KLE Technological University
Creating Value, Leveraging Knowledge

Curriculum Structure and Curriculum Content for the Academic Year 2023-25

Department of Computer Applications

Master of Computer Applications

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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
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.
2. Have a comprehensive background to practice Software Engineering Principles in various domains that require software architecture, design, development, and testing practices.
3. Understand the professional and ethical obligations of a software engineer towards society and the need for lifelong learning.
4. Have the ability to participate in multi-disciplinary teams using ICT effectively.
Program Outcomes-PO's
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.
2. **Problem analysis:** Identify, formulate research literature, and solve complex computing problems, reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.
3. **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.
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.
5. **Modern tool usage:** Create, select, adapt, and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
6. **Professional Ethics**: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

7. **Life-long learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.
8. **Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's work as a member and leader in a team, to manage projects and in multidisciplinary environments.
9. **Communication Efficacy:** 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.
10. **Societal and Environmental Concern:** 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.
11. **Individual and teamwork:** Function effectively as an individual and as a member or leader in diverse teams and multi-disciplinary environments.
12. **Innovation and Entrepreneurship:** Identify a timely opportunity and use of innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Program Specific Objectives -PSO's

1. **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.
2. **Professional Competency:** Apply computing concepts, skills, and processes to produce a product/project in the domain, demonstrating professional knowledge and attitude.

Curriculum Structure-Overall

	I	II	III	IV
Course with course code	Data Structures using C 23ECAC701 4-0-0	OOPS using Java 23ECAC703 3-0-0	Machine Learning 21ECAC801 3-0-1	Capstone Project Work 23ECAP803 0-0-13
	Database Management System 23ECAC702 4-0-0	Data Mining 20ECAC707 3-0-1	Big Data Analytics 20ECAC801 3-0-1	Elective-3 (MOOC) 23ECAE8XX 3-0-0
	Computer Networks 21ECAC701 3-0-1	Software Engineering 20ECAC708 4-0-0	Advanced JAVA Programming 23ECAC801 3-0-1.5	
	Mathematical Thinking & Logical Reasoning 15EHSC701 3-0-0	Cloud Computing 20ECAC709 3-0-1	Elective-1 23ECAE80X 3-0-0	
	Web Technology 23ECAP704 0-0-2	Design and Analysis of Algorithms 23ECAC704 4-0-0	Elective-2 23ECAE80X 3-0-0	
	Data Structures Lab 23ECAP701 0-0-1.5	Operating Systems 21ECAC702 3-0-1	Mobile Application Development 23ECAP801 0-0-1.5	
	DBMS Lab 23ECAP702 0-0-1.5	Java Programming Lab 23ECAP705 0-0-1.5	Mini Project-2 23ECAP802 0-0-2	
	Python Programming 23ECAP703 0-0-2	Mini Project-1 23ECAP706 0-0-1.5		
	Critical Thinking and Problem Solving Skills 23ECAH701 1-0-0	Communication and Leadership Skills 23EHSC702 1-0-0		
Credits	**23**	**27**	**22**	**16**

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Curriculum Structure-Semester wise

Semester - I

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	23ECAC701	Data Structures using C	PSC	4-0-0	4	4	50	50	100	3 hours
2.	23ECAC702	Database Management System	PSC	4-0-0	4	4	50	50	100	3 hours
3.	21ECAC701	Computer Networks	PSC	3-0-1	4	5	50	50	100	3 hours
4.	15EHSC701	Mathematical Thinking & Logic Reasoning	HSC	3-0-0	3	3	50	50	100	3 hours
5.	23ECAP704	Web Technology	PSC	0-0-2	2	4	80	20	100	3 hours
6.	23ECAP701	Data Structures Lab	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
7.	23ECAP702	DBMS Lab	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
8.	23ECAP703	Python Programming	PSC	0-0-2	2	4	80	20	100	3 hours
9.	23ECAH701	Critical Thinking and Problem Solvir Skills	HSC	1-0-0	1	1	100	--	100	
TOTAL				**15-0-8**	**23**	**31**	**620**	**280**	**700**	

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Semester - II

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	23ECAC703	OOPS using Java	PSC	3-0-0	3	3	50	50	100	3 hours
2.	20ECAC707	Data Mining	PSC	3-0-1	4	5	50	50	100	3 hours
3.	20ECAC708	Software Engineering	PSC	4-0-0	4	4	50	50	100	3 hours
4.	20ECAC709	Cloud Computing	PSC	3-0-1	4	5	50	50	100	3 hours
5.	23ECAC704	Design and Analysis of Algorithms	PSC	4-0-0	4	4	50	50	100	3 hours
6.	21ECAC702	Operating Systems	PSC	3-0-1	4	5	50	50	100	3 hours
7.	23ECAP705	Java Programming Lab	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
8.	23ECAP706	Mini Project-1	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
9.	23EHSC702	Communication and Leadership Skills	HSC	1-0-0	1	1	100	--	100	3 hours
TOTAL				**21-0-6**	**27**	**33**	**560**	**340**	**900**	

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Semester- III

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in Hrs)
1.	21ECAC801	Machine Learning	PSC	3-0-1	4	5	50	50	100	3 hours
2.	20ECAC801	Big Data Analytics	PSC	3-0-1	4	5	50	50	100	3 hours
3.	23ECAC801	Advanced JAVA Programming	PSC	3-0-1.5	4.5	6	50	50	100	3 hours
4.	23ECAE80X	Elective-1	PSE	3-0-0	3	3	50	50	100	3 hours
5.	23ECAE80X	Elective-2	PSE	3-0-0	3	3	50	50	100	3 hours
6.	23ECAP801	Mobile Application Development	PSC	0-0-1.5	1.5	3	80	20	100	3 hours
7.	23ECAP802	Mini Project-2	PSC	0-0-2	2	4	80	20	100	3 hours
TOTAL				**15-0-7**	**22**	**29**	**410**	**290**	**700**	

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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	0-0-13	13	26	100	150	250	3 hours
2.	23ECAE8XX	Elective-3 (MOOC)	PSE	3-0-0	3	3	100	--	100	3 hours
TOTAL				3-0-13	16	29	200	150	350	

Semester	I	II	III	IV	Total
Credits	23	27	22	16	88

List of Program Electives **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 **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

Curriculum Content- Course wise

Program: Master of Computer Applications		**Semester: I**
Course Title: Data Structures using C		**Course Code: 23ECAC701**
L-T-P : 4-0-0	**Credits: 4**	**Contact Hours: 4**
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**
Teaching Hours: 50	**Examination Duration: 3 Hrs**	

Chapter No.	Content	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	10 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.	5 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	5 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	10 Hrs
5	**Trees and Graphs**	10 Hrs

	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 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.	5 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	5 Hrs

Text Books :

1. Yedidyah Langsam, Augenstein, M.J. and Tenanbaum, Data Structures using C and C++, Second Edition, Pearson Education Asia, 2006

Reference Books:

1. Weiss, M.A., Data Structures and Algorithm Analysis in C, 2, Pearson Education Asia, 1997
2. Gilberg, R.F. and Forouzan, B.A. , Data Structures A Pseudo code Approach with C, 3, Reprint,Thomson Course Technology, 2005
3. Reema Thareja, Data Structures using C , 2 nd Edition, 2014, Oxford University Press

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	20
ISA- 2	20
Activities	10
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	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

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Program: Master of Computer Applications		**Semester: I**
Course Title: Database Management System		**Course Code: 23ECAC702**
L-T-P : 4-0-0	**Credits: 4**	**Contact Hours: 4**
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**
Teaching Hours: 50	**Examination Duration: :3 Hrs**	

Chapter No.	Content	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.	**8 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.	**7 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.	**10 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;	**10 Hrs**

	Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.	
Unit III		
6	**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; 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.	**5 Hrs**
7	**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.	**5 Hrs**

Text Books :

RamezElmasri, Shamkant B. Navathe, Database Systems, Sixth Edition, PEARSON, 1 January 2015

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

1. In Semester Assessment (ISA)

Assessment	**Marks**
ISA- 1	20
ISA- 2	20
Activities	10
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	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

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Program: Master of Computer Applications		**Semester: I**
Course Title: Computer Networks		**Course Code: 21ECAC701**
L-T-P : 3-0-1	**Credits: 4**	**Contact Hours: 5**
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**
Teaching Hours: 40+24	**Examination Duration: :3 Hrs**	

Chapter No.	Content	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.

Reference Books:

1. TCP/IP Protocol Suite ,4th MGH 2010 By B. A. Forouzan.

Activities			
#	**Topics**	**Activity**	**Weightage**
1	**Introduction to Data Communications**	Overview of networks and layered communications	10
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.	15
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.	15
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.	15
5	**Data Link Layers:** ARQ Protocol implementation using C Program.	Implement the different supported ARQ protocols implementation using C Program.	15
6	**Network Layer:** Network Operations and troubleshooting	1. Outline the network properties and testing the network connectivity. 2. Explain the addressing protocols.	15
7	**Network Layer:**	Simulation and Implementation of Routing Protocols.	15
Total			**100**

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	15
ISA- 2	15
Activities	20
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, 4	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	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

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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**
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: :3 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

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	15
ISA- 2	15
Activities	20
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	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	6	Any 1 question is to be answered

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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**
ISA Marks: 80	**ESA Marks:20**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: :3 Hrs**	

Chapter No.	Content	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	**05 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, Canvas, URL schemes, ASCII encoding	**12 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	**13 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, Stacking Elements, Dragging and Dropping Elements.	**10 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.

Activities : Implement the following programs using C programs			
#	Topics	Activity	Weightage
1.	Fundamentals of Web	• To Perform the content exploration of real time web application using SEO http://www.seowebpageanalyzer.com/ • Analyze the HTTP header using inspect element in Google chrome • Collect the data of HTTP header from multiple websites and prepare the report • Explore the elements of URL with following properties relevance, link type, authority, location and smell test. • Quiz on World wide web , URL, HTTP and Web Programmers toolbox	10
2.	HTML	• Develop a website of a real time application by including all HTML tags • Validate the developed website using online tools like https://validator.w3.org/ • Install and explore Blue Griffon HTML editor tool for development of web application http://bluegriffon.org/	10
3.	CSS and Bootstrap	• Design and develop a GUI for the web application by adding all CSS styles • Install and configure BootMetro UI framework and design a web page using bootstrap http://aozora.github.io/bootmetro/	10
4.	Dynamic documents and JavaScript	• Design and develop the registration page by performing the validation for all fields using JavasScript regular expression • Create a responsive web page using event handling methods of JavaScript Explore any two different online editors of JavaScript https://js.do/ https://playcode.io/online-javascript-editor	10
5.	PHP Programming	• Install and configure the Wamp/Xampp server environment https://www.wampserver.com/en/ https://www.apachefriends.org/download.html Program to demonstrate the control statements, user defined function and OOP concepts of PHP	10

6.	**Working with databases & SQL**	• Install and explore Laravel, CodeIgniter and Symfony PHP frameworks by integrating MySQL with webpage application. https://laravel.com/ https://www.codeigniter.com/ https://symfony.com/ Perform the CRUD operations in MySQL using PHP by accessing the data from webpage	**10**
7.	**Working with Cookies, Sessions & Headers**	• PHP program to store current date-time in a Cookie and display the 'Last visited on' date-time on the web page upon reopening of the same page. • PHP program to store page views count in Session, to increment the count on each refresh, and to show the count on web page • Explore the session, persistent and third party cookie stored in the browser of websites and analyze the features of it. • View and edit session storage with Chrome Dev Tools https://developers.google.com/web/tools/chrome devtools/storage/sessionstorage • Tracking Cookies with Light beam https://chadsansing.github.io/curriculum-testing/expanded-privacy-curriculum/tracking-cookies.html	**10**
Total			**100**

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	60
Activities	20
ISA	**80**
ESA	**20**
Total	**100**

Back

Program: Master of Computer Applications		Semester: I
Course Title: Data Structures Lab		Course Code:23ECAP701
L-T-P : 0-0-1.5	Credits: 1.5	Contact Hours: 3
ISA Marks: 80	ESA Marks:20	Total Marks: 100
Teaching Hours: 36	Examination Duration: :3 Hrs	

Sl. No.	Demonstration	Session
1	Programs to demonstrate the basic concepts of C: Looping and Control statements.	1
2	Design and Implement a menu-driven Program to perform various operations on array and structures.	1
3	Design and Implement a menu-driven Program to perform various operations on Strings.	1
4	Program to demonstrate the dynamic memory allocation and recursion concepts.	1
	Exercise	
5	A menu driven C program to perform PUSH and POP operations on STACK of Integers (Array Implementation of Stack with maximum size MAX).	1
6	Design and implement a C program for the following Stack Applications i. To convert an infix expression to postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands. Evaluation of postfix expression with single-digit operands and operators:+, -, *, /, %, ^	2
7	A menu driven C program to perform INSERT and DELETE operations on linear QUEUE and priority queue.	1
8	A menu driven C program to perform INSERT and DELETE operations on circular QUEUE.	1
9	A menu driven C program to perform various operations on Singly Linked List and Doubly linked list.	1
	Structured Enquiry	
10	a)A menu driven C program to perform various operations on : i) Implementation of Stack using Linked list. ii) Implementation of Queue using Linked list b) Design and implement a menu driven C program to perform various operations on Binary Search Tree(BST) of Integers	2

***Evaluation*:**

Students Assessment through CIA (80%) and ESA (20%)

Assessment	Weightage in Marks
Demonstration	20
Exercises	60
Structured Enquiry	20
ISA Total (to be scaled down to 80)	**100**
ESA	**20**

Back

Program: Master of Computer Applications		**Semester: I**
Course Title: DBMS Lab		**Course Code:23ECAP702**
L-T-P : 0-0-1.5	**Credits: 1.5**	**Contact Hours: 3**
ISA Marks: 80	**ESA Marks:20**	**Total Marks: 100**
Teaching Hours: 36	**Examination Duration: :3 Hrs**	

Sl. No.	**Demonstration**	Session
1.	Introduction to RDBMS and Constructing an Entity Relationship Diagram for a given statement.	1
2.	Basic SQL commands.	1
	Exercise	
3.	Student-Enrollment Database. Consider the following relations: Student(snum: integer, sname: string, major: string, level: string, age: integer) Class(name: string, meets at: string, room: string, fid: integer) Enrolled(snum: integer, cname: string) Faculty(fid: integer, fname: string, deptid: integer) Enrolled has one record per Student-class pair such that the student is enrolled in the class. Develop an ER schema by reverse engineering from the above relational schema. Write the following queries in SQL. 1. Create the above tables by properly specifying all the integrity constraints. 2. Insert at least five tuples into each table. 3. Find the names of all Juniors (level=JR) who are enrolled in a class taught by I.John. 4. For each level, print the level and the average age of students for that level. Find the names of students not enrolled in any class.	1
4.	Insurance Database. Consider the insurance database given below. PERSON (driverid: String, name: String, address: String) CAR (regno: String, model: String, year: Int) ACCIDENT (repno: Int, dat: Date, location: String) OWNS (driverid: String, regno: String) PARTICIPATED (driverid: String, regno: String, repno: Int,damageamt: Int) Develop an ER schema by reverse engineering from the above relational schema. Write the following queries in SQL. 1. Create the above tables by properly specifying the integrity constraints. 2. Enter at least five tuples for each relation. 3. Demonstrate how you	1

	• Update the damage amount for the car with a specific Regno in the accident with report number 12 to 25000 • Add a new accident to the database 4. Find the total number of people who owned cars that were involved in accidents in 2002. 5. Find the number of accidents in which cars belonging to a specific model were involved.	
5.	Movie Database. Data requirements of movie industry are captured. • Each movie is identified by title and year of release. Each movie has length in minutes and classified under one genres (like action, horror etc.). Each movie has a plot outline. • Production companies are identified by name and each has an address. A production company produces one or more movies. • Actors are identified by id. Other details like name and date of birth of actors are also stored. Each actor acts in one or more movies. Each actor has a role in movie. • Directors are identified by id. Other details like name and date of birth of directors are also stored. A Director can act in a movie (including the one that he or she may also direct). Each director directs one or more movies. • Each movie has one or more actors and one or more directors and is produced by a production company. 1. Draw an ER diagram that captures the preceding information. Identify any constraints not captured by the ER diagram. 2. Map the ER model to Relational schema and normalize the relations to 2NF. 3. Create the tables & insert at least 8 tuples in each relation. 4. Solve the following queries in SQL:- i. List the details of horror movies released in 2012 and directed by more than 2 directors. ii. List the details of actors who acted in movies having same titles but released before 2000 and after 2010. iii. List the details of production companies producing maximum movies. iv. List the details of movies where director and actor have same date of birth. Retrieve the names of directors directed all the movies produced by any one production company.	2
Structured Enquiry		

6.	Bank Database. Address and phone for each bank are also stored. Each branch is identified by its bank. Branch has name address and phone. A customer can open different kinds of accounts with the branches. An account can belong to more than one customer. Customers are identified by their SSN, name, address and phone number. There are different types of loans, each identified by a loan number. A customer can take more than one type of loan and a loan can be given to more than one customer. Loans have a duration and interest rate. Make suitable assumptions and use them in showing maximum and minimum cardinality ratios. 1. Draw an ER diagram that captures the preceding information. Identify any constraints not captured by the ER diagram. 2. Map the ER model to Relational schema and normalize the relations to 2NF. 3. Create the tables & insert at least 8 tuples in each relation. 4. Solve the following queries in SQL:- i. List the details of customers who have joint account and also have at least one loan. ii. List the details of the branch that has given the maximum loan. iii. List the details of savings accounts opened in the SBI branches located at Bangalore. iv. List the name of branch along with its bank name and total amount of loan given by it. Retrieve the names of customers who have accounts in all the branches located in a specific city	2
7.	Pharmacy Database. The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather: • Patients are identified by an SSN, and their names, addresses, and ages must be recorded. • Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. • Each pharmaceutical company is identified by name and has a phone number. • For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company.	2

If a pharmaceutical company is deleted, you need not keep track of its products any longer.

- Each pharmacy has a name, address, and phone number.
- Every patient has a primary physician. Every doctor has at least one patient.
- Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors.
- Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.
- Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
- Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

1. Draw an ER diagram that captures the preceding information. Identify any constraints not captured by the ER diagram.
2. Map the ER model to Relational schema and normalize the relations to 2NF.
3. Create the tables & insert at least 8 tuples in each relation. 4. Solve the following queries in SQL:-
   i. For each patient list out the patient's name, patient's doctor's name & prescription details.
   ii. For each pharmacy list out the drugs that it sells, containing Paracetemol as one of the ingredient in its formula along with its Pharmaceutical Company.
   iii. Produce a listing Pharmacy name, Pharmaceutical company, Drug trade name, contract start date & end date, supervisor for each contract between a Pharmacy & Pharmaceutical Company.
   iv. For each doctor display the doctor's name and the count of prescriptions given by doctor containing the drugs made by NAVYYA LABS.

	For each patient display the patient's name, drug name & the pharmacy name from where the patient bought the drug.	

***Evaluation*: Students Assessment through CIA (80%) and ESA (20%)**

Assessment	Weightage in Marks
Demonstration	20
Exercises	60
Structured Enquiry	20
ISA Total (to be scaled down to 80)	**100**
ESA	20

Back

Program: Master of Computer Applications		Semester: I
Course Title: Python Programming		Course Code:23ECAP703
L-T-P : 0-0-2	Credits: 2	Contact Hours: 4
ISA Marks: 80	ESA Marks:20	Total Marks: 100
Teaching Hours: 40	Examination Duration: :3 Hrs	

Expt. No.	Demonstration	Session
1	Demonstrate Python data types, operators and control statements	1
2	Introduction to Inheritance and exceptions	1
3	Demonstrate the file operations and text processing	1
4	Design and analyze the different statistical methods of NumPy and SciPy library	1
	Exercise	
5	Implementation of different types of operators and control statements	1
6	Explore the Math module for implementation of different built-in mathematical functions	1
7	Implementation of mean deviation and standard deviation for n values	1
8	Explore the OS module to implement the different file operations	1
9	Explore the following libraries to perform the different scientific and matrix operations - 1. Numpy 2. Scipy	1
10	Explore the different methods of pandas and matplotlib library to perform the dataframe operations and data visualization	1
	Structured Enquiry	
11	Analyze the following dataset from Kaggle and UCI repository using Pandas, Numpy and Matplotlib library. Prepare a report of 10 -15 pages with the data analysis and visualization of the data set. https://www.kaggle.com/ https://archive.ics.uci.edu/ml/index.php	2

Text Books:

1. Python The Complete Reference, Martin C Brown, Mc Graw Hill, 2018
2. Learning Python, Mark Lutz, Orielly, 5th Edition, 2013
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017

Reference Books:

1. Think Python, 2nd Edition, Allen Downey, Green Tea Press, 2017
2. Core Python Programming, W.Chun, Pearson, 2016
3. Introduction to Python, Kenneth A. Lambert, Cengages, 2015

***Evaluation*:**

Students Assessment through ISA (80%) and ESA (20%)

Assessment	Weightage in Marks
Demonstration	30
Exercises	50
Structured Enquiry	20
ISA Total (to be scaled down to 80)	**100**
ESA	20

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KLE Technological University | Creating Value, Leveraging Knowledge

Program: Master of Computer Applications		**Semester: I**
Course Title: Critical Thinking and Problem Solving Skills		**Course Code:23ECAH701**
L-T-P : 1-0-0	**Credits: 1**	**Contact Hours: 1**
ISA Marks: 100	**ESA Marks:0**	**Total Marks: 100**
Teaching Hours: 30	**Examination Duration: :3 Hrs**	

Chapter No.	Content	Hrs
1	**Communication Skills** ▪ Brain Storing ▪ Fractionation and Suspended Judgment ▪ Out of the box thinking and creativity activities	**6 Hrs**
2	**Perfect Presenter (PS)** ▪ The Zero Presentation ▪ OvercomingLiving with Stage(any) Fear ▪ Feedback matters.	**6 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)** ▪ Numbers ▪ Factors and Multiples ▪ The God of Math ▪ Ratio, Proportion and Variation	**6 Hrs**
Text Books :		
Reference Books:		

Evaluation Scheme			
1. In Semester Assessment (ISA)			
	Assessment	**Marks**	
	Activities	100	
	Total	**100**	

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KLE Technological University | Creating Value, Leveraging Knowledge

Program: Master of Computer Applications		Semester: II
Course Title: OOPS using Java		Course Code: 23ECAC703
L-T-P : 3-0-0	Credits: 3	Contact Hours: 3
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hours: 40	Examination Duration: 3 Hrs	

Chapter No.	Content	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, to String () method, String Tokenizer in Java.	**6 Hrs.**
	Unit II	
4	**Interfaces 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** 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;	**6 Hrs.**
6	**Multithreading** Multithreading- What Are Threads?, Interrupting Threads, Thread States, Thread Properties, synchronization	**4 Hrs.**
	Unit III	
7	**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.	**4 Hrs.**

8	**Servlets** Background; The life cycle of servlet, A simple servlet, The Servlet API, The javax.servlet Package ,The Servlet Interface, The Servlet Config Interface, Servlet Context Interface, Servlet Request Interface, Servlet Response Interface, The Cookies class.	**4 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.

Links https://www.studytonight.com/java/component-of-java.php
https://www.javatpoint.com/java-programs.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	20
ISA- 2	20
Activities	10
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

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Program: Master of Computer Applications		Semester: II
Course Title: Data Mining		Course Code: 20ECAC707
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hours: 40+24	Examination Duration: 3 Hrs	

Chapter No.	Content	Hrs
	Unit I	
1	**Introduction** Fundamentals of data mining, Kinds of pattern, technologies used, and technologies used, applications, issues, data objects and attribute types, Basic Statistical Descriptions of Data, Data Visualization.	**7 Hrs**
2	**Data Pre-processing** Need of pre-processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization.	**4 Hrs**
3	**Data Warehousing and Online Analytical Processing** Data Warehouse: Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.	**5 Hrs**
	Unit II	
4	**Mining Frequent Patterns, Associations, and Correlations** Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?: Pattern Evaluation Methods, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining.	**5 Hrs**
5	**Classification** Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Bayesian Belief Networks, Classification by Backpropagation.	**6 Hrs**
6	**Graph Mining, Social Network Analysis, and Multi-relational Data Mining** Methods for Mining Frequent Subgraphs, Mining Variant and Constrained Substructure Patterns, Characteristics of Social Networks, Mining on Social Networks, Multirelational mining, Multi Relational Classification, Multirelational Clustering with User Guidance.	**5 Hrs**
	Unit III	
7	**Cluster Analysis** Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering	**4 Hrs**
8	**Mining Complex Types of Data** Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.	**4 Hrs**
Text Books		

1. DataMining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012 by Elsevier Inc

#	Activity **List of Practices**
	Assignment
	All the activities using DM tools : Weka, Rapid Miner, Orange, KNIME, Tableau, Excel
	Google Analytics
1.	Demonstration of pre-processing on given dataset
2.	Demonstration of mining Discrimination between different Classes in given dataset
3.	Demonstration of Association rule process on given dataset using Apriori algorithm
4.	Demonstration of classification rule process on given dataset using Decision tree algorithm
5.	Demonstration of classification rule process on dataset using naïve Bayes algorithm
6.	Demonstration of prediction on given dataset using regression techniques
7.	Demonstration of data visualization on given dataset.
8.	Demonstration of quartiles using FIVE number summary on given dataset.
9.	Demonstration of Graph displays of statistical class description on given dataset using: 1. Histogram 2. A quantile plot 3. A quantile-quantile plot 4. A scatter plot 5. A loess curve
10	Demonstration of web mining for a given portal.

Evaluation Scheme

1. In Semester Assessment (ISA)

	Assessment	**Marks**	
	ISA 1	15	
	ISA 2	15	
	Integrated Lab Practices	20	
	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

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Program: Master of Computer Applications		Semester: II
Course Title: Software Engineering		Course Code: 20ECAC708
L-T-P : 4-0-0	Credits: 4	Contact Hours: 4
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hours: 50	Examination Duration: 3 Hrs	

Chapter No.	Content	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	7 Hrs.
2	**Agile Software Development** Agile methods, Agile development techniques, Agile project management. Scaling agile methods	7 Hrs.
3	**Requirement Engineering** Functional and Non-functional requirements, Requirements Engineering processes, Requirements elicitation, Requirement specification, Requirements validation; Requirements change.	6 Hrs.
	Unit II	
4	**System Modelling** Context models, Interaction Models, Structural models, Behavioural models. model driven architectures	7 Hrs.
5	**Architectural Design** Architectural Design Decisions, Architectural views, Architectural patterns, Application Architectures	7 Hrs.
6	**Design and implementation** Object oriented design using UML, design patterns, Implementation Issues, Open source development.	6 Hrs.
	Unit III	
7	**Software Testing** Development Testing, Test Driven Development, Release Testing, User Testing.	5 Hrs.
8	**Configuration management** Change management, Version management, System building, Release management.	5 Hrs.

Text Books :

1. Ian Summerville, Software Engineering, 10thed, Pearson Ed, 2018

Reference Books:

1. Roger S. Pressman, Software Engineering: A Practitioners Approach, 8the, McGraw, 2015
2. Jalote, P, An Integrated Approach to Software Engineering, 6e, willy Publications, 2015

Evaluation Scheme

1. In Semester Assessment (ISA)

	Assessment	Marks	
	ISA- 1	20	
	ISA- 2	20	
	Activities	10	
	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: II
Course Title: Cloud Computing		Course Code: 20ECAC709
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hours: 40+24	Examination Duration: 3 Hrs	

Chapter No.	Content	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 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 Hrs
6	**Networking Support**	4 Hrs

	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.	
	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 Fill, 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.

Activities			
#	**Topics**	**Activity**	**Weightage**
1	Introduction, Parallel and distributed systems	Compare the three cloud computing delivery models, SaaS, PaaS, and IaaS, from the point of view of the application developers and users. Discuss the security and the reliability of each one of them. Analyze the differences between the PaaS and the IaaS. An IT company decides to provide free access to a public cloud dedicated to higher education. Which one of the three cloud computing delivery models, SaaS, PaaS, or IaaS should it embrace and why? What applications would be most beneficial for the students? Will this solution have an impact on distance learning? Why? What is in your opinion the critical step in the development of a systematic approach to all-or-nothing atomicity? What does a systematic approach means? What are the advantages of a systematic versus an ad-hoc approach to atomicity?	15
2	Cloud Infrastructure	Several desirable properties of a large-scale distributed system includes transparency of access, location, concurrency, replication, failure, migration, performance, and scaling. Analyze how each one of these properties applies to AWS. Demonstration Cloud services using AWS or Azure or Google Cloud. ● Compare the Oracle Cloud offerings (see https://cloud.oracle.com) with the cloud services provided by Amazon, Google, and Microsoft.	15
3	Cloud Computing: Applications and Paradigms	Download and install the Zookeper from the site http://zookeeper.apache.org/. Use the API to create the basic workflow patterns or Use the AWS CloudFormation service to create the basic workflow patterns. Search the web for reports of cloud system failures and discuss the causes of each incident. Research the power consumption of processors used in mobile devices and their energy efficiency. Rank the	10

		components of a mobile device in terms of power consumption. Establish a set of guidelines to minimize the power consumption of mobile applications.	
4	Cloud Resource Virtualization	Virtualization simplifies the use of resources, isolates users from one another, supports replication and mobility, but exacts a price in terms of performance and cost. Analyze each one of these aspects for: (i) memory virtualization, (ii) processor virtualization, and (iii) virtualization of a communication channel. Virtualization of the processor combined with virtual memory management pose multiple challenges; analyze the interaction of interrupt handling and paging. ● In Section 5.6 we state that a VMM for a processor can be constructed if the set of sensitive instructions is a subset of the privileged instructions of that processor. Identify the set of sensitive instructions for the x86 architecture and discuss the problem each one of these instruction poses.	15
5	Cloud Resource Management and Scheduling	Analyze the benefits and the problems posed by the four approaches for the implementation of resource management policies: control theory, machine learning, utility based, market-oriented. Can optimal strategies for the five classes of policies, admission control, capacity allocation, load balancing, energy optimization, and QoS guarantees be actually implemented in a cloud? Support your answer with solid arguments. ● Multiple controllers are probably necessary due to the scale of the cloud. Is it beneficial to have system and application controllers? Justify your answers.	15
6	Networking Support	Implementation Simple IPC (Client Server Communication) Simple chat server ● multi-threaded File Server	10
7	Storage Systems	Analyze the reasons for the introduction of storage area networks (SANs) and their properties.	10

		Block virtualization simplifies the storage management tasks in SANs. Provide solid arguments in support of this statement. The designers of the Google file system (GFS) have re-examined the traditional choices for a file system. Discuss observations regarding these choices that have guided the design of GFS.	
8	Cloud Security	Write a survey paper on cloud computing security: Issues, threats, and solutions	10
Total			**100**

Evaluation Scheme

1. In Semester Assessment (ISA)

	Assessment	**Marks**	
	ISA- 1	15	
	ISA- 2	15	
	Activities	20	
	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: II**
Course Title: Design & Analysis of Algorithms		**Course Code: 23ECAC704**
L-T-P : 4-0-0	**Credits: 4**	**Contact Hours: 4**
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**
Teaching Hours: 50	**Examination Duration: :3 Hrs**	

Chapter No.	Content	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	**5 Hrs**
4.	**Decrease-and-Conquer** Variations of decrease-and-Conquer, Insertion Sort, Depth First and Breadth First Search, Topological sorting.	**5 Hrs**
	Unit II	
5.	**Divide-and-Conquer** Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties.	**5 Hrs**
6.	**Transform-and-Conquer** Presorting, Balanced Search Trees, Heaps and Heapsort.	**5 Hrs**
7.	**Space and Time Tradeoffs** Sorting by counting, Input Enhancement in String Matching	**5 Hrs**
8.	**Dynamic Programming** Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.	**5 Hrs**
	Unit III	
9.	**Greedy Technique** Prim's Algorithm, Kruskal's Algorithm, Huffman Trees	**5 Hrs**
10.	**Coping with the Limitations of Algorithm Power** Backtracking, Branch-and-Bound, Approximation Algorithm for NP-Hard problems.	**5 Hrs**

Text Books:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

Reference Books:

1. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, Second Edition, 2008.

Evaluation Scheme

1. In Semester Assessment (ISA)

	Assessment	Marks	
	ISA- 1	20	
	ISA- 2	20	
	Activities	10	
	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	1,2,3,4	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

Back

Program: Master of Computer Applications		Semester: II
Course Title: Operating Systems		Course Code: 21ECAC702
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hours: 40+24	Examination Duration: :3 Hrs	

Chapter No.	Content	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; Resource Management; Security and Protection; Virtualization, Distributed systems, Kernel data structures, Computing environments; Operating System Services; User - Operating System interface; System calls; System services; Linkers and Loaders; Operating System design and implementation; Operating System structure; Building and Booting an Operating System, Operating System Debugging	6 Hrs
2	**Process Management** Process Concept, Process scheduling Operation on Processes, Interprocess communication, Multi-Threaded Programming: Overview; Multicore Programming, Multithreading models; Thread Libraries; Threading issues. CPU Scheduling: Basic concepts; Scheduling criteria Scheduling algorithms Multiple-Processor scheduling; Thread scheduling, Algorithm Evaluation.	4 Hrs
3	**Process Synchronization** Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors	6 Hrs
	Unit II	
4	**Deadlocks** Deadlocks: System model; Deadlock in Multithreaded application, Deadlock characterization; methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock	6 Hrs
5	**Memory Management** Memory Management Strategies: Background; Swapping Contiguous memory allocation; Paging Structure of page table; Segmentation Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement Allocation of frames; Thrashing.	6 Hrs
6	**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
	Unit III	
7	**Secondary Storage Structures, Protection**	4 Hrs

	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, Capability-Based systems	
8	**Case study – Linux operating system** Design principles Kernel modules, Process management Scheduling, memory Management File systems, Input & output, Interprocess Communication.	**4 Hrs**

Text Books :

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

Reference Books:

1. D.M.Dhamdhere': Operating systems-A concept based Approach 2nd Edition, Tata McGraw-Hill 2002
2. P.C.P. Bhatt :Operating systems, 2nd Edition, PHI,2006.
3. Harvey M Deital ; Operating Systems 3rd Edition, Addison Wesley, 1990.
4. https://www.os-book.com/OS10/practice-exercises/PDF-practice-solu-dir/
5. https://codex.cs.yale.edu/avi/os-book/OS10/practice-exercises/index-solu.html

Activities : Implement the following programs using C programs			
#	Topics	Activity	Weightage
1.	UNIX Commands System Calls.	Program to simulate Unix commands and System calls.	10
2.	Process Synchronization	Program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority	10
3.		Program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.	10
4.	Process Synchronization	Program to simulate and Producer Consumer Problem using semaphores	10
5.		Program to simulate Dining Philosopher's problem	10
6.	Memory Management Techniques	Program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit	10
7.		Program to simulate paging technique of memory management.	10
8.	Deadlock Avoidance	Program to implement Banker's algorithm.	10
9.	Disk Scheduling	Program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN	10
10.	Page replacement algorithms	Program to simulate Unix commands and System calls.	10
Total			100

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA- 1	20
ISA- 2	20
Lab activities	10
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: II**
Course Title: Java Programming Lab		**Course Code:23ECAP705**
L-T-P : 0-0-1.5	**Credits: 1.5**	**Contact Hours: 3**
ISA Marks: 80	**ESA Marks:20**	**Total Marks: 100**
Teaching Hours: 36	**Examination Duration: :3 Hrs**	

Expt. No.	**Demonstration**	Session
1	Demonstration of Java data types, operators and control statements	1
2	Demonstration of Inheritance, constructor, encapsulation and overloading	1
3	Demonstrate mutator and exceptions	1
4	Demonstration of string classes & built-in methods	1
	Exercise	
5	Explore mechanism of different types of inheritance, constructor, mutator and exceptions	1
6	Explore the interfaces, inner classes and exceptions	1
7	Implementation of different types of exceptions, Anonymous Inner Class and static class	1
8	Implementation of the different methods and classes of Thread	1
9	Implementation of Linked Lists, Array Lists, Hash Sets, Tree Sets, Object Comparison, Queues, Dequeues, Priority Queues and Maps using collections	2
	Structured Enquiry	
10	Suppose you are developing a social media platform that allows users to create and share posts. Each post can have multiple comments, and users can like or dislike both posts and comments. You want to implement a data structure to store all the posts and their associated comments, number of likes and dislikes. You also want to be able to search for posts based on their titles and filter them based on the number of likes they have received. How would you use Java collections to implement this data structure efficiently? Create a JAVA application for this.	2

***Evaluation*:**

Students Assessment through CIA (80%) and ESA (20%)

Assessment	Weightage in Marks
Demonstration	20
Exercises	60
Structured Enquiry	20
CIA Total (to be scaled down to 80)	**100**
ESA	20

Back

Program: Master of Computer Applications		Semester: II
Course Title: Mini Project-1		Course Code: 23ECAP706
L-T-P : 0-0-1.5	Credits: 1.5	Contact Hours: 3
ISA Marks: 80	ESA Marks:20	Total Marks: 100
Teaching Hours: 36	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.

Assessment:

Students Assessment through CIE (50%) + SEE (50%)

Continuous Internal Evaluation	Assessment	Marks
	Problem Definition, Literature Review	05
	Synopsis and SRS Deliverables	05
	Design (Module wise algorithmic design)	10
	Coding	15
	Integration and testing	05

	Report	05
	Presentation skills and Viva-voce	05
	Total	**50**
Semester End Examination	Presentation	30
	Viva-voce	20
	Total	100

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 is 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.

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Program: Master of Computer Applications		Semester: II
Course Title: Communication and Leadership Skills		Course Code:23EHSC702
L-T-P : 1-0-0	Credits: 1	Contact Hours: 1
ISA Marks: 100	ESA Marks:0	Total Marks: 100
Teaching Hours: 16	Examination Duration: :3 Hrs	

Chapter No.	Content	Hrs
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 ▪ OvercomingLiving 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

1. In Semester Assessment (ISA)

Assessment	Marks
Activities	100
Total	**100**

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Course Content Semester: III

Program: Master of Computer Applications			**Semester: III**
Course Title: Machine Learning			**Course Code: 21ECAC801**
L-T-P : 3-0-1	**Credits: 4**	**Contact Hours: 5**	
ISA Marks: 50	**ESA Marks:50**	**Total Marks: 100**	
Teaching Hours: 40	**Practical Hours: 24**	**Exam Duration: : 3 Hrs**	

Chapter No.	Content	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, one-vs-all classification using logistic regression, Regularization.	**10 Hrs**
	Unit II	
3	**Supervised Learning: Neural Network** Introduction to Neural Network, Model representation, Gradient checking, Back propagation algorithm, Multi-class classification, Support vector machines, Applications & Use-cases.	**8 Hrs**
4	**Unsupervised Learning: Clustering and Dimensionality Reduction** Introduction to Clustering, K means Clustering Algorithm, Cost function, Application, Dimensionality reduction, PCA- Principal Component Analysis Applications, Clustering data and PCA.	**8 Hrs**
	Unit III	
5	**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**
6	**Sequence Modeling: Recurrent Neural Networks** Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs.	**3 Hrs**

Text Books :

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition by Aurélien Géron, October 15, 2019, O'REILLY
2. Python Machine Learning Third Edition, 2019 Packt Publishing, Sebastian Raschka Vahid

Mirjalili, December 2019.
3. The Hundred-Page Machine Learning Book, Andriy Burkov, January 13, 2019.
4. Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition by Andreas Müller, Sarah Guido, O'Reilly Media, November 15, 2016 Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, Second Edition, 2008.

List of Activity

#	Practice	Weightage
1.	Introduction to Scikit, Numpy, Scipy and TensorFlow	10
2.	Linear Regression – Single Variable Linear Regression	10
3.	Linear Regression – Multi Variable Linear Regression	10
4.	Classification – Logistic Regression	10
5.	Classification – Support Vector Machines (SVM)	10
6.	Classification using Neural Networks	10
7.	Unsupervised Learning – Principal Component Analysis (PCA)	10
8.	Unsupervised Learning – K-Means Clustering	10
9.	Deep Learning – Convolution Neural Networks Application	20

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	5,6	Any 1 question is to be answered

Back

Program: Master of Computer Applications		Semester: III
Course Title: Big Data Analytics		Course Code: 20ECAC801
L-T-P : 3-0-1	Credits: 4	Contact Hours: 5
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hours: 40	Practical Hours: 24	Exam Duration: :3 Hrs

Chapter No.	Content	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,

Activities			
#	**Topics**	• **Activity**	**Weightage**
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.	10
2	Big Data Analytics	• Prepare survey paper on BDA with issues, challenges and applications.	20
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.	20
4	Hadoop distributed file system	• Demonstration of HDFS commands • Hadoop Implementation of MapReduce programming for Word count problem, Totals sales and Max temperature problem.	20
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	15
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	15
		• Total	**100**

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 be answered
II	3 questions to be set of 20 marks each	4,5	Any 2 questions are be answered
III	2 questions to be set of 20 marks each	6	Any 1 questions are be answered

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Program: Master of Computer Applications		Semester: III
Course Title: Advanced Java Programming		Course Code:23ECAC801
L-T-P : 3-0-1.5	Credits: 4.5	Contact Hours: 6
ISA Marks: 50	ESA Marks:50	Total Marks: 100
Teaching Hours: 40	Practical Hours: 36	Exam Duration: 3 Hrs

Chapter No.	Content	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	**Struts.** Introduction to the Apache Struts, MVC Architecture, Struts Architecture, How Struts Works? Introduction to the Struts Controller, Introduction to the Struts Action Class, Using Struts Action From Class Using Struts HTML Tags Introduction to Struts Validator Framework, Client Side Address Validation in Struts, Custom Validators Example, Developing Application with Struts Tiles.	5 Hrs
5	**Spring Framework** Introduction to spring 3.0, spring configuration, Aspect oriented programming and ADO, Data Access, Spring Web, Spring Security, 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. Marty Hall, Larry Brown., Core Servlets and Java Server Pages, Second
2. Java 8, Programming Black Book, Dreamtech Press, 2022.

Reference Books:

1. **Herbert Schildt, Java the Complete Reference, Eight, Tata McGraw-Hill , 2011**
2. **www.Javatpoint.com**
3. **www.tutorialspoint.com**

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 be answered
II	3 questions to be set of 20 marks each	4,5,6	Any 2 questions are be answered
III	2 questions to be set of 20 marks each	7,8	Any 1 questions are be answered

Activities

Expt. No.	Experiment / Job Details
1.	Program to demonstrate Session management using JSP.
2.	Program to demonstrate Java Beans
3.	Program to demonstrate Remote Method Invocation in Java.
4.	Program to demonstrate Struts Framework
5.	Program to demonstrate Spring Framework.
6.	Write a JSP code to print session Id, session creation time and last accessed time and a welcome message if client has visited again.
7.	Write a java bean program to validate username and password
8.	Write a chat program using two users. One user will be chatting from the server side, while the other user would be chatting from the client side of the RMI application
9.	write program in Struts to upload the file on the server
10.	Write a program to send email with attachment using spring
11.	Write a program to save a passenger information using save Or Update() method of Hibernate
12.	Write a Database driven login form using Spring MVC and the Hibernate ORM framework.
13.	Design and develop E-commerce web application using spring and Hibernate frameworks

Back

Program: Master of Computer Applications		Semester: III
Course Title: Mobile Application Development		Course Code: 23ECAP801
L-T-P : 0-0-1.5	Credits: 1.5	Contact Hours: 3
ISA Marks: 80	ESA Marks:20	Total Marks: 100
Teaching Hours: 40		Exam Duration: :3 Hrs

Chapter No.	Content	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,	**5 hrs**
2	**Intermediate Dart Programming:** Dart classes and constructors, Interfaces, abstract classes, and mixins, Understanding Dart libraries and packages.	**6 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.	**5 hrs**
	Unit II	
4	**Handling User Input and Gestures** Handling user gestures, Input widgets, Validating Input (Forms), Custom input and FormField. **Theming and Styling:** Theme widgets, Material Design, iOS Cupertino, Using custom fonts, Dynamic styling with MediaQuery and LayoutBuilder.	**5 hrs**
5	**Routing: Navigating between Screens** Understanding the Navigator widget, named routes, Screen transitions. **Firebase Plugins**: Firebase overview, Firebase authentication, NoSQL database with Cloud Firestore.	**5 hrs**
6	**Platform Views and Map Integration** Displaying a map, Adding markers to the map, Adding map interactions, Using the Google Places API	**6 hrs**
	Unit III	
7	**Testing, Debugging, and Deployment,** Flutter testing – unit and widget testing, Debugging Flutter apps, Profiling Flutter apps, Preparing apps for deployment	**4 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.	**4 hrs**

Text Books :

1. Alessandro Biessek, Flutter for Beginners- An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, September 2019 1st Education

Lab Practices

Sl.No	Topic	Number of slots
1	Creating application using flutter	3
2	Creating widgets in flutter	2
3	Responding to gestures in flutter	3
4	Navigation and routing in flutter	2
5	Working with stateful and stateless widgets	2
6	Working with firebase in flutter	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
ISA Marks: 80	ESA Marks:20	Total Marks: 100
Teaching Hours: 48	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.

Assessment:

Students Assessment through CIE (50%) + SEE (50%)

Continuous Internal Evaluation	Assessment	Marks
	Problem Definition, Literature Review	05
	Synopsis and SRS Deliverables	05
	Design (Module wise algorithmic design)	10
	Coding	15
	Integration and testing	05

	Report	05
	Presentation skills and Viva-voce	05
	CIA Total	**50**
Semester End Examination	Presentation	**40**
	Viva-voce	10
	Total	**100**

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 is 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.

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III Semester MCA Electives

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**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 Hours**	

No	Content	Hrs
	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 Applications Using LDAP, Running an OpenLDAP Server, Configuring a System to Authenticate Using OpenLDAP	**10 Hrs**
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 Edition 1.0, Author Jaromír Hradílek jhradilek@redhat.com, Douglas Silas silas@redhat.com , Martin Prpič mprpic@redhat.com etc.

References:

1. Kemp, Juliet, Spinger, “Linux System Administration”
2. Anita Sengar “IT Infrastructure Management” 2012 Edition, publisher: S K Kataria and Sons
3. Sjaak Laan “Infrastructure Architecture - Infrastructure Building Blocks and Concepts Second Edition, Kindle Edition, Lulu Press Inc; Second Edition

Linux Administration Practices

COURSE DESCRIPTION:

IT infrastructure consists of a set of physical devices and software applications that are required to operate the entire enterprise. IT infrastructure is also consists both human and technical capabilities. These services include the following- Computing platforms used to provide computing services, that connect employees, customers, and suppliers into a coherent digital environment, including servers ,Data management services that store and manage corporate data and provide capabilities for analyzing the data and Application software services that provide enterprise-wide capabilities such as enterprise resource planning, customer relationship management, supply chain management, and knowledge management systems that are shared by all business units. It allows an organization to deliver IT solutions and services to its employees, partners and/or customers and is usually internal to an organization and deployed within owned facilities.

OBJECTIVES

- Acquire comprehensive knowledge, technical expertise and hands-on experience in IT Infrastructure Management
- To learn all aspects of IMS such as Networking, Operating Systems, Virtualizations and Data Center technologies.

LAB REQUIREMENTS:

- A modern web-browser with HTML5 and JavaScript enabled.
- Remote Desktop Client connection software.
- Internet connectivity Microsoft Account (LiveID).

LIST OF EXERCISES

#	Topics	ACTIVITY	WEIGHTAGE
1.	Web Server	Apache Web Server, IIS Server: Install and Configure the Apache Web Server on Linux and IIS server on windows.	10
2.	Samba Server	Implementation of Windows files and print services for Linux allowing the sharing of files and printers between Windows and Linux.	10
3.	LDAP Server	LDAP Server: Lightweight Directory Access Protocol- Server Installation to access a directory service.	10
4.	Mail Server	Mail Server configuration- POP3 Server, IMAP Server	10
5.	Proxy Server	Develop a small web proxy server, which is able to cache web pages. It is a very simple proxy server which only understands simple GET-requests, but is able to handle all kinds of objects - not just HTML pages, but also images.	10
6.	Firewalls and NAT (Network Address Translation)	Use of iptables to build a permissive firewall by selectively filtering packets based on protocol type. To demonstrate how addresses may be translated from private addresses to public and vice versa as they pass in and out of the firewall.	20
7.	Cloud Infrastructure: Azure Hands-on Build your Infrastructure in the Cloud using Windows Azure Infrastructure Services -	1. Login to the Windows Azure Management Portal, Define a new Windows Azure Affinity Group and Create a new Windows Azure Storage Account. 2. Register a DNS Server in Windows Azure. 3. Define a Virtual Network in Windows Azure. 4. Configure Windows Server Active Directory in a Windows Azure VM. 5. Configure New Machine for File Services in a Windows Azure VM.	30

References:

1. https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/194201472058683.pdf
2. http://itproguru.com/azurehol/#sthash.HMydlzVA.dpuf
3. https://simms-teach.com/docs/cis192/cis192lab08.pdf
4. https://simms-teach.com/resources.php
5. http://www.cs.rpi.edu/~kotfid/security1/PDF2/NS1_lab_6_1_4_en.pdf
6. http://www.cse.unsw.edu.au/~cs3331/12s1/Labs/
7. https://www.6diss.org/workshops/ca/dns-practical.pdf
8. http://www.dwaynewhitten.com/info306/pages/lab.html

9. http://www.bo.ingv.it/~scacciag/home_files/teach/netadminguide.pdf
10. https://techpolymath.com/2015/02/16/how-to-setup-a-dns-server-for-a-home-lab-on-ubuntu-14-04/
11. http://www.dwaynewhitten.com/info306/lab2.pdf

Evaluation Scheme

Assessment	Marks
ISA	50
ESA	50
Total	100

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

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Program: Master of Computer Applications		Semester: III
Course Title: **DevOps**		Course Code: **23ECAE802**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration:**3 Hrs**	

No	Content	Hrs
	Unit I	
1	**Introduction to DevOps and Continuous Delivery** Introducing DevOps, How fast is fast?, The Agile wheel of wheels, Beware the cargo cult Agile fallacy, DevOps and ITIL.	**3 Hrs**
2	**A View from Orbit :** **The DevOps process and Continuous Delivery – an overview :** The developers, The revision control system, The build server, The artifact repository, Package managers, Test environments, Staging/production, Release management, Scrum, Kanban, and the delivery pipeline, Wrapping up – a complete example, Identifying bottlenecks.	**3 Hrs**

3	**How DevOps Affects Architecture** Introducing software architecture, The monolithic scenario, The Twelve Factors, Architecture rules of thumb, The separation of concerns, The principle of cohesion, Coupling, Back to the monolithic scenario, A practical example, Three-tier systems, The presentation tier, The logic tier, The data tier, Handling database migrations, Rolling upgrades, Hello world in Liquibase, The changelog file, The pom.xml file, Manual installation, Microservices, Interlude – Conway's Law, How to keep service interfaces forward compatible, Microservices and the data tier, DevOps, architecture, and resilience.	**5 Hrs**
4	**Everything is Code** The need for source code control,The history of source code management, Roles and code, Which source code management system? A word about source code management system migrations, Choosing a branching strategy, Branching problem areas, Artifact version naming, Choosing a client, Setting up a basic Git server, Shared authentication, Hosted Git servers, Large binary files, Trying out different Git server implementations, Docker intermission, Gerrit : a) Installing the git-review package, b)The value of history revisionism, The pull request model, GitLab.	**5 Hrs**
	Unit II	
5	**Building the Code** Why do we build code? The many faces of build systems, The Jenkins build server, Managing build dependencies, The final artifact, Cheating with FPM, Continuous Integration, Continuous Delivery, Jenkins plugins, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, A look at the Jenkins filesystem layout, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures, About build status visualization, Taking build errors seriously, Robustness.	**3 Hrs**
6	**Testing the Code** Manual testing, Pros and cons with test automation, Unit testing, JUnit in general and JUnit in particular, A JUnit example, Mocking, Test Coverage, Automated integration testing, Docker in automated testing, Arquillian, Performance testing, Automated acceptance testing, Automated GUI testing, Integrating Selenium tests in Jenkins, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development, A complete test automation scenario : Manually testing our web application, Running the automated test, Finding a bug, Test walkthrough, Handling tricky dependencies with Docker.	**3 Hrs**
7	**Deploying the Code** Why are there so many deployment systems? Configuring the base OS, Describing clusters, Delivering packages to a system, Virtualization stacks: Executing code on the client, A note about the exercises, The Puppet master and Puppet agents, Ansible, Deploying with Chef, Deploying with SaltStack, Salt versus Ansible versus Puppet execution models, Vagrant, Deploying with Docker, Comparison tables, Cloud solutions, AWS, Azure.	**5 Hrs**
8	**Monitoring the Code** Nagios, Munin, Ganglia, Graphite, Log handling, Client-side logging libraries, The ELK stack.	**5 Hrs**

Unit – III		
9	**Issue Tracking** What are issue trackers used for? Some examples of workflows and issues, What do we need from an issue tracker? Problems with issue tracker proliferation, All the trackers : Bugzilla, Trac, Redmine, The GitLab issue tracker, Jira**.**	**4 Hrs**
10	**The Internet of Things and DevOps** Introducing the IoT and DevOps, The future of the IoT according to the market, Machine-to-machine communication, IoT deployment affects, software architecture, IoT deployment security, Okay, but what about DevOps and the IoT again?, A hands-on lab with an IoT device for DevOps.	**4 Hrs**
Text Book: **1.** Practical DevOps by Joakim Verona Publisher: Packt Publishing, Release Date: February 2016, ISBN: 9781785882876.		
References: 1. Effective DevOps, Building a Culture of Collaboration, Affinity, and Tooling at Scale , By Jennifer Davis, Ryn Daniels, Publisher: O'Reilly Media, Release Date: June 2016 , Pages: 410. **2.** The DevOps Handbook: How to Create World-Class Speed, Reliability, and Security in Technology Organizations, Gene Kim, Patrick Debois, John Willis, Jez HumbleIT Revolution Press, 2016 - Business & Economics - 480 pages.		

DevOps Practice Exercise:

SI NO.	TOPIC	ACTIVITY	WEIGTHAGE
1.	**DevOps basics:** Learn the origins of DevOps and the basic principles and techniques.	Lab Practice, Assignment and Quiz	10
2.	**AWS crash course:** Hands-on session where you learn to use the most important AWS services, including IAM, EC2, ASG, EBS, ELB, S3, and RDS.	Lab Practice, Assignment and Quiz	10
3.	**Infrastructure as code**: Overview of different techniques to manage infrastructure, including ad-hoc scripts (e.g., Bash, Python), configuration management tools (e.g., Chef, Puppet), machine images (e.g., VMs, Docker), and provisioning tools (e.g., Terraform, CloudFormation).	Lab Practice, Assignment and Quiz	10
4.	**Terraform introduction**: Go through a series of coding exercises that cover the basic Terraform syntax, state management, loops, conditionals, lifecycle management, and common gotchas.	Lab Practice, Assignment and Quiz	10
5.	**Advanced Terraform**: Go through a series of coding exercises that cover Terraform modules, file layout, keeping code DRY, team workflows, and automated testing.	Lab Practice, Assignment and Quiz	10
6.	**Immutable infrastructure:** Overview of immutable infrastructure practices, versioning artifacts, promoting artifacts through environments, and deployment.	Lab Practice, Assignment and Quiz	10
7.	**Packer introduction:** Build your own AMIs and other virtual machine images using Packer. **Docker introduction**: Create your own Docker images and deploy them using Docker orchestration tools.	Lab Practice, Assignment and Quiz	10
8.	**DevOps best practices**: Learn about continuous integration, micro services, feature toggles, canary deployments, monitoring, alerting, and log aggregation.	Lab Practice, Assignment and Quiz	10
9.	**Production readiness review:** A Gruntwork engineer goes through a checklist of questions with your team to see what work you need to do to be ready for prod. **Architecture deployment:** Deploy your customized Reference Architecture in AWS.	Lab Practice, Assignment and Quiz	10
10.	**Migrating to the new architecture:** Learn the process of migrating your apps and data to the new architecture.	Lab Practice, Assignment and Quiz	10
Total			**100**

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, 4,	Any 2 questions are to be answered
II	3 Questions to be set of 20 Marks Each	5, 6, 7, 8,	Any 2 questions are to be answered
III	2 Questions to be set of 20 Marks Each	9, 10	Any 1 question is to be answered

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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**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration:**3 Hrs**	

No	Content	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

References:

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	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

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User Interface Design Practices		
Sl.No	**Activity**	**Weightage**
1	Find two examples of user interfaces (might be desktop software, web applications, smartphone apps, consumer devices, car dashboards, building entrances, traffic intersections, shower controls, etc), one that you consider a good design and one that you consider a bad design. For each interface, you should: ● Describe its purpose for intended users. ● Analyze its good and bad points of usability with reference to all the dimensions of usability (learnability, visibility, efficiency, errors) Illustrate your analysis with appropriate screenshots or photographs.	5
2	Design a user interface for a specific task that communicates its conceptual model to the user more effectively, so that users are less likely to make this mistake. Sketch your ideas (alternate designs) on a whiteboard. Critique it, and update the designs.	5
3	Guided by the categories below, make a list of what needs to be made visible, and then brainstorm (and sketch) how the interface might make it visible. ● Actions: what can the user do? ● State: what is the current state of the system? ● Feedback: what was the effect of the user's actions	5

4	Explore the undo models used in single-user text editing. Choose a few different kinds of textboxes. Experiment with a web browser's undo model for text editing by typing, deleting, changing properties, and using Undo. Try to figure out: • How many undo streams are there—one, or many? • How is the history divided into undoable units? • How much previous state is recovered when you undo? (Selections? cursor positions?) • What visible feedback does Undo give? (e.g., if the Undo affects a location scrolled out of the box?)	5
5	User-centered design process, by conducting a lightweight UCD process on a few problems in the classroom.	10
6	User Analysis, Task Analysis, Domain Analysis by observing a real environment of people working.	10
7	Designing UIs by sketching.	10
8	Exploring some of the main structuring patterns of GUI software: the view tree, listeners, and model-view-controller using HTML, Javascript, and jQuery, along with a handy online HTML editor.	10
9	Explore low-fidelity prototyping by creating a simple, hand-drawn prototype in less than 5 minutes, and simulating it with another user.	10
10	Information visualization by experimenting with modifications to an existing visualization using a browser.	10
11	Exploring some of the principles and pitfalls of color design and typography.	10
12	Heuristic evaluation of an e-commerce web site. Record the usability problems found. Justify every observation by naming one or more usability heuristics (design principles) that it violates. Assign a severity rating to each problem (cosmetic, minor, major, or catastrophic). Include at least one positive usability comment, again justifying it by naming one or more heuristics.	10

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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
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration:3 Hrs	

No	Content	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.	8 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.	8 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	6 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	6 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.	4 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**	4 Hrs

	Introduction, Real-Life Examples, Case Studies: Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios, Digital forensics case illustrations Online Scams.	

Text Book:

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

References:

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.

Activities

#	TOPICS	ACTIVITY
1	**Introduction to Cybercrime, Cyber offences & Cybercrime**	• Exercise on hash functions and applications. • Message Authentication code • Symmetric and asymmetric algorithms. • Digital Signatures • Quantum shape Cryptology, Crypto libraries for developers • Detecting and protecting against Bitnets https://www.akamai.com/us/en/resources/what-is-a-botnet.jsp https://cryptobook.nakov.com/cryptography-overview
2	**Tools and Methods used in Cybercrime, Phishing and identity theft**	• Implementation of phishing simulator and identify the real time phishing scenario • Ethical hacking using Kali Linux and penetration testing • Exploration and practice of Kali Linux Tools • **Aircrack-ng** : Aircrack-ng is a suite of tools used to assess WiFi network security. • **Nmap** : Network Mapper, also commonly known as Nmap, is a free and open source utility for network discovery and security auditing. • **THC Hydra** : When you need to brute force crack a remote authentication service, Hydra is often the tool of choice. • **Nessus:** Nessus is a remote scanning tool that you can use to check computers for security vulnerabilities. • **WireShark**: WireShark is an open-source packet analyzer that you can use free of charge. • **Categories of SQL Injections** • Implementation of a steganography using various tools like: **Stegosuite, Stegohide, Xiao Steganography, SSuite Picsel, OpenPuff Camouflage** • https://stylesuxx.github.io/steganography/

		• https://manytools.org/hacker-tools/steganography-encode-text-into-image/ • Identifying cross-site scripting vulnerabilities and prevention mechanisms • https://www.veracode.com/security
3	**Cybercrimes and Cybersecurity: The Legal Perspectives, Organizational implications.**	• Guidelines on implications of organization from the view point of cybercrime and cybersecurity
4	**Understanding computer Forensics, Forensics of Hand-held devices**	• **Parrot Security OS**: Parrot **Security** operating system is a Debian-based Linux distribution built by Frozenbox Network for cloud oriented penetration testing. It is a comprehensive, portable **security** lab that you can use for cloud pentesting, computer forensics, reverse engineering and hacking. • **WebGoat:** The WebGoat, is a deliberately insecure web application, which is aimed at helping developers learn about security vulnerabilities. • **Categories of SQL Injections** and test vulnerabilities commonly found in java based applications.
5	**Social, Political, Ethical and Psychological Dimensions**	Real world case studies on various scenarios and detailed discussion on the cybercrimes, applicable law and legal liabilities and modus operandi covered by the criminals. Example; i. Orkut fake profile cases ii. Email account hacking iii. Credit Fraud iv. Online share trading fraud v. Source code Theft vi. Theft of confidential information vii. Software/Music Pyracy viii. Phishing ix. Cyber pornography x. Online sale of illegal articles https://www.slideshare.net/ishmecse13/case-study-on-cyber-crime

6	**Cybercrime: Illustrations, Examples and Case studies**	• Analyzing e-mail header for the following using tools like **WolframAlpha** or **Ipfingerprint** • Determine the sender's geographic Location • Information about sender's IP address

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

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KLE Technological University | Creating Value, Leveraging Knowledge

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
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration:3 Hrs	

No	Content	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.	6 Hrs
5	**Authorization and Authentication Protocols** Authorization: Multilateral Security, Firewalls, Intrusion Detection, Simple Authentication Protocols: Introduction, Simple Security Protocols, Authentication Protocols	6 Hrs
6	**Security Protocols** Real World Security Protocols: Introduction, Secure Socket Layer and TLS, Kerberos, Pretty Good Privacy and S/MIME.	4 Hrs
	Unit – III	
7	**Software Flaws and Malware** Introduction, Software Flaws, Malware, Miscellaneous Software Based Attacks, software tamper resistance, Digital Rights Management.	04 Hrs
8	**Cyber Crimes and Laws** 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.	04 Hrs

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.

References:

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.

Activities

#	TOPICS	ACTIVITY	WEIGHTAGE
1.	Cryptography Basics	Write a program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher	5
2.	Symmetric key encryption	• Write a Java program to implement the DES algorithm logic	5
3.		• Write a C/JAVA program to implement the Rijndael algorithm logic.	10
4.	Symmetric block cipher	• Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java keytool.	10
5.		Write a C/JAVA program to implement the BlowFish algorithm logic	10
6.	Asymmetric cryptographic algorithm	• Write a Java program to implement RSA Algoithm	10
7.		• Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).	10
8.	Secure Hash Algorithm	• Calculate the message digest of a text using the SHA-1 algorithm in JAVA.	10
9.	Intrusion detection System	• Explore the Intrusion Detection System "Snort"	10
10.		• Study of Anti-Intrusion Technique – Honey pot	10

	IP security	• Study of IP based Authentication	10
TOTAL			100

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

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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
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration:3 Hrs	

No	Content	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, Overridding 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	**08 Hrs**

	Handing, 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.	
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 CloneableObjects(IConeable), Building Comparable Objects(IComparable), 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 inline SQL Statements, using stored procedures , Executing select commands, SQL transaction	**04 Hrs**

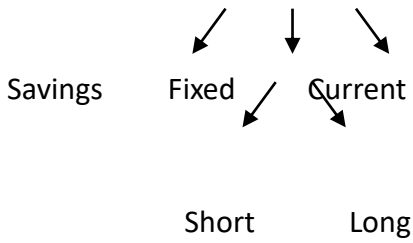
Text Book:

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

References:

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

Activities

#	Exercise	Slot
1	a) Write a C# program which provides methods for calculating the HYPOTENUSE of a triangle & AREA of a circle. The methods should demonstrate the boxing & unboxing techniques. b) Write a C# program to convert a Decimal number to its binary equivalent and vice versa using methods. The program should illustrate the use of reference variables and output variables.	1
2	Write a C# program to create a shopping list of electronic goods & another of books. Provide options to add item at specified location, to append an item, to delete an item. The shopping lists have to be merged & sorted alphabetically.	1
3	Design a C# structure CUSTOMER, with data members - name, account number, balance & account status (enumerated type – current /overdue /delinquent). Write a C# program to implement the above through structure variables & display customer's details categorized by account status.	1
4	Design an abstract class BankAccount with necessary data members. Derive the following classes. BankAccount  The Savings class provides with cheque book facility, withdrawal & deposit facility. The Current class provides only withdrawal & deposit facility. The Fixed class is derived by 2 classes Short term (1 to 2 years @ 8%) & Long term (3 to 5 years @ 10%). Write a driver program for this	1
5	Design an interface in C# for displaying product details like Product List, Product Features, Product color & price. Implement the interface for the products Car & Mobile Phones. Write a driver program for this.	2
6	Design a C# class Point (with 2 integer members x & y & necessary data members). The class should overload binary operators (+, -), unary	1

	operators (++,--), equality operators (==, !=) & comparison operators (<,>). Implement structured exceptional handling for your class. Write a driver program for this.	
7	Design a C# class RESULT to calculate the Internal Assessment marks of a student (minor1 + minor2 + assignment). Use delegate feature for this application. Write a driver program for this.	1
8	Implement an windows form application for demonstrating CRUD operations using SQL server as backend database.	2

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
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration:3 Hrs	

No	Content	Hrs
	Unit I	
1	**Statistical Analytics and Basics in Probability** Knowledge discovery: finding structure in data, Data quality versus data quantity, Statistical modeling 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 Book:

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, 2014.

References:

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, 2012

Activities

#	Exercise	Hours
1	Simulate concepts of Null hypothesis with defined data sets	20
2	Solve probability distributions (discrete and continuous random variable) with real world problems	20
3	Experiment statistical parameters (mean, variance, expectation, frequencies, p-values etc)	20
4	Regression, Correlation analysis, The correlation coefficient and Rank correlation	20
5	Case study on real world scenario related to data analytics	20

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

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KLE Technological University | Creating Value, Leveraging Knowledge

Program: Master of Computer Applications		Semester: III
Course Title: Full Stack Development with MERN		Course Code: 23ECAE808
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 6
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration:3 Hrs	

No	Content	Hrs
	Unit I	
1	**Introduction** MERN components, .Why MERN?, Server-less Hello World, Express, Separate script file, Transform, Automate.	3 Hrs
2	**React Components and React State** React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition. Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components.	5 Hrs
3	**Express and GraphQL** Express, REST API, GraphQL, GraphQL Schema File, List API, Integrate List API, Create API, Integrate Create API, Query Variables, Input Validations, Displaying Errors.	8 Hrs
	Unit II	
4	**Introduction to MongoDB** Introducing MongoDB, Key features of MongoDB, MongoDB shell, MongoDB databases, MongoDB collections, MongoDB CRUD operations .	5 Hrs
5	**Introduction to Mongoose** Introducing Mongoose, Understanding Mongoose schemas, Extending your Mongoose schema, Defining custom model methods, Model validation, Using Mongoose middleware, Using Mongoose DBRef.	5 Hrs
6	**React Router and Forms** Simple Routing, Route Parameters, Query Parameters, Links, Programmatic Navigation, Nested Routes, Browser History Router, Controlled Components, Form Inputs, Update API, Delete API	6 Hrs
	Unit – III	
7	**Server Rendering** Basic Server Rendering, Server Router, Data from APIs, Syncing Initial Data, Common Data Fetcher, Nested Components.	4 Hrs
8	**Authentication and Deployment** Sign-In UI, Google Sign-In, JSON Web Tokens, Authorization, React Context, CORS with Credentials, Server Rendering with Credentials, Git Repositories, MongoDB, Heroku, The API Application, The UI Application.	4 Hrs

Text Book:

1. Pro MERN Stack, 2nd Edition by Vasan Subramanian, published by Apress

References:

1. Amos Q, Haviv, MERN Web Development, Packt Publishing 2014

2. COLIN J. IHRIG, Full Stack Javascript Development with MERN, Sitepoint.2.

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

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Program: Master of Computer Applications		Semester: IV
Course Title: Capstone Project Work		Course Code: 23ECAP803
L-T-P: 0-0-13	Credits: 13	Contact Hrs: 250
ISA Marks: 100	ESA Marks: 100+50	Total Marks: 100
Teaching Hrs: Full Time	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.		

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IV Semester MCA- Elective Courses (MOOC)

Program: Master of Computer Applications		**Semester: IV**
Course Title: Deep Learning		**Course Code: 23ECAE809**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hrs: 3**
ISA Marks: 100	**ESA Marks: 00**	**Total Marks: 100**
Teaching Hrs: 40	**Exam Duration: ---**	

No	Content	Hrs
	Unit I	
1	**Deep Learning Intuition** Introduction to deep learning, Neural Network Basics, Batch Normalization in Neural Networks.	**3 Hrs**
2	**Adversarial Examples and Generative Adversarial Networks** Attacking neural networks with Adversarial Examples and Generative Adversarial Networks, Shallow Neural Networks, Key concepts on Deep Neural Networks, Building your Deep Neural Network: step by step, Deep Neural Network – Application. Explaining and Harnessing Adversarial Examples, Generative Adversarial Nets, Conditional GAN, Super-Resolution GAN, CycleGAN.	**7 Hrs**
3	**Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization** Practical aspects of deep learning, Optimization algorithms, Initialization, Regularization, Gradient Checking, Optimization, Hyperparameter tuning, Batch Normalization, Programming Frameworks.	**6 Hrs**
	Unit II	
4	**Convolutional Neural Networks** A guide to convolution for deep learning, The basics of ConvNets, Deep convolutional models, Visualizing and Understanding Convolutional Networks, Deep Inside Convolutional Networks: Visualizing Image Classification Models, Understanding Neural Networks Through Deep Visualization. • Convolutional Model: application • Keras Tutorial • Residual Networks.	**8 Hrs**
5	**Interpretability of Neural Networks** Detection Algorithms, Special Applications: Face Recognition & Neural Style Transfer, Dropout: A Simple Way to Prevent Neural Networks from Overfitting, DenseNet: Densely Connected Convolutional Networks.	**8 Hrs**
	Unit – III	
6	**Recurrent Neural Networks : Deep Reinforcement Learning** Introduction to Recurrent Neural Network, Building a Recurrent Neural Network - Step by Step • Character-level Language Modeling	**8 Hrs**

	• LSTM • Natural Language Processing and Word Embeddings • Sequence Models and Attention Mechanism • Operations on Word Vectors - Debiasing • Emojify! • Neural Machine Translation with Attention • Trigger Word Detection	

Text Book:

References:

1. Deep Learning, By Ian Goodfellow, Yoshua Bengio and Aaron Courville.
2. Deep Learning Tutorial, By LISA Lab, University of Montreal.
3. Deep Learning: Methods and Applications, By Li Deng and Dong Yu.
4. First Contact with TensorFlow, get started with Deep Learning Programming, By Jordi Torres.
5. Neural Networks and Deep Learning, By Michael Nielsen.
6. Advanced Machine Learning with Python Paperback, 28 Jul 2016 by John Hearty.

#	TOPICS	ACTIVITY
1	Deep Learning Intuition	• Python Basics with Numpy (Optional) • Implementation of Logistic Regression with a neural network mindset.
2	Adversarial Examples and Generative Adversarial Networks	• Building Shallow Neural Networks • Planar data classification with a hidden layer
3	Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization	• Working with Optimization Algorithms – Initialization, Regularization, Gradient Checking, Optimization • Working with Hyperparameter tuning & Batch Normalization. • Bird recognition in the city of Peacetopia (case study) • Autonomous driving (case study) • Tensorflow Tutorial
4	Convolutional Neural Networks & Interpretability of Neural Networks	• Building Convolutional Model: step by step • Keras Tutorial. • Working with Residual Networks

		• Working on Face Recognition & Neural Style Transfer • Car Detection with YOLO – Case Study
5	Recurrent Neural Networks : Deep Reinforcement Learning	• Building a Recurrent Neural Network - Step by Step • Dinosaur Land -- Character-level Language Modeling • Jazz improvisation with LSTM • Operations on Word Vectors - Debiasing • Neural Machine Translation with Attention • Trigger Word Detection

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	100
ESA	---
Total	100

Back

Program: Master of Computer Applications		Semester: IV
Course Title: Blockchain Technology		Course Code: 23ECAE810
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	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.** 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.	5 hrs
	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:

1. William Perry: Effective Methods for Software Testing(Second edition) John wiley 1999
2. Bezier B : Software Testing Techniques (Second edition) Van Nostrand Reinluold 1990

Activities

#	Practices
1.	Implementation of basic cryptographic algorithms such as AES, ECC, RSA, ECDSA, SHA256.
2.	Implementation of cryptographic primitives such as hash functions and digital signatures.
3.	Implementation of P2P blockchain application.
4.	Implementation of Interface for the cryptocurrency application such as wallet application and explorer application.
5.	Implement decentralized application development using MultiChain blockchain framework by considering real time use case.
6.	Develop decentralized application using smart contract concept in NEO and Ethereum blockchain platforms by considering real time use case.
7.	Simulation of double spend attack on the Bitcoin unconfirmed transaction.

Evaluation Scheme

In Semester Assessment (ISA)

Assessment	Marks
ISA	**100**
ESA	**---**

Total	**100**

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
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	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:		
References: **1.** Spark: The Definitive Guide: Big Data Processing Made Simple 1st Edition, Publisher: O'Reilly Media; 8 February 2018. 2. Apache Spark in 24 Hours, Sams Teach Yourself, Publisher : Sams Publishing; 1st edition (7 November 2016) 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

KLE Technological University | Creating Value, Leveraging Knowledge

Program: Master of Computer Applications		Semester: IV
Course Title: Software Practices & Testing		Course Code: 23ECAE812
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	Unit I	
1	**Software Practice- I** Style: Names, Expressions & Statements, Consistency & Idioms, Function Macros, Comments, Interfaces: Comma separated values, A prototype library, Interface principles, Resource Management, User Interfaces.	4 Hrs
2	**Software Practice- II** Algorithms & Data structures: Searching, Sorting, Libraries, Growing arrays, Lists, Trees, Hash tables, Design & Implementation: The Markov Chain algorithm, Data structure alternatives, Building the data structure in C, Generating Output, Performance, Lessons.	4 Hrs
3	**Software Practice- III** Performance: A Bottleneck, Timing & Profiling, Strategies for speed, Tuning the code, Space efficiency, Estimation, Portability: Language, Headers & Libraries, program Organization, Isolation, Data Exchange, Byte order, Portability & upgrade, Internationalization.	8 Hrs
	Unit II	
4	**Software Practice- IV** Notation: Formatting data, Regular Expressions, Programmable tools, Interpreters, Compilers & Virtual Machines, Programs that write programs, Using macros to generate code, Debugging: Debuggers, Good Clues & Easy bugs, No clues & hard bugs, last resorts, Non Reproducible bugs, Debugging tools, Other people bugs.	6 Hrs
5	**Six Essentials of Software Testing** The six essentials of software testing, The state of the art & the state of the practice, The clean-sheet approach, Establishing practical perspective, Critical choices: What, When and how to test, Critical disciplines, Frameworks for testing.	2 Hrs
6	**Testing method** Verification Testing: Basic verification methods, getting leverage on verification, Verifying documents at different phases, getting the best from verification, Three critical success factors for implementing verification, Recommendation, Validation Testing: Validation overview, validation methods, Validation methods, Recommendation strategies for validation testing, Controlling validation costs: Minimizing the cost performing tests, cost of maintaining the tests, Minimizing validation test ware development costs, Recommendation. Measurements: Useful and other interesting measures, Recommendations	8 Hrs
	Unit – III	

7	**Testing tasks, Deliverables and Testing tools.** Testing tasks, deliverables, & chronology, Master test planning ,Verificationtesting tasks and deliverables, Validation testing tasks and deliverables, A testing orphan.Software testing tools: Categorizing testing tools, Tool acquisition.	**4 Hrs**
8	**Managing Testing Technology** Organization approach to testing: Organizing and Reorganizing testing, Structural design elements, Approach to organizing the test functions, Selecting the right approach: Current practice, trends, challenges, GUIs: What is new here, Usage testing, tester to developer ratios, Software measures and practices benchmark study, Getting sustainable gains, Getting gains to happen, getting help, follow up, Standards relevant to software engineering and testing, Verification check lists.	**4 Hrs**

Text Book:

1. Brian W. Kernighan and Rob Pike: The practice of programming, Addison-Wesley, 1999.
2. Edward kit: Software testing in the Real World,Addison-Wesley,1995

References:

1. William Perry: Effective Methods for Software Testing(Second edition) John wiley 1999
2. Bezier B : Software Testing Techniques (Second edition) Van Nostrand Reinluold 1990

Activities

#	TOPICS	ACTIVITY
1	Software Practice- I	• **Practice of Programming** Example Naming style, Expression and statements usage. • **Usage** of Function Macros. • **Proper usage** of Comments in the programming. • **Working** with CSV, Prototype libraries. • Designing user interface (Case study)
2	Software Practice- II	• **Working** with different types of Algorithms like Searching, Sorting. • **Working** with different types of Data structures like Growing Arrays, List, Trees, Hash table. • **Design and Implementation** of Markov Chain algorithm.
3	Software Practice- III	• **Identifying** algorithm performance and improving algorithm performance by rewriting. • **Usage** of Timing and Profiling like Time in UNIX, Clock in C language. • **Practice** on tuning the code.
4	Software Practice- IV	• **Identifying** right language for given task. • **Working** on Programmable tools like Shell, AWK. • **Using** Macros to generate the code. • **Working** with Debugging tools.
5	Six Essentials of Software Testing	• **Understanding** Essentials of Software testing.
6	Testing method	• **Verification** testing method like Inspections, Walkthroughs, and Buddy checks practice on case study. • **Installing** Gtest and JUnit testing framework. • **Designing** test cases for given problem.

7	Testing tasks, Deliverables and Testing tools.	• **Installing** selenium automation testing tool • **Working** with selenium testing tool
8	Managing Testing Technology	• **Understanding** organization approach for testing. • **Selecting** right approach while testing. • **Working** with GUI design.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	**Marks**
ISA	**100**
ESA	**---**
Total	**100**

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Program: Master of Computer Applications		Semester: IV
Course Title: Virtual Reality Systems		Course Code: 23ECAE813
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	Unit I	
1	**Virtual Reality and Virtual Environment and The Historical Development of VR** Introduction, Computer graphics, Real-time computer graphics, Flight Simulation, Virtually environments, Virtually here, What is required?, The benefit of virtual reality, Historical Development of VR: Introduction, Scientific landmarks.	4 Hrs
2	**3D Computer Graphics** Introduction, The virtual world space, Positioning the virtual observer, The perspective projection, Human vision, Stereo perspective projection, 3D clipping, Color theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hiddeny-surface removal, Realism, Stereographic image	4 Hrs
3	**Geometric Modelling and Geometric Transformations** Introduction, From 2D to 3D, 3D space curves, 3D boundary representation, Other Modelling Strategies, Frames of reference; Geometric Transformations: Introduction, Frames of reference, Modelling Transformations, Instances, Picking, Flying, Scaling the VE, Collision Detection.	4 Hrs
4	**A generic VR System** Introduction, The virtual environment, The computer Environment, VR technology, Modes of Interaction, VR systems.	4 Hrs
	Unit II	
5	**Interacting with the Virtual World** User Interface Metaphors-Key Interactions: Manipulation, Navigation, and Communication, Manipulating a Virtual World-Manipulation Methods, Properties of Manipulation, Selection, Manipulation Operations, Manipulation Summary, Navigating in a Virtual World-Wayfinding, Trave, Navigation Summary, Interacting with Others- Shared Experience Collaborative Interaction, Interacting with the VR System (Metacommands)	8 Hrs
6	**The Virtual Reality Experience** Immersion-Physical/Sensory Immersion, Mental Immersion The Role of Realism in Immersion Point of View Venue, Rules of the Virtual World: Physics-Types of Virtual World Physics, User Interaction with the World Physics, Simulation/Mathematical Model, Object Co-interaction, World Persistence, Interference from the Physics of the Real World, Substance of the Virtual World - World Geography, Objects, Agents, User Interface Elements	8 Hrs
	Unit – III	

7	**Experience Design. Applying VR to a Problem** Will VR Meet Your Goals? - Is VR the Appropriate Medium?, Creating a VR Application - Adapting from Other Media, Adapting from an Existing VR Experience, Creating a New VR Experience, Designing a VR Experience- Design Deliberately, Design with the System in Mind, Design with the Venue in Mind, Design with the Audience in Mind, Consider Design Tradeoffs, Design the User Objective, Design the End of the Experience, Document, Deploy, and Evaluate the Experience, The Future of VR Design	**4 Hrs**
8	**The Future of Virtual Reality** The State of VR - Technology Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment, Plateau of Productivity, The Field of VR Research, Trends, Technology Futures - Display Technologies, Input Technologies, Software - Hardware Interface Software, Application Development Software, Application Futures	**4 Hrs**

Text Book:

1. John Vince, Virtual Reality Systems , Pearson, 2002
2. William R. Sherman, Alan B. Craig, Understanding Virtual Reality, Inteface, Application and Design, MORGAN KAUFMANN PUBLISHERS, 2003

Activities

#	TOPICS	ACTIVITY
1	**Getting Started**	Demonstrate the following: • The Dashboard interface • Creating a new scene • The Sumerian editor interface
2	**Amazon Sumerian Basics: Create your first scene**	Learn and accomplish the following: • Create a room with primitive entities (Box) • Cover lighting basics • Import entities from the asset library • Place and move objects • Create interactive behaviors using the State Machine • Add basic animations
3	**State Machine Basics**	Build **behaviors**, using a collection of **States** that are connected by **Transitions**, as an entity transitions from one state to another.
4	**Events Basics**	Create a simple action to rotate a *Box* entity when we click a *Sphere*.
5	**Timeline Basics**	Animate a drone to fly around a large sphere using the **Timeline** and **Keyframes**. The **Timeline** enables you to create animations and movements for scene entities. You can also trigger them by actions you set in the **State Machine**.
6	**Importing third Party Assets**	Import asset bundles that consist of multiple files by dragging and dropping them onto the canvas. Using this capability, you can import .obj files, .mtl files, meshes, materials, and textures using a single drag and drop.

7	**Material Fundamentals using the Classic Shader**	Demonstrate the concepts of adding Textures and optimizing the Material component by working with sphere Primitives.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	Marks
ISA	**100**
ESA	**---**
Total	**100**

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KLE Technological University | Creating Value, Leveraging Knowledge

Program: Master of Computer Applications		Semester: IV
Course Title: Internet of Things		Course Code: 23ECAE814
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	Unit I	
1	**Introduction to Internet of Things (IoT)** Definition & Characteristics of IoT, Physical Design of IoT: IoT protocols, Logical Design of IoT: IoT functional blocks, communication models and APIs.	6 Hrs
2	**IoT Enabling Technologies** Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates.	5 Hrs
3	**Domain specific IoTs** Home Automation ,Cities, Environment ,Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	5 Hrs
	Unit II	
4	**IoT Platforms Design Methodology** IoT Design Methodology, Case Study on IoT System for Weather Monitoring.	4 Hrs
5	**IoT systems – Logical design using Python** Introduction to Python, Data types, data structures, Control of flow, functions modules, packages, file handling, data/time operations, classes, Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib.	5 Hrs
6	**IoT Physical Devices and Endpoints** Basic building blocks of an IoT device, Exemplary device: Rasyberry Pi, interface (serial, SPI, I2C), Programming Rasyberry Pi with Python.	7 Hrs
	Unit – III	
7	**IoT Physical Servers & Cloud Offerings** Introduction to Cloud Storage models and communication APIs ,Webserver – Web server for IoT, Cloud for IoT, Python web application framework, Designing a RESTful web API	4 Hrs
8	**Case Studies Illustrating IoT Design** Home Automation-smart lighting, home intrusion detection, Cities-smart parking.	4 Hrs

Text Book:

Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”

Universities Press, 2015.

References:

1. Internet of Things Principles and Paradigms, Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufmann, Elsevier, 2016
2. Matt Richardson & Shawn Wallace, “Getting Started with Raspberry Pi”, O'Reilly (SPD), 2014.

Activities

#	TOPICS	ACTIVITY
1	**Introduction to Internet of Things (IoT)**	Presentation on IoT.
2	**Domain specific IoTs**	Presentation on IoT applications.
3	**IoT systems – Logical design using Python**	Exploring & practicing Python libraries for interfacing with IoT devices like Aurdino, Raspberry Pi and sensors.
4	**IoT Physical Devices and Endpoints** **&** **IoT Physical Servers & Cloud Offerings**	1. Easy Motion and Gesture Detection by PIR Sensor. 2. Soil Moisture Sensor using moisture sensor. 3. Humidity and Temperature Monitoring System using DTH sensor. 4. Remote for TV. 5. Color Recognition system. 6. Connecting all the systems with free cloud services like Thinkspeak, Blink Android app.
5	**IoT Design**	Case study on Home Automation.

Evaluation Scheme

2. In Semester Assessment (ISA)

Assessment	**Marks**
ISA	**100**
ESA	**---**
Total	**100**

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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
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	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, 3rd 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.

References:

1. Raj Kamal , Mobile Computing, Oxford University Press.

Activities

#	TOPICS	ACTIVITY
1	**Mobile Computing Through Telephony**	Implement respond to incoming SMS messages using Twilio library or any other similar services. • https://www.twilio.com/docs/sms
2		• Build an Interactive Voice Response (IVR) Phone Tree
3		Implement missed call service for your business using cloud telephony network https://www.ivrguru.com/missed-call-number-services
4	**Emerging Technologies.**	Design and Implement RFID-Based Information System
5		Implement Blue Tooth Application by using android Bluetooth API's in android applications to perform the following functionalities. • Scan for the available Bluetooth devices within the range • Use local Bluetooth adapter for paired Bluetooth devices • Connect to other devices through service discovery • Transfer data to and from other devices Manage multiple connections
6		Design a location tracking App using GPS in Android Studio.

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
ISA Marks: 100	ESA Marks: 00	Total Marks: 100
Teaching Hrs: 40	Exam Duration:	

No	Content	Hrs
	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 Approvals, Collaboration, Content File Management, Permissions, A Summary of Editorial Tools	4 Hrs

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** ○ 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)	Select Create Joomla Modules for the website such as Feed Display Module, Footer Module, Latest News Module, Search Module, Random Image Module, Who's Online Module etc.	20

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

Activities

#	TOPICS	ACTIVITY
1	Software Practice- I	• **Practice of Programming** Example Naming style, Expression and statements usage. • **Usage** of Function Macros. • **Proper usage** of Comments in the programming. • **Working** with CSV, Prototype libraries. • Designing user interface (Case study)
2	Software Practice- II	• **Working** with different types of Algorithms like Searching, Sorting. • **Working** with different types of Data structures like Growing Arrays, List, Trees, Hash table. • **Design and Implementation** of Markov Chain algorithm.
3	Software Practice- III	• **Identifying** algorithm performance and improving algorithm performance by rewriting. • **Usage** of Timing and Profiling like Time in UNIX, Clock in C language. • **Practice** on tuning the code.
4	Software Practice- IV	• **Identifying** right language for given task. • **Working** on Programmable tools like Shell, AWK. • **Using** Macros to generate the code. • **Working** with Debugging tools.
5	Six Essentials of Software Testing	• **Understanding** Essentials of Software testing. •
6	Testing method	• **Verification** testing method like Inspections, Walkthroughs, and Buddy checks practice on case study. • **Installing** Gtest and JUnit testing framework. • **Designing** test cases for given problem.

7	Testing tasks, Deliverables and Testing tools.	• **Installing** selenium automation testing tool • **Working** with selenium testing tool
8	Managing Testing Technology	• **Understanding** organization approach for testing. • **Selecting** right approach while testing. • **Working** with GUI design.

Evaluation Scheme

1. In Semester Assessment (ISA)

Assessment	**Marks**
ISA	**100**
ESA	**---**
Total	**100**

****

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