Setting Up Virtual Hosts, Setting Up an SSL Server. Mail Servers- Email Protocols, Email Program Classifications, Mail Transport Agents, Mail Delivery Agents, Mail User Agents	6 Hrs
Unit II		
4	File & Directory Servers : FTP Servers : The File Transfer Protocol, FTP Servers, Files Installed with vsftpd, Starting and Stopping vsftpd,vsftpd Configuration Options.Runing FTP Server Samba Server : Introduction to Samba, Samba Daemons and Related Services, Connecting to a Samba Share, Configuring a Samba Server ,Starting and Stopping Samba, Samba Server Types and the smbconf File, Samba Security Modes, Samba Account Information Databases, Samba Network Browsing , Samba with CUPS Printing Support, Samba Distribution Programs Directory Servers -OpenLDAP, Introduction to LDAP, Installing the OpenLDAP Suite , Configuring an OpenLDAP Server , SELinux Policy for	10 Hrs

	Applications Using LDAP, Running an OpenLDAP Server, Configuring a System to Authenticate Using OpenLDAP	
5	Viewing and Managing Log Files - Locating Log Files, Basic Configuration of Rsyslog, Working with Queues in Rsyslog , Using Rsyslog Modules , Interaction of Rsyslog and Journal, Structured Logging with Rsyslog , Debugging Rsyslog, Using the Journal, Managing Log Files in a Graphical Environment.	6 hrs
Unit – III		
6	Working with the GRUB 2 Boot Loader Configuring the GRUB 2 Boot Loader, Customizing GRUB Menu, GRUB 2 Password Protection, Reinstalling GRUB , GRUB 2 over Serial Console, Terminal Menu Editing During Boot, UEFI Secure Boot	4 Hrs
7	Automating System Tasks -Cron and Anacron- Installing Cron and Anacron, Running the Crond Services, Configuring Anacron Jobs, Configuring Cron Jobs, Controlling Access to Cron, Black and White Listing of Cron Jobs At and Batch-Installing At and Batch, Running the At Service, Configuring an At Job, Configuring a Batch Job, Viewing Pending Jobs, Additional Command Line Options, Controlling Access to At and Batch.	4 Hrs
Textbook: 1. Fedora 21 System Administrator's Guide: Deployment, Configuration, and Administration of Fedora 21 by Jaromír Hradílek, Douglas Silas, Martin Prpič, Publisher: Red Hat, Release Date: 2014.		
Referencebooks: 1. Linux System Administration Recipes: A Problem-Solution Approach by Juliet Kemp, Publisher: Apress, Release Date: October 2009. 2. IT Infrastructure Management by Anita Sengar, Publisher: S.K. Kataria & Sons, Release Date: 2010 (Reprint 2020). 3. IT Infrastructure Architecture: Infrastructure Building Blocks and Concepts by Sjaak Laan, Publisher: Lulu Press Inc., Release Date: February 2013.		

Evaluation Scheme:

1. In Semester Assessment (ISA)

Assessment	Marks
ISA-1	25
ISA-2	25
ISA	50

ESA	50
Total	100

2. End Semester Assessment (ESA) Pattern:

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4,5	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6,7	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: DevOps		Course Code: 23ECAE802
L-T-P: 2-0-1	Credits: 3	Contact Hrs: 4 hrs/week
ISA Marks: 66	ESA Marks: 34	Total Marks: 100
Teaching Hrs: 30	Practical : 24	Exam Duration: 2 Hrs
Unit I		
1	Introduction to DevOps and Revision Control System DevOps Principles and Practices, Agile Wheel of Wheels, DevOps and ITIL Alignment, Git Overview, Build Servers, Artifact Repositories, Package Managers, Test Environments, Staging vs. Production, Release Management, Scrum, Kanban, Delivery Pipeline Walkthrough, Identifying Bottlenecks in Software Delivery	4 Hrs
2	Everything is Code Roles and Code Responsibilities, Selecting SCM Tools, Source Code Migration Considerations, Branching Strategies and Pitfalls, Artifact Version Naming Best Practices, Setting Up a Basic Git Server, Shared Authentication, Git Hosting Platforms, Handling Large Binary Files, Exploring Alternative Git Server Implementations	5 Hrs
3	Git Workflows, Gerrit, Docker, and GitLab CI Docker Basics and Usage, Introduction to Gerrit, Installing git-review Package, History Revisionism, Pull Request Models, Peer Reviews, GitLab Overview, CI/CD Pipelines	6 Hrs
Unit II		
4	Building the Code Why we build code, build systems and CI/CD, Jenkins setup and plugin ecosystem, dependency management in Jenkins, Jenkins architecture: host server and build slaves, Jenkins job triggers, pipelines, and job chaining, Jenkins filesystem layout and infrastructure as code, build order and phases.	5 Hrs
5	Testing the Code Manual vs. automated testing, unit testing with JUnit (including examples), mocking and code coverage tools, integration testing strategies, automated testing in Jenkins pipelines.	5 Hrs
6	Deploying the Code OS-Level Configuration for Deployment, Cluster and Environment Setup, Package Delivery and Versioned Releases, Docker Deployment Workflow, Introduction to	5 Hrs

Kubernetes, Pods, Deployments, Services, Containerization Principles, Orchestration Principles

Textbook:

1. Practical DevOps by Joakim Verona Publisher: Packt Publishing, Release Date: February 2018.

Reference books:

1. Effective DevOps: Building a Culture of Collaboration, Affinity and Tooling at Scale by Jennifer Davis and Ryn Daniels, Publisher: O'Reilly Media, Release Date: June 2016.

2. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by Gene Kim, Patrick Debois, John Willis, Jez Humble, and Nicole Forsgren, Publisher: IT Revolution Press, Release Date: November 2021.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	15
ISA- 2	15
ISA- Lab	36
ISA	66
ESA	34
Total	100

2. End Semester Assessment (ESA)

UNIT	6 Questions to be set of 15 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 15 Marks Each	1, 2, 3	Any 2 full questions are to be answered
II	3 Questions to be set of 15 Marks Each	4,5,6	Any 2 questions are to be answered

Lab Activities

Sl.no	Practices	Lab slots
1	Git Basics & Version Control Setup Initialize a Git repository, create branches, push/pull changes from GitHub, and simulate version history.	1
2	Agile & Scrum Simulation Use a Kanban board (Trello/Jira) to create and manage a mini sprint backlog and simulate task progress.	1
3	Build Server & Artifact Management Set up a mock build server (using scripts or Jenkins) and simulate artifact generation/storage in a local repo (like Nexus/Artifactory).	1
4	Source Code Management & Git Server Setup Install and configure a local Git server (e.g., Gitea), create users with shared authentication, and clone repositories.	1
5	Branching Strategy & Merge Conflicts Practice Git branching (feature/release/hotfix) and resolve simulated merge conflicts between branches.	1
6	Code Review using Gerrit Install Gerrit, configure `git-review`, and conduct a sample peer code review process.	1
7	Docker Image Build & Containerization Write a simple Dockerfile, build a custom Docker image, and run a containerized app (e.g., a simple Node.js or Python app).	1
8	CI/CD Pipeline with GitLab CI Create a `.gitlab-ci.yml` file to automate testing and deployment stages on GitLab.	1
9	Jenkins CI Job Configuration Install Jenkins, configure a freestyle or pipeline job, manage build triggers, and integrate Git repository.	2
10	Automated Testing & Kubernetes Deployment Write and run unit tests using JUnit, configure Jenkins to trigger tests, then deploy a Dockerized app to a Kubernetes cluster using `kubectl`.	2

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: User Interface Design		Course Code: 23ECAE803
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:3 Hrs
Unit I		
1	What Users Do The Basics of User Research ,Users’ Motivation to Learn, The Patterns.	5 Hrs
2	Organizing the Content: Information Architecture and Application Structure The Big Picture, The Patterns:- Feature, Search, and Browse, News Stream, Picture Manager, Dashboard, Canvas Plus Palette, Wizard.	5 Hrs
3	Getting Around: Navigation, Signposts, and Wayfinding Staying Found, The Cost of Navigation, Navigational Models, Design Conventions for Websites, The Patterns:- Clear Entry Points, Menu Page, Pyramid, Modal Panel, Deep-linked State, Escape Hatch, Fat Menus, Sitemap Footer, Sign-in Tools, Sequence Map, Breadcrumbs, Annotated Scrollbar, Animated Transition.	6 Hrs
Unit II		
4	Organizing the Page: Layout of Page Elements The Basics of Page Layout, The Patterns:- Visual Framework, Center Stage, Grid of Equals, Titled Sections, Module Tabs, Collapsible Panels, Movable Panels, Right/Left Alignment, Diagonal Balance.	5 Hrs
5	Lists of Things Use Cases for Lists, Back to Information Architecture, The Patterns:- Two-Panel Selector, One-Window Drilldown, List Inlay, Thumbnail Grid, Row Striping, Jump to Item, Cascading Lists, Tree Table.	5 Hrs
6	Doing Things: Actions and Commands Pushing the Boundaries, The Patterns:- Button Groups, Hover Tools, Action Panel, Smart Menu Items, Preview, Progress Indicator, Macros.	6 Hrs
Unit – III		
7	Showing Complex Data: Trees, Charts, and Other Information Graphics The Basics of Information Graphics, The Patterns:- Overview Plus Detail, Datatips, Data Spotlight, Dynamic Queries, Data Brushing, Local Zooming, Sortable Table, Radial Table, Multi-Y Graph, Small Multiples, Treemap.	4 Hrs
8	Getting Input from Users: Forms and Controls The Basics of Form Design, Control Choice, The Patterns:- Forgiving Format, Structured Format, Fill-in-the-Blanks, Input Hints, Input Prompt, Password Strength Meter, Autocompletion, Dropdown Chooser, Same-Page Error Messages.	4 Hrs



Text Book:

1. Jenifer Tidwell, Designing Interfaces, 2nd Edition, O'Reilly ,2010

Reference books:

1. Laws of UX, Jon Yablonski, O'Reilly, April 2020.
2. 100 Things Every Designer Needs to Know About People, Susan Weinschenk, New Riders, 2011.
3. Jodie Moule., Killer UX Design, SitePoint,2012

Evaluation scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA-1	25
ISA-2	25
ISA	50
ESA	50
Total	100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2,3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4, 5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Cyber Security		Course Code: 23ECAE804
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical : --	Exam Duration: 3 Hrs
Unit I		
1	Introduction to Cybercrime, Cyber offences & Cybercrime Cybercrime definition and origins of the word, Cybercrime and information security, Classifications of cybercrime, A global Perspective on cybercrimes. Cyber-attack plans, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets, Proliferation of Mobile and Wireless Devices, Credit Card Frauds in Mobile and Wireless Computing Era. Security challenges posed by mobile devices.	6 Hrs
2	Tools and Methods used in Cybercrime, Phishing and identity theft Proxy servers, Phishing, Password cracking, key loggers and spyware, Virus and worms, Trojan horses and backdoors, steganography, DoS and DDoS, SQL Injection, Buffer Overflow, Attack on wireless Networks, Phishing and Identity theft.	6 Hrs
Unit II		
3	Cybercrimes and Cybersecurity: The Legal Perspectives, Organizational implications. Cybercrime and the legal landscape around world, Why do we need Cyberlaw: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cost of cybercrime and IPR issues, Web threats for organization, cloud computing threats; security and privacy implications, social computing issues; Guidelines for internet usage and safe computing; incident handling	7 Hrs
4	Understanding computer Forensics, Forensics of Hand-held devices Historical background of forensics; Digital forensics science; need for computer forensics; cyber forensics and digital evidence; Analysis E-mail; Digital forensics life cycle; chain of custody concepts; network forensics; Forensics and social networking; challenges in computer forensics; Hand-held devices and digital forensics; Toolkits for Hand-held device forensics; Techno-legal challenges form hand-held devices; Guidelines8	7 Hrs
5	Doing Things: Actions and Commands Pushing the Boundaries, The Patterns:- Button Groups, Hover Tools, Action Panel, Smart Menu Items, Preview, Progress Indicator, Macros.	6 Hrs
Unit – III		

6	Social, Political, Ethical and Psychological Dimensions Intellectual property in the cyberspace; Ethical dimension of cybercrimes; Psychology, mindset and skills of hackers and other cyber criminals; Sociology of cybercriminals.	4 Hrs
7	Cybercrime: Illustrations, Examples and Case studies Introduction, Real-Life Examples, Case Studies: Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios, Digital forensics case illustrations Online Scams.	4 Hrs

Text Book:

1. Nina Godbole & Sunit Belapur, "Cyber Security", Wiley India, 2011 and Reprint 2018.

Reference books:

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.

Evaluation Scheme

1 . In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	3,4,5	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6,7	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Information Security		Course Code: 23ECAE805
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:3 Hrs
Unit I		
1. Cryptography Basics	Introduction, Classic Crypto: Modern Crypto, Taxonomy of Cryptography & Cryptanalysis.	04 Hrs
2. Symmetric Key Crypto	Introduction, Stream Ciphers, Block Ciphers, Block cipher modes	06 Hrs
3. Public Key Crypto and Hash Functions	Introduction, Knapsack, RSA, Diffie-Hellman, Elliptic Curve Cryptography, Public Key Notation, Uses for Public Key Crypto, Public Key Infrastructure Hash Functions: Introduction, The Birthday Problem, Non-Cryptographic Hashes, Tiger Hash, HMAC	06 Hrs
Unit II		
4 Authentication and Authorization	Introduction, Authentication Methods: Passwords, Biometrics, Two-Factor Authentication, Single Sign-On, Protocols. Introduction to authorization, Access Control Matrix, Multilevel Security Models, Multilateral Security, Firewalls, Intrusion Detection.	06 Hrs
5 Authorization and Authentication Protocols	Authorization: Multilateral Security, Firewalls, Intrusion Detection, Simple Authentication Protocols: Introduction, Simple Security Protocols, Authentication Protocols	06 Hrs
6 Security Protocols	Real World Security Protocols: Introduction, Secure Socket Layer and TLS, Kerberos, Pretty Good Privacy and S/MIME.	06 Hrs
Unit – III		
7 Software Flaws and Malware	Introduction, Software Flaws, Malware, Miscellaneous Software Based Attacks, software tamper resistance, Digital Rights Management.	03 Hrs
8 Cyber Crimes and Laws		03 Hrs

Introduction, Computer Forensics, Online Investigative tool, tracing and recovering electronic evidence, Internet fraud, Identity Theft, Industrial Espionage, Cyber Terrorism. Indian IT laws: Introduction and briefs of Law clauses.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", 6th Edition, 2018
2. Mark Stamp, "Information Security: Principles and Practices", 2nd Edition, John Wiley and Sons, 2011.

Reference books:

1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security", 2nd Edition, Thompson, 2005.
2. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007.

Evaluation Scheme

1 . In Semester Assessment (ISA)

Assessment	Marks
ISA1	15
ISA2	15
Activity	20
ESA	50
Total	100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2,3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4,5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: C# Programming with .Net		Course Code: 23ECAE806
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:3 Hrs
Unit I		
1.	The Philosophy of .NET Understanding the Previous State of Affairs, The .NET Solution, Introducing the Building Blocks of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Assemblies, The Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifest, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime, The Assembly/Namespace/Type Distinction, Using ildasm.exe, Deploying the .NET Runtime, The Platform independent nature of .NET, Installing the .NET Framework, C# Command-Line Compiler, Building C# Applications using csc.exe, Working with csc.exe Response Files.	08 Hrs
2.	C# Language Fundamentals. The Anatomy of a Simple C# Class, An Interesting Aside : The System.Environment Class, Defining Classes and Creating objects, The System.Console Class, Establishing Member Visibility, Default Values of Class Member Variables, Member Variable Initialization Syntax, Defining Constant Data, Defining Read-only fields, Understanding the static keyword, Method Parameter Modifiers, Iteration Constructs, Decision Constructs and the Relational/Equality Operators, Understanding Value Types and Reference Types, Understanding Boxing and Unboxing Operations, Working with .NET Enumerations, The Master Class: System.Object, Overriding some default behaviours of System.Object, The System Data types(and C# Shorthand notation), The System.String data types, The role of System.Text.StringBuilder, .NET Array Types, Understanding C# Nullable Types, Defining Custom Namespaces	04 Hrs
3.	Object-Oriented Programming with C# Understanding the C# Class Type, Reviewing the Pillars of OOP, The First Pillar: C#'s Encapsulation Services, The Second Pillar: C#'s Inheritance Support, Programming for Containment/Delegation, The Third Pillar: C #'s Polymorphic Support, C# Casting rules, Understanding C# Partial types, Documenting C# Source Code via XML	04 Hrs

Unit II		
4.	Object Lifetime and Exceptions Handling. Classes, Objects and References, the basics of Object Lifetime, The role of Application Roots, Understanding Object Generations, System.GC type, Building Finalizable Objects, Building Disposable Objects, Building Finalizable and Disposable types. Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handling, The Simplest possible example, Configuring the state of an exception, System – Level Exception (System. System Exception), Application-Level Exception (System.ApplicationException), Processing Multiple Exception, The Finally Block, The result of unhandled exceptions, Debugging Unhandled exceptions using VS. NET.	8 Hrs
5.	Interfaces and Collections Defining Interfaces in C#, Implementing an Interface in C#, Contrasting Interfaces to Abstract Base Classes, Invoking Interface Members at the Object Level, Interfaces As Parameters, Interfaces As Return Values, Arrays of Interfaces Types, Understanding Explicit Interface Implementation, Building Interface Hierarchies, Implementing Interfaces Using Visual Studio 2005, Building Enumerable Types(IEnumerable and IEnumerator), Building Cloneable Objects(ICloneable), Building Comparable Objects(Comparable), The Interfaces of the System.Collections Namespace, The Class Types of System.Collections.	4 Hrs
6.	Callback Interfaces, Delegates, and Events, Advanced C# Techniques Understanding Callback Interfaces, Understanding the .NET Delegate type, Defining a Delegate in C#, The System.MulticastDelegate and System.Delegate Base Classes, Investigating a Delegate Object, Delegates as Parameters, Understanding C# Events Building a Custom Indexer, Internal Representations of Type Indexers: Final Details, Understanding Operator Overloading Binary Operators, Unary Operators, Equality Operators, Comparison Operators, Understanding Custom Type Conversions, The Advanced Key words of C#, C# Preprocessor Directives.	4 Hrs
Unit – III		
7.	Records Background, Defining a Record, Nondestructive Mutation, Property Validation, Calculated Fields and Lazy Evaluation, Primary Constructors, Records and Equality Comparison	04 Hrs
8.	Programming with Windows Forms and Database Access with MS SQL Server Controls, Building Custom Windows Forms Controls, Defining Custom Events, Defining Custom Properties, Overview of Data Access, Creating database connections, connecting to MSSQL Server, Dataset and Data table features, using	04 Hrs

inline SQL Statements, using stored procedures , Executing select commands, SQL transaction

Text Book:

1. Pro C# 9 with .NET 5, Foundational Principles and Practices in Programming, Apress, Troelsen, Andrew, Japikse, Philip, 10 edition .
2. C# 9.0 in a Nutshell by Joseph Albahari, O'Reilly Media Inc 2021

Reference Books:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc. Wiley-Dream Tech Press
2. Tom Archer: Inside C#, WP Publishers, 2001.
3. Herbert Schildt: The Complete Reference C#, Tata McGraw Hill, 2004

Evaluation Scheme

1 . In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2, 3	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	4,5,6	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	7,8	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Statistical Foundation for Data Science		Course Code: 23ECAE807
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:3 Hrs
Unit I		
1	Statistical Analytics and Basics in Probability Knowledge discovery: finding structure in data, Data quality versus data quantity, Statistical modelling versus statistical description. Concepts in Probability, Bayes Theorem, Random Variables, Means, variances, and expected values; Standard Distributions- Binomial, Poisson, Geometric, Uniform, Exponential and Normal (Gaussian) distribution.	08 hrs
2	Data manipulation Data types, Data summarization, Means, medians, and central tendency, summarizing variation, summarizing (bivariate) correlation, Data diagnostics and data transformation, Outlier analysis, Entropy, Data transformation Simple smoothing techniques, Binning, Moving averages, Exponential smoothing. Introduction to SPSS (IBM's) statistical tool.	07 hrs
Unit II		
3	Data visualization and statistical graphics Univariate visualization, Strip charts and dot plots, Boxplots, Stem-and-leaf plots, Histograms and density estimators, Quantile plots, Bivariate and multivariate visualization, Pie charts and bar charts, Multiple boxplots and QQ plots, Scatterplots and bubble plots, Heatmaps, Time series plots. Visualization in SPSS tool.	08 hrs
4	Techniques for supervised learning What is "supervised learning?", Simple linear regression The simple linear model, Multiple inferences and simultaneous confidence bands, Regression diagnostics, Weighted least squares (WLS) regression Correlation analysis, The correlation coefficient and Rank correlation.	07 hrs
Unit – III		
5	Techniques for unsupervised learning and Case study Unsupervised versus supervised learning, Principal component analysis, Principal components, implementing a PCA, Exploratory factor analysis the factor analytic model, Principal factor estimation, Maximum likelihood estimation, Selecting the number of factors, Factor rotation, Implementing an EFA, Canonical correlation analysis. Case study on Data Analytics on Real world datasets	10 hrs

Text Books:

1. Piegorsch, Walter W. Statistical data analytics: foundations for data mining, informatics, and knowledge discovery. John Wiley & Sons, 2015.
2. Hinton, Perry R., Isabella McMurray, and Charlotte Brownlow. SPSS explained. Routledge, 2023.

Reference Books:

1. Wu, James, and Stephen Coggeshall. Foundations of predictive analytics. Chapman and Hall/CRC, 2012.
2. Marcoulides, George A., and Scott L. Hershberger. Multivariate statistical methods: A first course. Psychology Press, 2014.
3. Morgan, George A., et al. IBM SPSS for introductory statistics: Use and interpretation. Routledge, 2016

Evaluation Scheme
1. In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	50
Total	100

2. End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 20 Marks Each	1, 2	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	3,4	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	5	Any 1 question is to be answered

[BACK](#)

Program: Master of Computer Applications		Semester: III
Course Title: Full Stack Development with MERN		Course Code: 23ECAE808
L-T-P: 2-0-1	Credits: 3	Contact Hrs: 4 hrs/week
ISA Marks: 66	ESA Marks: 34	Total Marks: 100
Teaching Hrs: 30	Practical :24	Exam Duration: 2 Hrs
Unit I		
1	JavaScript & TypeScript Fundamentals JavaScript Essentials (ES6+ Features): Variables (let, const), Functions, Template Literals, Destructuring, Spread & Rest Operators, Promises & Async/Await ; Advanced JavaScript : Closures, Hoisting, Scope, Event Loop, Modules & Import/Export in ES6;	5 Hrs
2	Introduction to MERN ,React.js Development & State Management Overview of MERN (MongoDB, Express.js, React.js, Node.js),Client-Server Architecture,Creating a Basic "Hello World" App in MERN,Introduction to React.js & JSX, Components (Functional vs Class), Props & State ,Handling Events & Forms in React , React Router (Private & Public Routes) , State Management: Context API & Redux Toolkit	6 Hrs
3	Backend Development with Node.js & Express.js Building a REST API with Express.js, Middleware in Express.js (Logging, Authentication, Error Handling), Rate Limiting & Security Headers (Helmet.js, CORS, Express Rate Limit), Authentication with JWT (Login, Register, Logout, Role-Based Access)	5 Hrs
Unit II		
4	MongoDB & Database Management Introduction to NoSQL Databases (MongoDB vs. SQL) ,CRUD Operations in MongoDB using Mongoose, Schema Design & Relationships, Query Optimization (Indexing, Aggregation Pipeline)	6 Hrs
5	API Integration & File Handling API Calls using Fetch & Axios , CRUD Operations in React (GET, POST, PUT, DELETE) , Handling File Uploads using Multer for Express.js , REST API vs. GraphQL	4 Hrs
6	Advanced Authentication & Real-Time Communication OAuth Authentication (Google, GitHub Login), WebSockets & Real-Time Communication (Socket.io - Live Chat, Notifications), Preventing Security Threats (XSS, CSRF, CORS, SQL Injection, OWASP Basics)	4 Hrs

Text Book:

1. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node by Vasan Subramanian, Publisher: Apress, Release Date: May 2019.

Reference Books:

1. MEAN Web Development by Amos Q. Haviv, Publisher: Packt Publishing, Release Date: September 2014.
2. Full Stack JavaScript Development with MEAN by Adam Bretz and Colin J. Ihrig, Publisher: SitePoint, Release Date: 2015.
3. JavaScript: The Good Parts by Douglas Crockford, Publisher: O'Reilly Media, Release Date: May 2008.
4. TypeScript in 50 Lessons by Stefan Baumgartner, Publisher: Smashing Magazine, Release Date: 2020.

Evaluation Scheme
1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	15
ISA- 2	15
ISA- Lab	36
ISA	66
ESA	34
Total	100

2. End Semester Assessment (ESA)

UNIT	6 Questions to be set of 15 Marks Each	Chapter Nos.	Instructions
I	3 Questions to be set of 15 Marks Each	1, 2, 3	Any 2 full questions are to be answered
II	3 Questions to be set of 15 Marks Each	4, 5, 6	Any 2 questions are to be answered

Lab Activities

Sl.no	Practices	Lab slots
1	JavaScript & TypeScript Practice Develop small programs using ES6+ features and demonstrate closures, callbacks, promises and async/await.	1
2	React Component Design Build a React-based user profile card that uses props and state to display and toggle user information.	1
3	Form Handling & Routing in React Create a multi-step form in React with validation and navigation using React Router.	1
4	Global State Management Implement a theme toggler app using Context API and manage user authentication state using Redux Toolkit.	1
5	RESTful API with Express.js Design a basic CRUD API for product management using Express.js, including middleware for logging and error handling.	1
6	JWT Authentication Create a secure login system using JWT for user authentication and protect backend routes.	1
7	MongoDB CRUD with Mongoose Build a backend to manage student records with MongoDB and Mongoose including schema validation.	2
8	Review Submission with File Upload Develop a feedback form in React and use Multer in Express.js to handle file/image uploads to the server.	1
9	GraphQL API Development Create a GraphQL server with schema for books and implement basic queries and mutations. Fetch data in React using Apollo Client.	1
10	Real-Time Chat App Implement a live chat feature using Socket.io in Node.js and React, enabling real-time user interaction.	2

[BACK](#)



Semester-IV

Program: Master of Computer Applications		Semester: IV
Course Title: Capstone Project Work		Course Code: 23ECAP803
L-T-P: 0-0-17	Credits: 17	Contact Hrs: 34
ISA Marks: 100	ESA Marks: 100+50	Total Marks: 250
Teaching Hrs: Full Time	Practical:--	Exam Duration:3 Hrs
A student must carry out a project on any domain using cutting edge technologies and demonstrates the same at the end of the semester.		

Internal Semester Assessment(50%)	Assessment	Weightage in marks
	Periodic reviews by Project Guide	25
	Periodic reviews by committee	25
End Semester Assessment(50%)	Final Review	50
	Total	100

[BACK](#)

Elective 3 (MOOC)

Program: Masters of Computer Applications		Semester - IV
Course Title: Deep Learning		Course Code: 23ECAE809
L-T-P: 2-0-1	Credits: 3	Contact Hours: 4 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs : 30	Practical: 24	Exam Duration: --
Unit –I		
1	Deep Learning Intuition Introduction to deep learning, Neural Network Basics, Multilayer Perceptron, Gradient-Based Learning, Hidden Units, Back-Propagation and Other Differentiation Algorithms, Batch Normalization in Neural Networks.	5 hrs
2	Training and Improving Deep Neural Networks Building Deep Neural Networks: Step-by-Step, Deep Neural Network Applications, Initialization Techniques, Regularization Techniques, Optimization Algorithms, Gradient Checking, Hyper parameter Tuning, Practical Aspects of Deep Learning, Deep Learning Programming Frameworks	7 hrs
Unit –II		
3	Convolutional Neural Networks Foundations of CNNs- A Guide to Convolution for Deep Learning, The Basics of ConvNets, Deep Convolutional Models, Advanced CNN Architectures- Residual Networks (ResNet), Dense Net: Densely Connected Convolutional Networks, Dropout: A Simple Way to Prevent Neural Networks from Over fitting CNN Implementation-Convolutional Model: Applications, Keras Tutorial for CNN	7 hrs
4	Interpretability and Applications of Neural Networks- Visualizing Understanding Neural Networks, Visualizing and Understanding Convolutional Networks, Deep Inside Convolutional Networks: Visualizing Image Classification Models, Understanding Neural Networks Through Deep Visualization.	6 hrs
Unit –III		
5	Recurrent Neural Networks and LSTM Introduction to Recurrent Neural Networks- What are Recurrent Neural Networks, Building a Recurrent Neural Network – Step by Step, Core RNN Architectures, Long Short-Term Memory (LSTM) Networks, Character-Level Language Modelling.	5 hrs

Text Book:

1. Deep Learning with Python, Ian Goodfellow, Yoshua Bengio and Aaron Courville, 2016.

Reference Books:

1. Deep Learning Foundation and Concepts, Christopher M Bishop, 2016.

Evaluation Scheme
1. In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---

Lab Activities

Sl. NO	TOPICS	ACTIVITY	Lab slots
1	Deep Learning Intuition	Building and Implementation of basic neural networks	2
2	Improving Deep Neural Networks	- Apply Initialization, Regularization - Use Optimizers like SGD and Adam - Hyperparameter Tuning - Implement Batch Normalization	2
3	Convolutional Neural Networks	- Build a CNN Model - Experiment with Dropout - Visualize CNN Filters and Feature Maps - Implement ResNet Model	2
4	Interpretability & CNN Applications	- Neural Style Transfer using VGG16 Model - Car Detection using YOLO	3
5	Recurrent Neural Networks: Deep Reinforcement Learning	- Build a Character-Level RNN for text generation - LSTM for Text Generation - Word Embedding Operations & Debiasing	3

[BACK](#)

Program: Master of Computer Applications		Semester - IV
Course Title: Blockchain Technologies		Course Code: 23ECAE810
L-T-P: 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs : 40	Practical : --	Exam Duration: --
Unit I		
1	Introduction What blockchain is, What blockchain isn't, Blockchain definitions, How are blockchains different from databases? History of blockchain, Blockchain 2.0, The motivations behind blockchain, Characteristics of blockchain, Background of DLT, The different types of blockchain, Overview of blocks, Influence of Moore's law on blockchain technology.	5 hrs
2	A Bit of Cryptography Cryptography in blockchain, Classical cryptography, Cryptographic primitives, Symmetric key cryptography, Asymmetric key cryptography, Elliptic-curve cryptography, Digital signatures, Cryptographic hashing.	5 hrs
3	Cryptography in Blockchain Hashing in blockchain, Linking blocks in a blockchain, Linking blocks using an SHA256 hashing algorithm, Block structure, Blockchain functionality, Creating a blockchain, Byzantine failure problem in blockchain, Digital signatures in blockchain, Creating an identity, Signatures in transaction, Asset ownership in blockchain, Transferring an asset, Transmitting the transaction, Claiming the asset, Blockchain wallets.	6 hrs
Unit II		
4	Networking in Blockchain Peer-to-peer (P2P) networking, Network discovery, Block synchronization, Building a simple blockchain in a P2P network, Validating a new block, Selecting the longest chain, Conflict resolution, Block exchange between peers, Initial block synchronization, Broadcasting scenarios, Application interfaces.	6 hrs
5	Cryptocurrency Bitcoin basics, Getting started with Bitcoin Core, Keys and addresses, Transactions, Mining and consensus, Blockchain, Blockchain networks, Bitcoin hard forks and altcoins, A simple cryptocurrency application: Transactions, Wallet, Transaction management.	5 hrs
6	Diving into Blockchain - Proof of Existence	5 hrs

	MultiChain blockchain platform, Setting up a blockchain environment, Getting started with MultiChain, Proof of Existence architecture, Building the Proof of Existence application, Executing and deploying the application.	
Unit – III		
7	Diving into Blockchain - Proof of Ownership Digital assets and identity, Proof of ownership, Smart contracts, Choosing the smart contract platform, NEO blockchain: Building blocks of a NEO blockchain, NEO technology, NEO nodes, NEO network, NEO transactions, Ethereum blockchain: Ethereum nodes, Getting started, Creating a decentralized application.	4 hrs
8	Blockchain Security. Transaction security model, Decentralized security model, Attacks on the blockchain, Threats of quantum computing.	4 hrs
Text Book: 1. Foundations of Blockchain, O'REILLY publications, 2019.		
References Books: 1. Master in Blockchain, 4 th edition, Packt publishing, 2023.		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---

[BACK](#)

Program: Master of Computer Applications		Semester: IV
Course Title: Big Data Analysis with PySpark		Course Code: 23ECAE811
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 100	ESA Marks:--	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:--
Unit I		
1	Getting Started – Introduction Introduction to Apache Spark, Installing softwares, Scala Basics, Flow Control in Scala, Functions in Scala, Data Structures in Scala	4 Hrs
2	Using Resilient Distributed Datasets (RDDs) The Resilient Distributed Dataset, Ratings Histogram Example, Preview, Key / Value RDD's, and the Average Friends by Age example, Running the Average Friends by Age Example, Filtering RDD's, and the Minimum Temperature by Location Example, Running the Minimum Temperature Example, and Modifying it for Maximum, Counting Word Occurrences using Flatmap(), Improving the Word Count Script with Regular Expressions, Sorting Word Count Results – Find the Total Amount Spent by Customer	7 Hrs
3	SparkSQL, Datasets and Dataframes Introduction to SparkSQL, Using SparkSQL, Using DataSets, Implement the "Friends by Age" example using DataSets, Exercise Solution: Friends by Age, with Datasets, Word Count example, using Datasets, Revisiting the Minimum Temperature example, with Datasets, Implement the "Total Spent by Customer" problem with Datasets	5 Hrs
Unit II		
4	Spark Programs Examples Find the Most Popular Movie, Use Broadcast Variables to Display Movie Names, Find the Most Popular Superhero in a Social Graph, Find the Most Obscure Superheroes, Solution: Find the Most Obscure Superheroes, Superhero Degrees of Separation: Introducing Breadth-First Search, Superhero Degrees of Separation: Accumulators, and Implementing BFS in Spark, Superhero Degrees of Separation: Review the code, and run it. Item-Based Collaborative Filtering in Spark, cache(), and persist()	5 Hrs
5	Running Spark on a Cluster Using spark-submit to run Spark driver scripts, Packaging driver scripts with SBT, Package a Script with SBT and Run it Locally with spark-submit, Introducing Amazon Elastic MapReduce, Partitioning, Best Practices for Running on a Cluster, Troubleshooting, and Managing Dependencies	5 Hrs
6	Machine Learning with Spark ML Introducing MLLib, Using MLLib to Produce Movie Recommendations, Linear Regression with MLLib, Predict Real Estate Values with Decision Trees in Spark	6 Hrs
Unit – III		



7	Introduction to Spark Streaming The DStream API for Spark Streaming, Real-time Monitoring of the Most Popular Hashtags on Twitter, Structured Streaming, Using Structured Streaming for real-time log analysis, Windowed Operations with Structured Streaming	4 Hrs
8	Introduction to GraphX GraphX, Pregel, Breadth-First-Search with Pregel, Using the Pregel API with Spark GraphX, Superhero Degrees of Separation using GraphX	4 Hrs

Text Book:

Reference books:

1. Spark: The Definitive Guide: Big Data Processing Made Simple 1st Edition, Publisher: **O'Reilly Media ;8 February2018.**
2. Apache Spark in 24 Hours, Sams Teach Yourself, Publisher : **Sams Publishing; 1st edition)7 November2016(**
3. Beginning Apache Spark 2: With Resilient Distributed Datasets, Spark SQL, Structured Streaming and Spark Machine Learning library, Publisher : **Apress; 1st ed .edition)16 August 2018(**
4. <https://www.coursera.org/learn/scala-spark-big-data>
5. <https://www.udemy.com/course/apache-spark-with-scala-hands-on-with-big-data/>

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---
Total	100

[BACK](#)

Program : Master of Computer Applications		Semester - IV
Course Title: Software Practices and Testing		Course Code: 23ECAE812
L-T-P: 2-0-1	Credits: 3	Contact Hours: 4 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 30	Practical : 24	Exam Duration: --
Unit I		
1	Software Testing Fundamentals Testing and need of testing, Objectives of software Testing, Software Testing Types, STLC (Software Testing Life Cycle), Quality assurance.	4 hrs
2	Levels of testing Unit Testing, Integration Testing, Functional Testing, System Testing Types, Test environment.	5 hrs
3	Test Case Development Test Documentation, Test Scenario, Write Test Cases, Test Analysis, Requirements Traceability Matrix, Test Data Generation.	5 hrs
Unit II		
4	Selenium Introduction to Selenium, selenium Components & Brief Introduction to each component, Selenium Web Driver, Synchronization in Web Driver, Handling Alerts & Windows, configuring other Browsers, Data Driven Testing	8 hrs
5	TestNG Overview of TestNG, Annotation of TestNG, Creating Test Suite, Execution of Test Suite, creating groups, Execution of test case with groups, Creating TestNG.xml file, Parallel of Test Cases, understanding of test results, Running only failed test cases	8 hrs
Text Books: 1. Software Testing –A Craftsman’s Approach 4 th Edition – Paul C Jorgensen 2. Software Testing – A Self Teaching Introduction – Rajeev Chopra PHD 3. Test Automation using Selenium WebDriver with Java-Navneesh Garg		
Reference Books: 1. Software Testing and quality Assurance ,Theory and Practice – Kshirasagar Naik and Priyadarshini Tripathy		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---

Lab Activities

Sl.No	Demonstration	Lab Slots
1	Writing test plan	1
2	Writing test cases	1
3	Execution of test cases	2
	Exercises	
4	Write the test plan and test cases for the below scenarios Flipkart Ecommerce Site. • Test Scenario: Check Login Functionality. • Test Scenario: Check the Search Functionality • Test Scenario: Check the Product Description Page • Test Scenario: Check the Order History	2
5	Banking Site • Test Scenario: Check the Login and Authentication Functionality • Test Scenario: Check Money Transfer can be done • Test Scenario: Check Account Statement can be viewed • Test Scenario: Check Fixed Deposit/Recurring Deposit can be created.	2
6	Food delivery app • User registration • Ordering food • Delivery tracking • Payment processing • User Feedback	2
7	Using Selenium and TestNG execute test cases for the above scenarios	2
	More exercise on Selenium and TestNG	
1	Design and execute a selenium-based automation solution to display web page using browser.	2

2	Create a selenium automation testing to verify the login functionality of a web page with valid credentials and redirect to the expected landing page.	
3	Implement a selenium automation testing for search functionality of any web application.	2
4	Design and implement a selenium automation testing to verify the webpage title, ensuring that they match predefined expected title and actual title across different web pages	2
5	Develop a TestNG test suite to validate the functionality and sequencing of TestNG annotations.	2
6	Create a TestNG test suite to verify the login functionality of a web application, validating different sets of login credentials including correct and incorrect.	2
7	Implement a TestNG test class to navigate through different webpages of a website, validating page transitions and displaying the name of visited current page for verification.	2

[BACK](#)

Program: Master of Computer Applications		Semester: IV
Course Title: Virtual Reality Systems		Course Code: 23ECAE813
L-T-P: 3-0-0	Credits: 3	Contact Hours: 3 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:--
Unit I		
1	Introduction to Virtual Reality Definition and scope of VR, Modern VR experiences, Historical evolution of VR technologies.	4 hrs
2	Bird's Eye View Overview of hardware, sensors, displays, Software components, Virtual world generators, Game engines, Human senses and perceptual psychology	4 hrs
3	A generic VR System Introduction, The virtual environment, The computer Environment, VR technology, Modes of Interaction, VR systems.	4 hrs
Unit II		
4	Geometry in Virtual Worlds Geometric modelling technique, Coordinate transformations and axis-angle representations, Viewing transformations and their applications Light and Optics Light propagation, Lenses and optical systems, Visual displays.	8 hrs
5	The Physiology of Human Vision Eye anatomy, Photoreceptors, Eye movements, Neural vision structures. Visual Perception, Depth and motion perception, Color perception, Multisensory integration.	8 hrs
Unit – III		
6	Rendering and Motion Visual Rendering, Graphical rendering techniques, Ray tracing, Shading, Rasterization VR-specific rendering challenges. Motion in Real and Virtual Worlds, Velocities and acceleration, Vestibular system, Virtual world physics, Simulation and collision detection	6 hrs
7	Tracking and Interaction Tracking, Tracking systems, IMU integration, Sensor fusion, Eye tracking, SLAM (Simultaneous Localization and Mapping), Interaction, Locomotion, Manipulation, Social interaction, Specialized interaction mechanisms	6 hrs



Text Books:

1. VIRTUAL REALITY, By Steven M. LaValle. Cambridge University Press, 2023.
2. John Vince, Virtual Reality Systems, Pearson, 2002
3. William R. Sherman, Alan B. Craig, Understanding Virtual Reality, Interface, Application and Design, MORGAN KAUFMANN PUBLISHERS, 2003

Reference Books:

1. Virtual Reality Technology by Grigore C. Burdea and Philippe Coiffet, Wiley, 2017
2. Designing Virtual Reality Systems: The Structured Approach by Gerard Jounghyun Kim, Springer (2005)

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	50
ESA	--
Total	100

[BACK](#)

Program: Master of Computer Applications		Semester - IV
Course Title: Internet of Things		Course Code: 23ECAE814
L-T-P: 3-0-0	Credits: 3	Contact Hours: 4 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 40	Practical:--	Exam Duration: --
Unit I		
1	Basics of Networking Introduction, Network Types, layered network models, Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components.	8 Hrs
2	IoT Sensing and Actuation Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	8 Hrs
Unit II		
3	IoT Processing Topologies and Types Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.	8 Hrs
4	IoT Connectivity Technologies Introduction , IEEE 802.15.4 ,Zigbee , Thread , ISA100.11A , WirelessHART ,RFID ,NFC ,DASH7, Z-Wave , Weightless ,Sigfox,LoRa ,NB-IoT ,Wi-Fi , Bluetooth	8 Hrs
Unit – III		
5	ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.	4 Hrs
6	Case Studies Illustrating IoT Design IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies. Home Automation- smart lighting, home intrusion detection, Cities-smart parking.	4 Hrs
Text Books 1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, Introduction to IoT, Cambridge University Press 2021.		
Reference Books: 1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press		

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---

[BACK](#)

Program: Master of Computer Applications		Semester: IV
Course Title: Wireless Mobile Computing		Course Code: 23ECAE815
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:--
Unit I		
1	Introduction Mobility Of Bits & Bytes, Wireless-The Beginning, Mobile Computing, Dialog Control, Networks, Middleware & Gateways, Applications & Services, Developing Mobile Computing Applications, Security In Mobile Computing, Standard And Standard Bodies And Players In The Wireless Space	3 Hrs
2	Wireless LAN. Introduction, Wireless LAN advantages, IEEE 802.11 standards, Wireless LAN architectures, Mobility in Wireless LAN, Deploying Wireless LAN, Mobile adhoc Networks and Sensor Networks. Wireless LAN security, WiFi versus 3G.	3 Hrs
3	Mobile Computing Architecture. History of computers, History of Internet, Internet-the ubiquities networks, Architecture for mobile computing, The three-tier architectures, Design consideration for mobile computing, Mobile computing through internet, Making existing applications mobile enable.	5 Hrs
4	Mobile Computing through Telephony. Evaluation of telephony, Multiple access procedure, Mobile computing through telephone, Developing an IVR application, Voice XML, Telephony application Programming Interphase (TAPI).	5 Hrs
Unit II		
5	Emerging Technologies. Introduction, Blue-tooth, Radio Frequency Identification (RFID), Wireless Broad Band (WiMAX), Mobile IP, Internet protocol Ver 6 (IP v6), Java card.	4 Hrs
6	Global System for Mobile Communication (GSM) Introduction, GSM architectures, GSM entities, Call routing in GSM, PLMN interface, GSM address and identifiers, Network aspect in GSM, GSM frequency allocation, Authentication and security,	4 Hrs
7	Short Message Services (SMS) Mobile Computing over SMS, Short Message Services (SMS), Value Added Services through SMS, Accessing the SMS Bearer.	4 Hrs

8	General Packet Radio Service (GPRS) Introduction, GPRS and packet data network, GPRS network architecture, GPRS network operation, Data services in GPRS, Application for GPRS, Limitation of GPRS, Billing and Charging in GPRS.	4 Hrs
Unit – III		
9	Wireless Application Protocol (WAP) Introduction, WAP, MMS, GPRS, Application	4 Hrs
10	CDMA & 3G Introduction, Spread Spectrum technology, IS-95, CDMA vs GSM, Wireless Data, 3 rd generation network, Application on 3G.	4 Hrs
Text Book: 1. Asoke K Talukder & Roopa R Yavagal . Mobile Computing, Tata McGraw Hill Education Private Limited, New Delhi. Second Edition, 2010.		
Reference Books: 1. Raj Kamal , Mobile Computing, Oxford University Press.		

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---
Total	100

[BACK](#)

Program: Master of Computer Applications		Semester: IV
Course Title: Web Content Management		Course Code: 23ECAE816
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3 hrs/week
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 40	Practical :--	Exam Duration:--
Unit I		
1	What Content Management Is (and Isn't) What Is Content?, What Is a Content Management System?, Types of Content Management Systems, What a CMS Does, What a CMS Doesn't Do	4 Hrs
2	Points of Comparison Target Site Type, Systems Versus Implementations, Platform Versus Product, Open Source Versus Commercial, Technology Stack, Management Versus Delivery, Coupled Versus Decoupled, Installed Versus Software-as-a-Service (SaaS), Code Versus Content, Code Versus Configuration, Uni- Versus Bidirectional Publishing, Practicality Versus Elegance, and the Problem of Technical Debt	6 Hrs
3	Acquiring a CMS Open Source CMSs, Commercial CMSs, Software-as-a-Service, Build Your Own, Questions to Ask	6 Hrs
Unit II		
4	The Content Management Team Editors, Site Planners, Developers, Administrators, Stakeholders	6 Hrs
5	CMS Feature Analysis The Difficulties of Feature Analysis, An Overview of CMS Features	4 Hrs
6	Content Modeling Data Modeling 101, Data Modeling and Content Management, Separating Content and Presentation, Defining a Content Model, Relationships, Content Composition, Content Model Manageability, A Summary of Content Modeling Features	6 Hrs
Unit – III		
7	Content Aggregation The Shape of Content, Content Geography, Aggregation Models: Implicit and Explicit, Aggregation Functionality, By Configuration or by Code, A Summary of Content Aggregation Features	4 Hrs
8	Editorial Tools and Workflow The Content Lifecycle, The Editing Interface, Versioning, Version Control, and Version Labels, Dependency Management, Content Scheduling and Expiration, Workflow and	4 Hrs

Approvals, Collaboration, Content File Management, Permissions, A Summary of Editorial Tools

Text Book:

1. “Web Content Management”, Systems, Features, and Best Practices, Deane Barker, Publisher: O'Reilly Media, March 2016.

WEB CONTENT MANAGEMENT SYSTEM – COURSE PROJECT

COURSE DESCRIPTION:

Today, many web publishers use content management systems (CMS) to allow them to instantly and dynamically update web pages and properties as new content becomes available so that every visit to a site is engaging, informative, and meaningful. The course project shall explore any one of the three most popular open source web-based content management systems—WordPress, Joomla, and Drupal—to create dynamic and flexible websites and landing pages. Students shall explore the fundamentals of planning dynamic websites, CMS database management, developing CSS-controlled site templates, and creating database-driven websites through the planning and creation of their own topic-based sites.

OBJECTIVES

- Introduce learners to any one of the three most popular open source content management systems (CMS) such as WordPress, Drupal, or Joomla.
- Create, deploy and Maintain websites using CMS, including creating and editing content, adding functionality, and creating custom templates and themes.

COURSE PROJECT TITLE: BUILDING WEBSITE USING CMS

(JOOMLA / WORDPRESS OR DRUPAL)

To build website for any real world examples such as Corporate web sites or portals, Online magazines, newspapers, and publications, E-commerce and online reservations, Government applications, Small business web sites, Community-based portals, School, religious web sites or Personal or family homepages using popular Web Content Management System. The website shall facilitate to create, manage, store and deploy content on the Web, including text, graphics, video or audio as a part of Enterprise Content Management.

EXECUTION PLAN:

Sl.No	Demonstration	Implementation	Weightage
1.	Introducing Content Management Systems - An overview of some of the different tools and methods that today's web publishers are using to create highly-tailored dynamic web content. - Purchasing and configuring a domain name and web hosting.	1. Introduction to Joomla & Installation 2. Domain Name Registration & Configuration and Hosting 3. Create a Database 4. Content Preparation and Planning	20
2.	Introduction to Joomla - Explore the CAM model (Categories, Articles, and Menus) approach to creating content for Joomla environments. - Administration and management of users and media. - Installing Joomla - Exploring the Admin Interface - Content creation using the CAM model - Content customization: images, video, audio, tags, formats, etc.	1. Write an article & put your articles in order with categories. 2. Customize Administrator's Panel 3. Change your website's look with Templates. 4. Expand your website's functionality with different extensions. 5. Content creation & Customization using the CAM model	20
3.	Joomla Menus - Creating and controlling menus for Joomla site. - To link to articles and create special menu items. - Adding and displaying menus - Linking menus to articles and other features	1. Categorize the articles which allow grouping your content better. 2. Create menu items for website.	20
4.	Extending Joomla –Plug-ins, Modules	Select Create Joomla Modules for the website such as Feed Display Module, Footer Module, Latest News Module, Search Module,	20

	○ Use of Joomla, Plug-ins, Modules, Components and other extensions. ○ Installation of extensions, Finding and adding Joomla extensions ○ Adding and setting up 2 “big” extensions (choose blog, calendar, image gallery, Paypal-based shopping cart, or portfolio. Other extensions on approval)	Random Image Module, Who's Online Module etc.	
5.	Custom Templates ○ Explore the addition of creation and uses of customized Joomla templates ○ Modifying templates using CSS and HTML tricks.	Select and Customize template for website.	20
6.	User management and permissions ○ Explore how to manage users in Joomla site, including managing who sees what based on login, as well as who can do what based on permissions assigned.	Control the use of Captcha, registration allowed and type of registration, default user group new users, reset password, and new user registration email notice to administration.	20

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---
Total	100

[BACK](#)