SCHEME AND CURRICULUM BOOK

MASTER OF COMPUTER APPLICATIONS

PG DEGREE 2 YEAR PROGRAMME

Engineering and Technology

(w.e.f. Session 2024-2025)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Gurugram University, Gurugram, Haryana

Gurugram University, Gurugram

GENERAL COURSE STRUCTURE AND CREDIT DISTRIBUTION

CREDIT DISTRIBUTION

POSTGRADUATE PROGRAMME

Scheme of Programme Master of Computer Applications (MCA)

(Scheme PG A1: Postgraduate Programmes (Course work only))

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
	Core Course(s)													
CC-A01	Computer Fundamentals and Programming in C	241/MCA/CC101	3	-	2	3	-	1	4	25	50	5	20	100
CC-A02	System Software and Operating Systems	241/MCA/CC102	3	-	2	3	-	1	4	25	50	5	20	100
CC-A03	Artificial Intelligence and Applications	241/MCA/CC103	3	-	2	3	-	1	4	25	50	5	20	100
	Discipline Specific Elective Courses													
DSE-01	Web Designing fundamentals	241/MCA/DS101	2	-	2	2	-	1	3	15	35	5	20	75
	Multidisciplinary Course(s)													
MDC-01	One from the pool	241/MCA/MD101	3	-	-	3	-	-	3	25	50	-	-	75
	Ability Enhancement Course(s)													
AEC-01	One from the pool	241/MCA/AE101	2	-	-	2	-	-	2	15	35	-	-	50
	Value-added Course(s)													
VAC-01	One from the pool	241/MCA/VA101	2	-	-	2	-	-	2	15	35	-	-	50
Total Credits									**22**					**550**

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
	Core Course(s)													
CC-A04	Database management and management	241/MCA/CC201	3	-	2	3	-	1	4	25	50	5	20	100
CC-A05	Data Structures and Algorithms	241/MCA/CC202	3	-	2	3	-	1	4	25	50	5	20	100
CC-A06	Object oriented programming using Java	241/MCA/CC203	3	-	2	3	-	1	4	25	50	5	20	100
	Discipline Specific Elective Courses													
DSE-02	Security in Computing	241/MCA/DS201	3	-	-	3	-	-	3	25	50	-	-	75
	Multidisciplinary Course(s)													
MDC-02	One from the pool	241/MCA/MD201	3	-	-	3	-	-	3	25	50	-	-	75
	Ability Enhancement Course(s)													
AEC-02	One from the pool	241/MCA/AE201	2	-	-	2	-	-	2	15	35	-	-	50
	Skill Enhancement Course(s)													
SEC-01	One from the pool	241/MCA/SE201	1	-	2	1	-	1	2	5	20	5	20	50
Total Credits									**22**					**550**

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A07	Software Engineering	241/MCA/CC301	3	-	2	3	-	1	4	25	50	5	20	100
CC-A08	Computer System Architecture	241/MCA/CC302	3	1	-	3	1	-	4	30	70	-	-	100
CC-A09	Data Communications and Computer Networks	241/MCA/CC303	3	-	2	3	-	1	4	25	50	5	20	100
Discipline Specific Elective Courses														
DSE-03	Full stack programming-1	241/MCA/DS301	2	-	2	2	-	1	3	15	35	5	20	75
Multidisciplinary Course(s)														
MDC-03	One from the pool		3	-	-	3	-	-	3	25	50	-	-	75
Skill Enhancement Course(s)														
SEC-02	One from the pool		1	-	2	1	-	1	2	5	20	5	20	50
Value-added Course(s)														
VAC-02	One from the pool		2	-	-	2	-	-	2	15	35	-	-	50
Seminar														
Seminar		241/MCA/SM301	2	-	-	2	-	-	2	-	-	-	-	50
Project/Internship/Field Activity#														
		241/MCA/PR301	-	-	8	-	-	4	4	-	-	-	-	100
Total Credits									**28**					**700**

#Four credits of internship earned by a student during summer internship after 2nd semester will be counted in 3rd semester of a student who pursue 2-year PG Programme without taking exit option.

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A10	Soft Computing	241/MCA/CC401	3	-	2	3	-	1	4	25	50	5	20	100
CC-A11	Data Science and visualization	241/MCA/CC402	3	-	2	3	-	1	4	25	50	5	20	100
Discipline Specific Elective Courses														
DSE-04	Full stack programming-2	241/MCA/DS401	2	-	2	2	-	1	3	15	35	5	20	75
Multidisciplinary Course(s)														
MDC-04	One from the pool		3	-	-	3	-	-	3	25	50	-	-	75
Ability Enhancement Course(s)														
AEC-03	One from the pool		2	-	-	2	-	-	2	15	35	-	-	50
Community Engagement/Field Work/Survey/Seminar/Project														
Seminar		241/MCA/SM401	-	-	12	-	-	6	6	-	-	-	-	150
Total Credits									**22**					**550**

Multidisciplinary Course from the department for pool of the Courses in the University

(These courses are to be offered to students of different discipline/Subject)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-1	Digital Electronics	241/MCA/MD101	3	-	-	3	-	-	3	25	50	-	-	75

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-2	Discrete Mathematics OR Modelling and Simulation	241/MCA/MD201 241/MCA/MD202	3	-	-	3	-	-	3	25	50	-	-	75

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-3	Probability and Statistics OR Fundamentals of electrical and electronics science	241/MCA/MD301 241/MCA/MD302	3	-	-	3	-	-	3	25	50	-	-	75

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-4	Cloud, edge and fog computing OR Internet of Things	241/MCA/MD401	3	-	-	3	-	-	3	25	50	-	-	75

Skill Enhancement Course from the department for pool of the Courses in the University

(These courses are offered by each department for students of other departments/same department and is designed to provide value-based and/or skill-based knowledge and should contain both theory and lab/hands-on/training/field work.)

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
SEC-1	Problem solving using python programming	241/MCA/SE201	1	-	2	1	-	1	2	5	20	5	20	50

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
SEC-2	Mobile Application Development	241/MCA/SE301	1	-	2	1	-	1	2	5	20	5	20	50

Ability Enhancement Course from the department for pool of the Courses in the University

(These courses are offered by department of Indian and Foreign Languages for students of other departments/same department and leads to enhancement in the ability of learnRegional and foreign languages.)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-1	English Language & Communication Level 1		2	-	-	2	-	-	2	15	35	-	-	50

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-2	English Language & Communication Level 2		2	-	-	2	-	-	2	15	35	-	-	50

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-3	English Language & Communication Level 3		2	-	-	2	-	-	2	15	35	-	-	50

Value Added Course from the department for pool of the Courses in the University

(All the departments will offer value added course for the students of same or different department.)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VAC-1	Environmental studies		2	-	-	2	-	-	2	15	35	-	-	50

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VAC-2	Human Values and Community Outreach		2	-	-	2	-	-	2	15	35	-	-	50

Nature of Work	Course Credits	Contact hours per week	Contact hours per semester (15 weeks)
Lecture	01	01	15
Tutorial per paper	01	01	15
Practical, Seminar, Internship, field practice/project, or community engagement, etc.	01	02	30

Note: Tutorial batch size (UG programme: 20-25, PG Programme: 12-15)

The distribution of credits among the lectures/tutorial/practicum will be as follows:

Courses	Total Credits	L (Credits)	T (Credits)	P (Credits)	MARKS			
					TI	TE	PI	PE
Only Theory	4	3 (3 hrs)	1	-	30	70	-	-
	3	2 (2 hrs)	1	-	25	50	-	-
	2	1	1	-	15	35	-	-
Theory and Practicum	4	3 (3 hrs)	-	1 (2 hrs)	25	50	5	20
	4 (Where pract. is ominant)	2 (2 hrs)	-	2 (4 hrs)	15	35	15	35
	3	2 (2 hrs)	-	1 (2 hrs)	15	35	5	20
	2	1	-	1 (2 hrs)	5	20	5	20
When Practicum is separate course	2	-	-	2 (4 hrs)	-	-	15	35
	3	-	-	3 (6 hrs)	-	-	25	50
	4	-	-	4 (8 hrs)	-	-	30	70
AEC/VAC	2	2 (2 hrs)			15	35	-	-
SEC	3	2 (2 hrs)		1 (2 hrs)	15	35	5	20
	2	1		1 (2 hrs)	5	20	5	20
DSEC	4	3 (3 hrs)		1 (2 hrs)	25	50	5	20
Minor/VOC	4	2 (2 hrs)		2 (4 hrs)	15	35	15	35
Internship	4	--	--	4 (8 hrs)			30	70

L= Lecture; T= Tutorial, P= Practicum; TI= Theory Internal Assessment; TE= Theory End Semester Examination; PI= Practicum Internal; PE= Practicum End Semester examination

Semester 3

Course code	CC-A07			
Category	Core Course			
Course title	**Software Engineering**			
Course ID	241/MCA/CC301			
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1. Understand the fundamental principles and characteristics of software, including its evolution and the evolving role of software in modern systems.

CO2. Apply basic concepts of Software Design, including Architectural Design, Modularization, Design Structure Charts, Flow Charts, and measures of Coupling and Cohesion.

CO3. Define Software Quality attributes and understand Software Quality Assurance plans and activities, including Software Documentation

CO4. Understand the need for Software Maintenance and differentiate between categories such as Preventive, Corrective, and Perfective Maintenance.

UNIT-I

Introduction: Software and its Characteristics, Evolving Role of Software, Software Product. Software Processes. Software Crisis. Software Engineering Evolution. Principles of Software Engineering. Programming-in-the-small vs. Programming-in-the-large. Software Components. Software Engineering Processes.

Software Life Cycle (SLC) Models: Water-Fall Model, Prototype Model. Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Object Oriented Models.

UNIT-II

Software Requirements: Functional and Non-Functional. User requirements. System requirements. Software Requirements Document - Requirement Engineering Process: Feasibility Studies. Requirement's elicitation and analysis, requirements validation, requirements management.

Software Design: Basic Concept of Software Design. Architectural Design. Low Level Design: Modularization. Design Structure Charts. Flow Charts. Coupling and Cohesion Measures.

UNIT-III

Design Strategies: Function Oriented Design. Object Oriented Design. Top- Down and Bottom-Up Design. User Interface Design. Programming practices and Coding standards.

Software Measurement and Metrics: Process Metrics. Project metrics. Estimation-LOC, Halstead's Software Science. Function Point (FP). Cyclomatic Complexity Measures: Software Project Estimation Models- Empirical. Putnam. COCOMO I & II.

UNIT-IV

Software Testing: Introduction. Verification vs. Validation. Software Reliability. Levels of Testing. Structural Testing (White Box Testing). Functional Testing (Black Box Testing).

Software Maintenance: Need for Maintenance. Categories of Maintenance: Preventive. Corrective and Perfective Maintenance. Cost of Maintenance: Software Re-Engineering. Reverse Engineering, Software Documentation.

Textbooks & References:

1. Gill, Nasib Singh. Software Engineering. Khanna Book Publishing Co. (P) Ltd., New Delhi.
2. Pressman, Rogers. Software Engineering. TMH.
3. Jalote, Pankaj. An Integrated Approach to Software Engineering. Narosa Publications.
4. Chhillar, Rajender Singh. Software Engineering: Testing Faults Metrics. Excel Books, New Delhi.
5. Ghezzi, Carlo. Fundamentals of Software Engineering. PHI.
6. Fairley, R. E. Software Engineering Concepts. McGraw-Hill.
7. Lewis, T. G. Software Engineering. McGraw-Hill.
8. Shere. Software Engineering & Management. Prentice Hall.
9. Deutsch, Willis. Software Quality Engineering: A Total Technical and Management Approach. Prentice Hall.

Software Engineering Lab

Experiment List

1. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
2. To perform the user's view analysis for the suggested system: Use case diagram.
3. To draw the structural view diagram for the system: Class diagram, object diagram.

4. To draw the behavioral view diagram: State-chart diagram, Activity diagram
5. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram
6. To perform the implementation view diagram: Component diagram for the system.
7. To perform the environmental view diagram: Deployment diagram for the system.
8. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
9. To perform Estimation of effort using FP Estimation for chosen system.
10. To Prepare time line chart/Gantt Chart/PERT Chart for selected software project

Course code	CC-A08			
Category	Core Course			
Course title	**Computer System Architecture**			
Course ID	241/MCA/CC302			
Scheme and Credits	L	T	P	Credits
	3	1	-	4
Theory Internal	30			
Theory External	70			
Total	100			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1. Understand and apply number systems including Binary, Octal, Hexadecimal, Decimal, and perform interconversion of numbers.

CO2. Understand the architecture and components of Basic Computer Design, including Computer Instructions and Types, Instruction Cycle.

CO3. Analyze CPU Design principles, including CPU Registers, Micro-operations and their types.

CO4. Describe the organization and functionality of Input/Output Systems including Peripheral Devices, Input-Output Interface.

UNIT-I

Number System: Number System: Binary, Octal, Hexadecimal, and Decimal; 1's and 2's Complements; Interconversion of Numbers.

Codes: Weighted and Non-weighted Codes, BCD Codes, Gray Codes, Self-complementing Codes, Error-Detecting/Correcting Codes, Alphanumeric Codes, Hamming Codes.

Floating Point Numbers: Binary Arithmetic, Binary Addition and Subtraction, 2's Complement Arithmetic, Booth Coding, Binary Multiplication.

Logic Design: Logic Gates, Truth Tables, Boolean Algebra, Boolean Expressions- Variables and Literals, Equivalent and Complement of Boolean Expressions, Theorems of Boolean Algebra, SOPs & POSs of Boolean Expressions.

UNIT-II

Combinational Circuits: Combinational Logic, Arithmetic Circuits - Adder and Subtracter, BCD Adder, Code Converters, Parity Generators/Checkers, Multiplexers, Demultiplexers, Decoders, Encoders.

Sequential Circuits: Latches, RS Flip-Flop, , JK Flip-Flop, Master-Slave Flip-Flops.

UNIT-III

Basic Computer Design: Computer Instructions and Types, Instruction Set, Instruction Cycle, Instruction Formats, Addressing Modes, Computer Registers, Bus System, Register Transfer Language Terminology.

CPU Design: CPU Registers, Micro-operations and Types, Design of ALU, Control Unit Design - Microprograms, Control Unit of a Basic Computer, Timing and Control: Hardwired and Micro-programd Controlled Unit, Architectures - RISC, CISC, Scalar, Superscalar, and Pipelined Architectures.

UNIT-IV

Input/Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, Serial Communication.

Advanced Architecture: Introduction to Parallel Processing - Pipelining, Parallel Computer Structures, Architectural Classification, Pipelining & Vector Processing; Instruction and Arithmetic Pipelines, Principles of Designing Pipelined Processors.

Textbooks & References:

1. Mano, M. M. Digital Logic and Computer Design. Prentice-Hall of India.
2. Gill, Nasib Singh and Dixit, J. B. Digital Design and Computer Organisation. University Science Press (Laxmi Publications), New Delhi.
3. Stallings, William. Computer Organisation& Architecture.
4. Anand Kumar. Fundamentals of Digital Circuits. PHI.
5. Hwang, Kai. Advanced Computer Architecture. McGraw-Hill International.
6. Mano, M. M. Computer System Architecture. Prentice-Hall of India.
7. Tokheim. Digital Electronics. TMH.

Course code	CC-A09			
Category	Core Course			
Course title	**Data Communication and Computer Networks**			
Course ID	241/MCA/CC303			
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1: Understand the fundamental concepts of computer communications and networking technologies, including the OSI and TCP/IP reference models, network topologies, and types of networks.

CO2: Analyze and differentiate between various network devices, nodes, hosts, and their functionalities in different network architectures.

CO3: Apply principles of analog and digital communication, modulation techniques, and transmission media to design and troubleshoot effective communication networks.

CO4: Design and implement network services and protocols for reliable and secure data transmission, including connection-oriented and connectionless services, error detection, and correction techniques.

CO5: Understand LAN technologies such as Ethernet, VLANs, and wireless LANs, and understand the configurations of WAN technologies like Frame Relay and ATM.

UNIT-I

Introduction to Computer Communications and Networking Technologies, Uses of Computer Networks, Network Devices, Nodes, and Hosts, Types of Computer Networks and their Topologies, Network Software: Network Design Issues and Protocols, Connection-Oriented and Connectionless Services, Network Applications and Application Protocols, Computer Communications and Networking Models: Decentralized and Centralized

Systems, Distributed Systems, Client/Server Model, Peer-to-Peer Model, Web-Based Model, Network Architecture and the OSI Reference Model, TCP/IP Reference Model, Example Networks: The Internet, X.25, Frame Relay, ATM.

UNIT-II

Analog and Digital Communications Concepts, Concept of Data, Signal, Channel, Bit Rate, Maximum Data Rate of Channel, Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth Capacity, Baud Rate, Asynchronous and Synchronous Transmission, Data Encoding Techniques, Modulation Techniques, Guided and Wireless Transmission Media, Communication Satellites, Switching and Multiplexing, Dial-up Networking, Analog Modem Concepts, DSL Service.

UNIT-III

Data Link Layer: Framing, Flow Control, Error Control; Error Detection and Correction, Sliding Window Protocols, Media Access Control: Random Access Protocols, Token Passing Protocols, Introduction to LAN Technologies: Ethernet, Switched Ethernet, VLAN, Fast Ethernet, Gigabit Ethernet, Token Ring, FDDI, Wireless LANs, Bluetooth, Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways.

UNIT-IV

Network Layer and Routing Concepts: Virtual Circuits and Datagrams, Routing Algorithms, Flooding, Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing, Congestion Control Algorithms, Internetworking, Network Security Issues: Security Threats, Encryption Methods,.

Textbooks & References:

1. Michael A. Gallo, William M. Hancock, Computer Communications and Networking Technologies, CENGAGE Learning.
2. Andrew S. Tanenbaum, Computer Networks, Pearson Education.
3. James F. Kurose, Keith W. Ross, Computer Networking, Pearson Education.
4. Behrouz A. Forouzan, Data Communications and Networking, McGraw-Hill.

Data Communication and Computer Networks Lab

List of Experiment

1. To construct a simple network topology on Packet Tracer.
2. To verify and configure VLAN and VLAN trunk in packet tracer.
3. To construct RJ45 cable.
4. a) To configure simple static routing.

b) To implement Security on interconnecting devices.

5. To configure a Network Topology constitutes Routers and Switches using PacketTracer.

6 Working with complex network topologies.

7. To monitor network traffic using Wire Shark

8. To get the MAC or Physical Address of the system Using Address Resolution Protocol.

9. To Configure network using Routing Information Protocol (RIP)

10. To configure network state routing protocol (OSPF).

11. To configure Border Gateway Protocol.

12. To configure Application Layer protocols: DHCP and DNS.

Course code	DSE-03			
Category	Discipline Specific Elective Course			
Course title	**Full Stack Pogramming-1**			
Course ID	241/MCA/DS301			
Scheme and Credits	L	T	P	Credits
	2	-	2	3
Theory Internal	15			
Theory External	35			
Practical Internal	05			
Practical External	20			
Total	75			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1: Explain the significance of Full Stack Development and distinguish it from traditional web development practices.

CO2: Understand different types of CSS selectors, cascading, inheritance, specificity, and units of measure for specifying width and height of elements.

CO3: Apply the basics of JavaScript programming language including variables, data types, objects, strings, numbers, math operations, arrays, and boolean logic.

CO4: Understand the fundamentals of AngularJS framework including expressions, modules, data binding, scopes.

UNIT-I

Why Full Stack Development? Web development vs FullStack Development, Client-Server architecture, Rules of three-tier architecture, Anatomy of a Website, Web hosting steps, HTML, HTML Document Object Model, W3C standards for HTML, Structural markup, Semantic markup, HTML Lists, Links, Absolute versus relative path names, URL: Anatomy, Types, HTML Formatting, HTML Tables, Meta tags, Structural tags, Character entities, Forms Input Types.

UNIT-II

CSS: W3C CSS Validator, Types, CSS Selectors, Cascading, Inheritance, Specificity, Units of Measure, Width and Height of element, Box Model Layout, Border Box Versus Content Box, Responsive website

Design Bootstrap Grid System, CSS pre-processor: Less, Sass and features.

UNIT-III

JavaScript: Java Script Language Basics, Objects, Strings, Numbers, Math, Arrays, Boolean, JavaScript Scope, JavaScript Events, Comparisons, Conditions, Switch, Loops in JavaScript, JavaScript RegExp, JavaScript Errors, JavaScript Debugging, JavaScript Hoisting, JavaScript Strict Mode, JavaScript Functions, JavaScript Objects, JavaScript Forms, JavaScript HTML DOM, JavaScript BOM, DOM vs BOM.

UNIT-IV

Introduction to AngularJS, AngularJS Expressions, AngularJS Modules, AngularJS Data Binding, AngularJS Scopes, AngularJS Directives & Events, AngularJS Controllers, AngularJS Filters, AngularJS Services, AngularJS HTTP, AngularJS Tables, AngularJS Select, Fetching Data from MySQL.

Textbooks & References:

1. Duckett, Jon. HTML and CSS: Design and Build Websites. Wiley.
2. McFarland, David. CSS: The Missing Manual. O'Reilly Media.
3. Brown, Tiffany B. CSS Master, 3rd Edition. Packt Publishing, 2021.
4. Flanagan, David. JavaScript: The Definitive Guide. O'Reilly Media.
5. Freeman, Adam. AngularJS Programming by Example. Packt Publishing.
6. Frisbie, M. AngularJS web application development cookbook. Packt Publishing.

Full Stack Pogramming-1 Lab

List of Experiment

1. Prepare a survey document of ten website which you like and dislike with various reasons. (Prerequisite)
2. Use table tag to format web page. Also create the Time-Table of your class using table tag.
3. Create your profile page i.e. educational details, Hobbies, Achievement, My Ideals etc.
4. Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site.
5. Design a web page and embed various multimedia features in the page.
6. Design signup form to validate username, password, and phone numbers etc using Java script.
7. Write a JavaScript program to determine whether a given year is a leap year in the Gregorian calendar.
8. Write a JavaScript program to convert temperatures to and from celsius, Fahrenheit.

Course code	MDC-03			
Category	Multidisciplinary Course			
Course title	**Probability and Statistics**			
Course ID	241/MCA/MD301			
Scheme and Credits	L	T	P	Credits
	3	-	-	3
Theory Internal	25			
Theory External	50			
Total	75			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1: Elucidate the basic principles of statistics

CO2: Apply the correlation and regression analysis to engineering problem

CO3: Apply the principles of probability to thermodynamic problems

CO4: Explain probability distribution and solve problems

Unit –I

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: Quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio.

Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, skewness and kurtosis.

Unit – II

Statistical Methods: correlation and regression –Karl Pearson's coefficient of correlation and rank correlation problems, regression analysis-lines of regression, problems.

Curve fitting: curve fitting by the method of least square-fitting the curves of the form

Unit –III

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

Unit –IV

Probability Distributions: Random variables (discrete and continuous), probability mass/density function, Binomial, Poisson, Exponential and normal distributions

Textbooks & References:

1. Gupta, S. C., & Kapoor, V. K. . Fundamentals of Mathematical Statistics. Sultan Chand & Sons.
2. Hogg, R. V., Tanis, E. A., & Rao, J. M. Probability and Statistical Inference (7th ed.). Pearson Education, New Delhi.
3. Goon, A. M., Gupta, M. K., & Dasgupta, B. Fundamentals of Statistics, Vol. I & II. The World Press, Kolkata.
4. Ross, S. M. Introduction to Probability and Statistics for Engineers and Scientists. Academic Press.

Course code	MDC-03			
Category	Multidisciplinary Course			
Course title	**Fundamentals of Electrical and Electronics Engineering**			
Course ID	241/MCA/MD302			
Scheme and Credits	L	T	P	Credits
	3	-	-	3
Theory Internal	25			
Theory External	50			
Total	75			
Duration of Exam	**3 hrs**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OBJECTIVES

CO1. To provide basic knowledge of different elements of electrical and electronics engineering field.

CO2. To familiarize the students with the concepts of electrical circuits and network Analysis.

CO3. To understand the basics of AC and DC circuits.

CO4. To familiarize students to the analysis and design of analog electronic circuits which form the basic building blocks of almost any electronic system.

CO5. To introduce p-n junction theory, operation of the semiconductor devices and their use in basic electronic circuits.

UNIT-I

DC Circuits: Role and importance of circuits in Engineering, Concept of fields, charge, current, voltage, energy and their interrelationships. Electrical circuit elements (R, L and C), voltage and current sources (ideal &Controlled) series and parallel circuits, Network reduction: voltage and current division. Kirchhoff current and voltage laws with their applications (Nodal and Mesh Analysis), Source transformation - star delta conversion. Superposition theorem, Thevenin and Norton Theorems, Millman, Substitution and Reciprocity theorem.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, average, peak and rms values, complex representation of impedance, phasor representation, complex power, real power, reactive power,

apparent power, power factor and Energy, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel),Resonance; Introduction to three- phase circuits

UNIT-III

Introduction to p-n junction diode and its applications. Half wave & full wave rectifiers. clipping and clamping circuits, Varactor, Varistor, Voltage Regulator Bipolar junction transistors and its biasing BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time, Testing of bipolar junction transistor with multi-meter, Reading datasheet of BJT.

UNIT-IV

Field Effect Devices: JFET: basic Operation and characteristics, drain and transfer characteristics, pinch off voltage, parameters of JFET: Transconductance (gm), ac drain resistance (rd), amplification factor(μ), Small Signal Model & Frequency Limitations. MOSFET: basic operation, depletion and enhancement type, pinch-off voltage, Shockley equation and Small Signal Model of MOSFET, MOS capacitor.

Textbooks & References:

1. Hughes, E. Electrical Technology. ELBS.
2. Millman, J., &Halkias, C. Integrated Electronics (2nd ed.). McGraw Hill.
3. Mano, M. M. Digital Logic Design. Phi.
4. Kothari, D. P., &Nagrath, I. J. Basic Electrical Engineering. Tata McGraw Hill.
5. Del Toro, V. Principles of Electrical Engineering. PHI.
6. Sedra, A., & Smith, C. Microelectronic Circuits: Theory and Applications (6th ed.). Oxford University Press.
7. Boylestad, R., &Nashelsky, L. Electronic Devices and Circuit Theory (10th ed.). Pearson.
8. Jain, R. P. Modern Digital Electronics. Tmh.
9. Malvino, A. P., & Leach, D. P. Digital Principles and Applications (8th ed.). TMH Publishers.
10. Tyagi, M. S. Introduction to Semiconductor Materials and Devices. John Wiley & Sons.

Course code	SEC-2			
Category	Skill Enhancement Course			
Course title	**Mobile Application Development**			
Course ID	241/MCA/SE301			
Scheme and Credits	L	T	P	Credits
	1	-	2	2
Theory Internal	30			
Theory External	70			
Total	100			
Duration of Exam	**3 hours**			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

COURSE OUTCOMES:

CO1: Understand the basic concepts and functions of Mobile Application and Android Studio.

CO2: Describe the working and architecture of Android Operating System.

CO3: Design Android UI Layout and Describe activities.

CO4: Design and develop an application using Database.

UNIT I

Android Architecture: Introduction to Android, Features of Android, Android Architecture, Android and File Structure, Layouts – Linear, Relative, Grid and Table Layouts, Views and Resources, Activities and Intents, Activity Lifecycle and Saving State,

User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, List View, Spinner View.

UNIT II

Event Handling – Handling clicks or changes of various UI components.

Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, using Intent to dial a number or to send SMS.

UNIT III

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions

Location and Mapping: Location based services, Mapping, Google Maps activity, Working with MapView and MapActivity; Playing and Recording of Audio and Video in application.

UNIT IV

Persisting Data to files: Saving to Internal Storage, Saving to External Storage

Introduction to SQLite database: creating and opening a database, creating tables, inserting retrieving and deleting data.

Application Signing, API keys for Google Maps, Publishing application to the Android Market.

Textbooks & References:

1. ZigurdMednieks, Laird Dornin, G,BlakeMeike and Masumi Nakamura, Programming Android, O'Reilly Publications.
2. Wei-Meng Lee, Beginning Android Application Development, Wiley India Ltd.
3. Burd, B. Android Application Development All-in-One for Dummies.
4. James C.S., Android Application development for Java Programr, CENGAGE Learning.
5. Pradeep Kothari, Android Application Development: Black Book, Wiley India Ltd.

Mobile Application Development Lab

List of Experiment

1. Installation of Android studio.
2. Development Of Hello World Application
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
4. Create a screen that has input boxes for User Name, Password, Address, Gender(radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout)
5. Design an android application Using different layouts
6. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity
7. Design an android application Send SMS using Intent
8. Create an android application using Fragments
9. Design an android application for menu.
10. Create a user registration application.

VAC-02 Syllabus

Semester 4

Course code	CC-A10			
Category	Core Subject			
Course title	**Soft Computing**			
Course ID	241/MCA/CC401			
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 hrs.			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

Course Outcomes:

CO1: Understand soft computing paradigms including Artificial Intelligence Systems, Neural Networks, Fuzzy Logic, and Genetic Algorithms.

CO2: Develop proficiency in genetic algorithms, including concepts like encoding, fitness functions, and selection methods.

CO3: Study various models of ANNs and their learning algorithms (supervised, unsupervised, reinforcement learning).

CO4: Learn the principles of fuzzy logic, including membership functions, fuzzy sets, and fuzzy inference systems.

UNIT-I

Introduction: Introduction to soft computing, Soft Vs Hard Computing, Different Components of Soft Computing: Artificial Intelligence Systems, Neural Networks, Fuzzy Logic, Genetic Algorithms.

Genetic algorithms: Basic concepts; Encoding; Fitness Function; Reproduction-Roulette wheel, Boltzmann, tournament, rank, and steady state selections; Convergence of GA, Problem Solving using GA.

UNIT-II

Artificial Neural Networks: Introduction to biological and artificial neural network; Different artificial neural network models; Supervised, Unsupervised and Reinforcement Learning; Hebbian Learning, Generalized Hebbian learning algorithm.

Artificial Neural Networks Architecture: Basic building block of an artificial neuron, Activation functions, Introduction to Early ANN architectures: McCulloch & Pitts model; Single Perceptron, Backpropagation networks; Multi-Layer Perceptron; Hopfield Network; Applications of Neural Network.

UNIT-III

Fuzzy systems and applications: NotionofFuzziness, MembershipFunctions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy Control System and Fuzzy Rule Based Systems.

UNIT-IV

Applications: PatternRecognitions,ImageProcessing, BiologicalSequenceAlignment and DrugDesign,RoboticsandSensors,InformationRetrievalSystems,ShareMarketAnalysis, Natural Language Processing.

Textbooks&References:

1. M.Mitchell:AnIntroductiontoGeneticAlgorithms,Prentice-Hall.
2. J.5.R.Jang, C.T.Sun and E.Mizulani; Neuro-Fuzzyand Soft Computing, PHI, Pearson Education.
3. TimothyJ.Ross:FuzzyLogicwithEngineeringApplications, McGraw-ill.
4. DavisE.Goldberg:GeneticAlgorithms:Search,OptimizationandMachine Learning. Addison Wesley.
5. S.RajasekaranandG.A.V.Pai:NeuralNetworks,FuzzyLogicandGenetic Algorithms, PHI.
6. D.E.Goldberg:Genetic AlgorithmsinSearch,Optimization, andMachineLearning, Addison-Wesley.

Soft Computing Lab

List of experiments

1. WAP to implement Artificial Neural Network
2. WAP to implement Activation Functions
3. WAP to implement Adaptive prediction in ADALINE NN
4. WAP to implement LMS and Perceptron Learning Rule
5. WAP to implement ART NN
6. WAP to implement BAM Network

7. WAP to implement Full CPN with input pair
8. WAP to implement discrete Hopfield Network
9. WAP to implement Hebb Network
10. WAP to implement Hetro associate neural net for mapping input vectors to output vectors

Course code	CC-A11			
Category	Core Subject			
Course title	**Data science and Visualization**			
Course ID	241/MCA/CC402			
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 hrs.			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

Course Outcomes:

CO1: Understand and implement the basics of programming in Python.

CO2: Apply the Numpy package for numerical calculations in Python.

CO3: Apply Pandas package for loading and preprocessing data in Python. Implement various data visualization tools of Python on real world data.

CO4: Understand and implement the Machine Learning Concepts in Python

Unit I

Overview of Python Programming Concepts: The concept of data types; variables, assignments; numerical types; operators and expressions; Control Structures; String manipulations; File Handling – creating, reading/writing text/number files; Dictionaries; Functions; OOPs Concepts

Unit II

Introduction to Numpy: Creation on Array ,Array generation from Uniform distribution, Random array generation, reshaping, maximum and minimum, reshaping, Arithmetic operations, Mathematical functions, Bracket Indexing and Selection, Broadcasting, Indexing a 2D array (matrices); Data Manipulation with Pandas -Creating a Series - from lists, arrays and dictionaries, Storing data in series from intrinsic sources, Creating Data Frames, Imputation, Grouping and aggregation, Merging, Joining, Concatenation, Find Null Values or Check for Null Values, Reading data from csv, txt, excel, web.

Unit III

Introduction to Visualization - Installing and setting up visualization libraries, Canvas and Axes, Subplots, Common plots – scatter, histogram, boxplot, Logarithmic scale, Placement of ticks and custom tick labels, Pandas Viz, Style Sheets, Plot type, Area, Barplots, Histograms, Line Plots, Scatter Plots, BoxPlots, Hexagonal Bin Plot, Kernel Density Estimation plot (KDE), Distribution Plots, Categorical Data Plots, Combining Categorical Plots, Matrix Plots, Regression Plots, Grids; Python Visualizations toolkits/libraries.

Unit IV

Introduction to Machine Learning with SciKit-Learn &PyTorch– Data Representation and basic functions Estimator, parameters & model validation, Model Selection, Curve, Grid search, Feature engineering, Naive Bayes Classification, Linear regression, SVM etc; Overview of other Python ML/Deep Learning toolkits/Libraries. Introduction to NLP with NLTK and its functions, modules like speech tagging, tokenization, parsing, segmentation, recognition, cleaning & normalization of text etc; Overview of other Python NLP toolkits/Libraries.

Textbooks&References:

1. Charles Dierbach., Introduction to Python using Computer Science, Wiley Publications, Second Edition, 2015

2. Mark Lutz , Learning Python, O'Reilly publications , Fifth Edition, 2015

3. Jake VandarPlas, Python Data Science Handbook, O'Reilly , 2016

4. Paul Barry, Head First Python, Orielly Publications, Second Edition, 2010

Data science and Visualization Lab

List of experiments

1. Python program to display details about the operating system, working directory, files And directories in the current directory, lists the files and all directories, scan and classify them as directories and files
2. Python program to convert an array to an array of machine values and vice versa
3. Python program to get information about the file pertaining to the file mode and to get time values with components using local time and gm time.
4. Python program to connect to Google using socket programming
5. Python program to perform Array operations using Numpy package
6. Python program to perform Data Manipulation operations using Pandas package.
7. Python program to display multiple types of charts using Matplotlib package
8. Python program to perform File Operation on Excel Data Set
9. Python program to implement with Python Sci Kit-Learn & NLTK.
10. Python program to implement with Python NLTK/Spicy/Py NLPI.

Course code	DSE-04			
Category	Discipline Specific Elective Course			
Course title	Full Stack Programming-2			
Course ID	241/MCA/DS401			
Scheme and Credits	L	T	P	Credits
	2	-	2	3
Theory Internal	15			
Theory External	35			
Practical Internal	05			
Practical External	20			
Total	75			
Duration of Exam	3 hrs.			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

Course Objectives:

CO1: Understand Web Development and Frameworks and develop applications using advanced Backend Development Skills

CO2: Develop Node.js applications utilizing event handling, timers, callbacks, and handling data I/O operations.

CO3: Understand concepts of NoSQL and MongoDB

CO4: Develop Full-Stack Applications with Express, Angular, and React

UNIT I

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React.

UNIT II

Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js

UNIT III

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications

UNIT IV

Implementing Express in Node.js, Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives, MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering

Textbooks&References:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular WebDevelopment', Addison-Wesley, Second Edition, 2018.
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday SkillsExpected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
4. KirupaChinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

Full Stack Pogramming-2 Lab
List of Experiment

1. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter.
2. Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items
3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.
4. Create a food delivery website where users can order food from a particular restaurant listed in the website.
5. Develop a classifieds web application to buy and sell used products.
6. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days.
7. Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed.
8. Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions.

Course code	MDC-4			
Category	Multidisciplinary			
Course title	Cloud, Edge & Fog Computing			
Course ID	241/MCA/MD401			
Scheme and Credits	L	T	P	Credits
	3	-	-	3
Theory Internal	25			
Theory External	50			
Total	75			
Duration of Exam	3 Hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Outcomes:

CO1: Understand Cloud Computing comprehensively and cloud security challenges.
CO2: Deploy Models and Service Offerings
CO3: Investigate management principles in cloud computing and virtualization technologies.
CO4: Analyse case studies and real-world examples of emerging paradigms like Fog Computing and Edge Computing.

UNIT-I

Cloud computing: Concept & definitions, Characteristics of Cloud, Cloud Computing Benefits and Limitations, Evolution of Cloud Computing, NIST model, cloud cube model, Cloud Computing v/s Client Server Architecture, Cloud computing vs. Cluster computing vs. Grid computing.

Models & Services: Deployment models: public, private, hybrid & community, Deploying a web service from inside and Outside of a Cloud. Service models: laaS, PaaS,Saas,IDaaS,CaaSandothers.

Applications: Applications areas of Cloud Computing. Cloud computing as indispensable to modern smart healthcare system, Role played by cloud computing/servicesduringoutbreakofpandemics {likeCovid-19}in keepingthe life moving.

UNIT-II

Cloud Management: Concept of Service Oriented Architecture, Service Oriented Architecture & Service Level Agreements (SLAs). Monitoring of an entire cloud computingdeployment stack,lifecyclemanagement of cloudservices.

Virtualization: Objectives, Benefits of Virtualization,Importance of virtualizationin cloud computing, Load Balancing and Virtualization,Improving Performancethrough Load Balancing, Hypervisors, Machine Imaging, Case Study: VMware.

Cloud Security Concepts: Cloud security challenges, Cloud security approaches, Cloud SecurityAlliancestandards,cloudsecurity models andrelated patterns.

Case Study: Cloud services offered by popular vendors like Amazon, Microsoft, Oracle. GI Cloud initiative.

UNIT-III

Fog Computing: Concept of Fog computing: Background, Motivation & Application Scenarios, Characteristics&Issues, ProsandCons, Myths about FogComputing,Fog Computing Services, Fog Computing Components.

Fog Protocols: Fog Protocol, Fog Kit, Proximity Detection Protocols- DDS/RTPS computing protocols.

Privacy-Preserving Computation in Fog Computing: Introduction, Concept of Block Chain, Multi-Party Computation and Block Chain.

UNIT-IV

Edge Computing: Introduction, Application Scenarios, Characteristics & Issues, Edge Architectures,Edge Computing Applications. Difference between Cloud, Edge & Fog computing(s), Mobile Edge Computing.

Challenges in Federating Edge Resources: Network challenges, management challenges, other miscellaneous challenges.

Middleware for Fog & Edge Computing: Concept & importance, middleware infrastructures. Security management in Edge Cloud Architecture.

Textbooks & References:

1. Toby Velte, Anthony Velte ,Robert Elsenpeter, "Cloud Computing: A Practical Approach", The McGraw-Hill.
2. KrisJamsa,"CloudComputing:Saas,PaaS,laaS,Virtualizationandmore."
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: AnEnterprisePerspectiveonRisksandCompliance.",O'ReillyMediaInc.
4. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms.", Wiley.
5. NikosAntonopoulos,LeeGillam,"CloudComputing:Principles,Systemsand Applications.", Springer, 2012.
6. Ronald L.Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing.", Wiley-India.
7. Barrie Sosinsky, "Cloud Computing Bible.", Wiley-India.
8. Rajkumar Buyya & Satish Narayana Srirama,"Fog and Edge Computing", Willey Series on Parallel and Distributed Computing.

9. Computing :Helping the Internet of Things Realize its Potential." ,University of Melbourne.
10. Zaigham Mahmo od, "Fog Computing: Concepts, Framework and Technologies.", Kirtdle Edition.

Course code	MDC-4			
Category	Multidisciplinary			
Course title	Internet of Things			
Course ID	241/MCA/MD402			
Scheme and Credits	L	T	P	Credits
	3	-	-	3
Theory Internal	25			
Theory External	50			
Total	75			
Duration of Exam	3 Hrs			

Note: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no. 2 to 9 will be 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

Course Outcomes:

CO1: Understand the concepts of Internet of Things
CO2: Analyze basic protocols network
CO3: Understand the concepts of Web of Things
CO4: Basic Understanding of Cloud Computing.
CO5: Design IoT applications in different domain and be able to analyze their performance

UNIT - I

INTRODUCTION TO IOT: Introduction to IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network, Challenges in IoT (Design ,Development, Security)

UNIT – II

NETWORK AND COMMUNICATION ASPECTS: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

UNIT - III

WEB OF THINGS: Web of Things vs Internet of things, two pillars of web, Architecture and standardization of IoT, Unified multi tier-WoT architecture, WoT portals and Business intelligence, Cloud of things: Grid/SOA and cloud computing, Cloud middleware, cloud standards

UNIT – IV

RESOURCE MANAGEMENT IN IOT: Domain specific applications of IoT, Home automation, Industry applications, Surveillance applications, Other IoT applications Clustering, Synchronization, Software agents.

Textbooks&References:

1. Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach"

2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

3. CunoPfister, "Getting Started with the Internet of Things", Shroff Publisher/Maker Media.

4. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, JohnWiley and Sons