HIMACHAL PRADESH UNIVERSITY

MASTER OF COMPUTER APPLICATIONS (MCA)
Effective: MCA I year from 2021
MCA II year from 2022

Duration: 2 Years (4 Semesters)

Eligibility:

Bachelor of Computer Applications (BCA) /B.Sc.(Computer Science)/ B.Sc. (IT)/ BA(Computer Science)/ BA (IT) OR any Graduate with 20-24 credits in the subjects of computer OR any graduate with minimum of 6 courses of computer studied in graduation (in case of degree not in credit system) with at least 50% marks (45% in case of SC/ST) from a university established by law in India.

Age Limit:

Maximum age limit for admission to MCA course is 26 years for general category, 29 years for SC/ST category and 28 years for girl candidates, as on the 1st July of the year concerned. The Vice-Chancellor may permit age relaxation up to a maximum of six months.

Basis of Admission:

The admission to MCA course will be made on the basis of merit of the Entrance Examination (written test) conducted by H.P. University.

Written Test 100 Marks

Duration 1:30 hours

The written test will consist of one paper of 100 marks and of 1:30 hour's duration and shall include the following three sections:

Section	Contents	Marks
A	General logical ability & aptitude	20
B	Mathematics of +2 level	20
C	Computer Awareness	60
Total		100

The minimum qualifying marks in the Entrance Examination (written test) for subsidized as well as non-subsidized seats will be 35% i.e. 35 marks out of total of 100 marks.

Reservation for MCA:

I). Subsidized Seats

(a) (i) 15% and 7.5% of the seats shall be reserved for bonafide Himachali Scheduled Castes and Scheduled Tribes candidates respectively who have passed their qualifying examination from Himachal Pradesh University or from any other University established by law in India which is equivalent to the qualifying examination of H.P. University.

(b) The remaining seats shall be filled as under

(i) 25% seats shall be open for all the candidates irrespective of the institution from where they have passed their qualifying examination.
(ii) 75% of the seats shall be filled out of the candidates who have passed their qualifying examination from Himachal Pradesh University or H. P. Krishi Vishva Vidyalaya or Dr. Y. S. Parmar University of Horticulture and Forestry or Himachal Pradesh Technical University or Central University of Himachal Pradesh or the candidates who are Himachal Pradesh domicile irrespective of passing qualifying examination from any other university established by law in India which is equivalent to the qualifying examination of Himachal Pradesh University, subject to the following reservation: 5% of the seats shall be reserved for Physically Handicapped candidates with a minimum of 40% disability and who are Himachal Pradesh Domicile.

(c) Two supernumerary seats shall be reserved for Himachali Bonafide only single child who is a girl. In this respect, an affidavit issued by a competent authority in original shall have to be submitted by the candidate at the time of counselling.

(d) There are 10% additional seats reserved for the Economically Weaker Section (EWS) category for admission. If these seats remain vacant then these seats neither be filled with other category nor will carry forward.

(e) Two supernumerary seats shall be reserved for the students of the state of Jammu and Kashmir Migrants.

(f) Few Supernumerary seats for foreign National who apply through ICCR are also available as per H.P. University Rules.

II) Non-Subsidized Seats

(a) 15% and 7.5% of the seats shall be reserved for bonafide Himachali Scheduled Caste and Scheduled Tribe candidates respectively who have passed their qualifying examination from Himachal Pradesh University or from any other University established by law in India which is equivalent to the qualifying examination of H.P. University.

(b) The remaining seats shall be filled as under
(i) 25% seats shall be open to all the candidates irrespective of the institution from where they have passed their qualifying examination, in which the graduates of this University shall also be eligible to compete through competitive test.
(ii) 75% of the seats shall be filled out of the candidates who have passed their qualifying examination from Himachal Pradesh University or H. P. Krishi Vishva Vidyalaya or Dr. Y. S. Parmar University of Horticulture and Forestry or Himachal Pradesh Technical University or Central University of Himachal Pradesh or the candidates who are Himachal Pradesh domicile irrespective of passing qualifying examination from any other university established by law in India which is equivalent to the qualifying examination of Himachal Pradesh University.

(c) Three supernumerary seats shall be reserved for wards of H.P. University Employee.

Scheme of Examination:

English shall be the medium of instruction and examination. The pass marks in each course shall be 40% in each written paper and in the internal assessment separately, and 40% in viva-voce, project work and semester course and 50% in the aggregate subject to the conditions that aggregate shall be determined at the end of the examination. Other rules shall be as per the rules of the university.

Theory Papers:

Each paper will be of 100 marks (75 marks for theory exam and 25 marks for internal assessment) and duration of each paper will be 3 hours. In respect of theory papers 25 marks in each paper shall be reserved for award of internal assessment based on such work as assignments/practical/periodical tests/quiz etc.

Practical Examination

Each paper will be of 100 marks (50 marks for practical exam and 50 marks for internal assessment) and duration of each paper will be 3 hours. In respect of practical papers, 50 marks shall be reserved for internal assessment in similar manner.

The marks awarded by the teacher on account of internal assessment in relation to theory/practical paper as mentioned above shall be submitted to the office of Chairman.
Conduct: Practical exam will be conducted by the external examiner from the panel submitted by Chairman, Department of Computer Science, Himachal Pradesh University and duly approved by the university authority/evaluation branch, Himachal Pradesh University, Shimla.

Project Work:

In 2nd year (fourth semester) the student has to develop one software project, which will be evaluated by the external examiner from the panel submitted by Chairman, Department of Computer Science, Himachal Pradesh University, and duly approved by the university authority/evaluation branch, Himachal Pradesh University, Shimla on the following basis:

System Development Project

System Design	100 Marks
Log Book and Interim Report	100 Marks
Seminars (2)	100 Marks
Project Report (3 + 1 Copies)	200 Marks
Viva-Voce	100 marks
Total	600 Marks

In fourth semester, the Chairman/Head of the Department will assign a guide/supervisor, to each candidate for his/her project work. The candidate shall be required to maintain his/her project diary (logbook) of work in the organization. Each student will be required to give at least two seminars on his/her project work. Each student is required to submit three copies of his/her project reports in the Department after completion of the project work which will be evaluated by external examiner.

S. No	Course No.	Paper	Credits	Lecture Hrs/ week	Tutorial Hrs/ week	Univ. Exam Marks	Internal Assess-ment
		First Year					
		Semester 1					
1	MCA-101	Programming Methodologies Using C	4	3	1	75	25
2	MCA-102	Data Structures & Algorithm Analysis	4	3	1	75	25
3	MCA-103	Computer Organization & Architecture	4	3	1	75	25
4	MCA-104	Data Communication & Computer Networks	4	3	1	75	25
5	MCA-105	Operating System	4	3	1	75	25
6	MCA-111	Practical-1(C)	2	6		50	50
7	MCA-112	Practical-2 (Data Structures & Algorithm Analysis)	2	6		50	50
		Semester 2					
1	MCA-201	Programming with Python	4	3	1	75	25
2	MCA-202	Data Base Management System	4	3	1	75	25
3	MCA-203	Software Engineering	4	3	1	75	25
4	MCA-204	Computer Graphics	4	3	1	75	25
5	MCA-E01	Elective – 1	4	3	1	75	25
6	MCA-211	Practical – 3 (Python)	2	6		50	50
7	MCA-212	Practical – 4 (DBMS)	2	6		50	50

S. No	Course No.	Paper	Credits	Lecture Hrs/ week	Tutorial Hrs/ week	Univ. Exam Marks	Internal Assess-ment
		Second Year					
		Semester 3					
1	MCA-301	Data Mining Using R	4	3	1	75	25
2	MCA-302	Web Technologies	4	3	1	75	25
3	MCA-303	Information Security	4	3	1	75	25
4	MCA-E02	Elective - 2	4	3	1	75	25
5	MCA-E03	Elective - 3	4	3	1	75	25
6	MCA-311	Practical-5 (R)	2	6		50	50
7	MCA-312	Practical-6 (Web Technologies)	2	6		50	50

S. No	Course No.	Paper	Credits	Univ. Exam Marks
Semester – 4				
1	MCA-401	System Development Project		
	(a)	System Design	4	100
	(b)	Log Book and Interim Report	4	100
	(c)	Seminars (2)	4	100
	(d)	Project Report (3+1 Copies)	6	200
	(e)	Viva-Voce	6	100

ELECTIVES

S. No	Course	Paper
1	MCA-E01	Theory of Computation
2	MCA-E02	Artificial Intelligence & Expert Systems
3	MCA-E03	Cloud Computing
4	MCA-E04	Cyber Law
5	MCA-E05	Distributed Data Base Management System
6	MCA-E06	Management of Software Projects
7	MCA-E07	Open Source Software
8	MCA-E08	Image Processing
9	MCA-E09	Distributed Systems
10	MCA-E10	Object-Oriented Software Engineering
11	MCA-E11	Simulation and Modeling
12	MCA- E12	Software Quality and Testing

Total Credits 96

MCA – 101 Programming Methodologies Using C **L** **T**
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Course Objectives:
This is an introductory course and covers the key features of the C language and its usage. The first unit help in thoroughly understanding the C syntax and basic programming paradigms. The remaining chapters focus on more complex concepts of the C language. This course will briefly touch upon some miscellaneous features and the mechanism used in the implementation of the same.

UNIT – I

Programming Tools- Problem analysis, Program constructs (sequential, decision, loops), Algorithm, Flowchart, Pseudo code, Decision table, Modular programming, Top Down and Bottom up approaches, Concept of High Level Languages, Low Level Languages, Assembly Languages, Assembler, Compiler, Interpreter, Type of errors.
Introduction- What is C, getting started with C, the first C program, compilation and execution, receiving input, C instructions, control instructions in C.
Decision Control Structure- if statement, if-else statement, use of logical operators, conditional operators.
Loop Control Structure- loops, while loop, for loop, odd loop, break statement, continue statement, do-while loop,
Case Control Structure- decisions using switch, switch vs if-else ladder, goto keyword.

UNIT – II

Functions and Pointers- what is a function, passing values between functions, scope rule of functions, calling convention, one dicey issue, function declaration and prototypes, call by value and call by reference, an introduction to pointers, pointer notation, back to function calls, recursion, recursion and stack, adding functions to the library.
Data Types Revisited- integers, long and short; integers, signed and unsigned; chars, signed and unsigned; float and double, storage classes in C.
C Preprocessor- features, macro expansion, file inclusion, conditional compilation, #if and #elif directives, miscellaneous directives.

UNIT – III

Arrays- what are arrays, array initialization, bounds checking, passing array elements to a function, pointers and arrays, two dimensional arrays, array of pointers, three dimensional array.
Strings- what are strings, more about strings, pointers and strings, standard library string functions, two-dimensional array of characters, array of pointers to strings, limitation of array of pointers to strings.
Structures- declaring a structure, accessing structure elements, how structure elements are stored, array of structures, additional features of structures, uses of structures.

UNIT – IV

Console Input/Output- types of I/O, console I/O functions.
File Input/Output- data organization, file operations, counting characters, tabs, spaces, file opening modes, string I/O in files, record I/O in files, text files and binary files, using argc and argv.
Miscellaneous Features- Enumerated data type, renaming data types with typdef, typecasting, bit fields, pointers to functions, functions returning pointers, functions with variable number of arguments, unions.

Text Book-

1.Yashwant Kanetkar, “Let us C”, BPB Publications.

Reference Books-

1.Mullis Cooper, “Spirit of C”, Jacob Publications.
2.Kerninghan B.W. & Ritchie D. M., “The C Programming Language”, PHI Publications.
3.Yashwant Kanetkar, “Pointers in C”, BPB Publications.
4.Gotterfied B., “Programming in C”, Tata McGraw Hill Publication

Course Outcomes:

By the end of the course, students will be able to
CO 1: Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
CO 2: Demonstrate an understanding of computer programming language concepts.
CO 3: Able to develop C programs and run them.
CO 4: Analyse and interpret the concept of pointers, declarations, initialization and ‘ ‘ operations on pointers and their usage.
CO 5: Able to define structure, union and enumeration user defined data types.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 102 Data Structures and Algorithm Analysis

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Course Objectives:

The objective of this course is to provide basic to advance level of knowledge to student regarding various types of data structures and to provide knowledge regarding various problem solving techniques like greedy, divide and conquer, dynamic and backtracking.

UNIT-I

Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation, quick sort technique to sort an array, recursion),Queues, Priority Queues, Linked Lists(traversal, insertion, deletion),type(linear, circular, doubly linked, inverted), Trees, Binary Tree, Binary Search Tree, AVL Tree, Hashing.

UNIT –II

Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations.

Divide and Conquer: The General Method, Merge Sort, Quick Sort, Selection sort.

The Greedy Method: The General Method Knapsack Problem, Job Sequencing With Deadlines, Huffman Coding.

UNIT-III

Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Minimum Spanning Trees(Kruskal's Algorithm, Prim's Algorithm).

Dynamic Programming: The General Method Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Traveling Salesperson Problem.

UNIT – IV

Back Tracking: The General Method, The 8 Queens Problem, Sum Of Subsets, Graph Coloring, And Hamiltonian Cycles.

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility.

Text Book:

1. Seymour Lipschutz, "Data Structures", McGraw Hill Education.

Reference Books:

1. *Parag* H. *Dave*, *Himanshu* B. *Dave,* Design and Analysis of Algorithms, *Pearson* Education (2007).
2. Jean Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill Publications.
3. Robert L. Kruse,"Data Structures & Program Design", PHI Publications.
4. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 2006.

5. J. Kleinberg and E.Tardos, Algorithms Design, Pearson Education, 2006.

Course Outcomes:

By the end of the course, students will be able to
CO 1. Implement different types of data structures.
CO 2. Differentiate between various types of problem solving techniques.
CO 3. Calculate the complexity of a problem.
CO 4. Differentiate between N and NP problems.
CO 5. Solve problems related to graph theory.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-103 Computer Organization & Architecture L T
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Course Objectives:
To introduce the fundamental concepts of digital computer organization and architecture. To develop a basic understanding of the building blocks of a digital computer system. To enable understanding of how these building blocks are organized together to architect a digital computer system. To enable understanding of how various functional units of a digital computer system interacts to meet the processing requirements of the user.

UNIT – I

Digital Logic Circuit: Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip Flops, Sequential Circuits
Digital Components& Data Representation: Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Units, Data Types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary Codes, Error Correction Codes

UNIT – II

Register Transfer and Micro-operations: Register Transfer Language, Register transfer, Bus and Memory Transfer –Three State Bus Buffer, Memory Transfer; Arithmetic Micro-operations – Binary Adder, Binary Adder-Subtractor, Binary Incrementer, Arithmetic Circuit; Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.
Basic Computer Organization: Instruction codes – Stored Program Organization, Indirect Address; Computer Registers – Common Bus System; Computer Instructions – Instruction Set Completeness; Timing and Control; Instruction Cycle – Fetch and Decode, Determine the Type of Instruction, Register-Reference Instructions; Memory Reference Instructions; Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic

UNIT – III

Programming the Basic Computer: Machine Language, Assembly Language, Introduction to Assembler, Program Loops, Programming Arithmetic and Logic Operations
Micro programmed Control: Control Memory, Address Sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Micro program Example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, Fetch Routine, Symbolic Micro program, Binary Micro program, Design of Control Unit – Micro program Sequencer
Central Processing Unit: Introduction, General Register Organization, Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction Formats – Three-, Two-, One- and Zero-Address

Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupt, RISC & CISC Characteristics, Overlap Register Window

UNIT – IV

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors

Computer Arithmetic – Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit and Operations

Input-Output Organization: Peripheral Devices, Input-Output Interface, Modes of Transfer – Programmed I/O, Interrupt-Driven I/O, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware

Text Book:

1. Computer System Architecture, by M. Morris Mano, Third Edition. 2007. Low Price Edition. Pearson Education

Reference Books:

1. Computer Architecture and Organization, by John P. Hayes. Third Edition. 2017. McGraw Hill Publication.
2. Computer Organization and Architecture: Designing for Performance, by William Stallings. Tenth Edition. 2016. Pearson Education India.

Course Outcomes:

By the end of the course, Students will be able to

CO 1: Explain the working of arithmetic, logic and shift units in a computer system

CO 2: Elucidate the role of instruction set and instruction cycle in program execution

CO 3: Explain concept of interrupts and their handling

CO 4: Elucidate significance of stack and instruction formats

CO 5: Explain various mode of data transfer between memory and I/O devices

CO 6: Elucidate organization and operation of – main memory, auxiliary memory, associative memory and cache memory

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 104 Data Communication & Computer Networks

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Course Objectives:

The key objective is to acquire a foundational understanding of computer network and communication technologies. As part of this course, students will be introduced to network models and standards, network protocols and their use, wired and wireless technologies, network security and detailed description of all layers in ISO/OSI and TCP/IP.

UNIT – I

Introduction: Data Communication, Network Components, Protocol & Standards, Standard Organization, Topologies, Transmission modes, Categories of Networks, Uses, Applications. The OSI Reference Model: Layered architecture, Functions of layers, TCP/IP reference model, Comparison of OSI & TCP/IP models.

Physical layer: Guided and wireless transmission media, Magnetic, twisted pair, coaxial cable, fibre optics, radio, microwave, infrared, Communication satellites, **IEEE standards**: 802.3 (Ethernet), 802.4 (TokenBus), 802.5 (Token Ring), 802.11(Wireless LAN), 802.15 (Bluetooth)

UNIT – II

Data Link and Mac Layer: Design issues, Framing techniques, Flow control, Error Control, Error Detecting code and Error Correcting codes, Data link Control and Protocols-- For noiseless Channel – Simplest Protocol, Stop-and-Wait Protocol, For Noisy Channel-- Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective-Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access-- Random Access-- MA, CSMA, CSMA/CD, CSMA/CA, Controlled Access—Reservation, Polling, Token passing, Channelization--FDMA, TDMA, CDMA.

UNIT – III

Network Layer: Network layer design issues, Addressing, Routing algorithms-shortest path routing, flooding, distance vector routing ,link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, Congestion Control algorithms – congestion prevention policies, congestion control in virtual circuit & datagram sub-networks, definition of quality of service, Internetworking – Tunneling, internet-work routing, fragmentation, Network layer in Internet –IP protocol, IP Address, OSPF, BGP, Internet multicasting, Mobile IP, IPv4, IPv6,Internet radio, VoIP.

Transport Layer: Concept of transport service, elements of transport protocols, TCP and UDP, A simple transport protocol, Remote procedure call, Performance issues in computer networks.

UNIT – IV

Application layer services &protocols: Domain name system, SMTP, File transfer protocol, HTTP, HTTPS, TELNET, World Wide Web.

Network Security: Attacks on Computers & Computer security-- Need for security, approaches, principles, types of attacks, Cryptography concept and techniques, Symmetric Key algorithms-- (DES), Asymmetric key algorithms--RSA, Digital signature , Firewalls. E-mail security, Web security, social issues in network security.

Text Book-

1. B.A. Forouzan, "Data Communication & Networking", 4th Edition Tata Mcgraw Hill.

Reference Books:

1. A.S. Tanenbaum, "Computer Networks", Prentice Hall, 1992, 4th edition.
2. William Stallings, "Data & Computer Communication", McMillan Publishing Co.
3. Black, "Data Networks", PHI, 1988.
4. Fred Halsall, "Data Communications, Computer Networks", Pearson Education.

Course Outcomes:

By the end of the course, Students will be able to

CO 1. Independently understand basic computer network technology.
CO 2. Understand and explain Data Communications System and its components.
CO 3. Different types of network topologies and protocols.
CO 4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO 5. Identify the different types of network devices and their functions within a network.
CO 6. Understand and build the skills of subnetting and routing mechanisms.
CO 7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 105 Operating System **L T**
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Course Objectives

The objective of this course is to provide basic as well as advance knowledge of functions of operating system. The entire course is divided into four parts; first unit covers the various types of operating system. Second unit is about process management where student can get the knowledge of basic to advance level of the process management. The third unit will clear the functional concept of memory management. Fourth unit is about file structure of the operating system.

UNIT – I

Introduction: Definition Of The Operating System, Functions Of An Operating System, Different Types Of Systems - Simple Batch System, Multi-Programmed Batched System, Time Sharing System, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems, Computer System Structure-operation, I/O structure, storage structure, hardware protection, Operating System Services.

UNIT – II

Process Management: Process- Process Concept, Process Scheduling, Operation On Processes, Cooperating Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, priority scheduling, round robin scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, multiple processor scheduling, real time scheduling.

Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions.

Deadlocks: Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

UNIT – III

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal , external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation.

File System Interface: File Concept, Access Methods–sequential, direct, index, Directory Structure–single-level, two–level, tree-structured, acyclic-graph, general graph.

UNIT – IV

File System Implementation: File System Structure, Allocation Methods-contiguous allocation, linked allocation, indexed allocation, Free Space Management-bit vector, linked list, grouping, counting, Directory Implementation–linear list, hash table, Efficiency And Performance, Recovery– consistency checking, backup and restore.

Secondary Storage Structure: Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling, Selection of A Scheduling Algorithm, Disk Management-disk formatting, boot block, bad blocks.
Security: problem, authentication–passwords, program threats, system threats-worms, viruses, threat monitoring, encryption.

Text Book:

1. Silberschatz, Galvin, “Operating System Concepts”, Addison Wesley

   Publishing Company, 1989.

Reference Books:

1. William Stallings, “Operating Systems”, Macmillan Publishing Company.
2. Deitel H.M., “An Introduction To Operating System”, Addison Wesley Publishing Company, 1984.
3. Tanenbaum, A.S., “Modern Operating System”, Prentice Hall of India Pvt.Ltd..

Course Outcomes:-

By the end of this course, the student will be able to,
CO 1. Student will be able to differentiate between various types of operating system.
CO 2.Gain in depth knowledge of process basics and scheduling.
CO 3. Able to deal with situation of dead lock and how to overcome form it.
CO 4.Gain in depth knowledge of various page replacement techniques.
CO 5. Know about various types of storages media(s).
CO 6. Know about disk Scheduling.
CO 7. Know about threads and security of operating system.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA 201 Programming with Python

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Course Objectives:

The course is designed to provide basic knowledge of Python and course leads students from the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with binary data, and using the extensive functionality of Python modules. Extra emphasis is placed on features unique to Python, such as tuples, array slices, and output formatting.

UNIT – I

Introduction to Python: Installation and Working with Python, Understanding Python variables, Python basic Operators, Understanding python blocks, Basic data types of Python, Conditional blocks using if, else and elseif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else.

UNIT – II

Python Functions and Data Structures: Function Specifications, Global Variables, Modules, Passing parameters to Functions, Recursive functions, System functions and Parameters, importing modules, Lambda function in python, Python String, List, Tuple, Set, And Dictionary Manipulations, Programming using string, list, tuple, set and dictionary in built functions.

UNIT – III

File Handling: Opening a file, Understanding read functions: read(), readline() and readlines(), Understanding write functions: write() and writelines(), appending data to a file, closing files, Manipulating file pointer using seek, Programming using file operations. Python Object Oriented Programming:

Oops Concept of class, object and instances, Constructor, class attributes and destructors, Method overloading in python, Operator overloading, Inheritance.

UNIT – IV

Python Regular Expression and Exception Handling: Special symbols and characters for Regular expressions, Pattern matching and searching, Pattern searching using regex, Validation using regular expressions, What is exception, Handling an exception, try…except…else, try-finally clause, Argument of an exception, Python standard exception, Raising an exception, User-defined exceptions.

Python Database Connectivity: Introduction, SQL Database connection using python, creating and searching tables, Reading and storing config information on database, Programming using database connections.

Text Book:

1. **Think Python 2nd Edition by Allen B. Downey.**

Reference Books:

1. Learning Python, 5th Edition, by Mark Lutz, Released June 2013, Publisher(s): O'Reilly Media, Inc.
2. *Python* Programming, A modular approach: Naveen Kumar Sheetal Taneja 2017 Edition, *Pearson. education India.*

Course Outcomes:

By the end of the course, students will be able to:-
CO 1. Build problem solving and programming capability,
CO 2. Master the fundamentals of writing Python scripts,
CO 3.Learn core Python scripting elements such as variables and flow control structures,
CO 4. Discover how to work with lists and sequence data,
CO 5. Write Python functions to facilitate code reuse,
CO 6. Use Python to read and write files,
CO 7. Make their code robust by handling errors and exceptions properly,
CO 8. Work with the Python standard library,
CO 9. Implement Python's object-oriented features,
CO 10. Search text using regular expressions.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA -202 Data Base Management System **L T**
3 1

Course objectives:
The goal of this course is to teach the fundamentals of the database systems at master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.

UNIT – I

Basic Concepts: File Systems vs. DMBS, Characteristics of the Data Base Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of a DBMS.
Data Base Systems Concepts and Architecture: Schema and Instances, DBMS architecture and Data Independence, Data Base languages and Interfaces, DBMS functions and component modules, Centralized and Client/Server Architectures for DBMS, Data Models.
Entity Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R schema to Tables.
Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra– Basic Operations, Relational Calculus, Codd Rules.

UNIT – II

SQL: Data Definition and Data Types, Components of SQL: DDL, DML, and DCL, Schema Change Statement in SQL, Views, Joins& Queries in SQL, Specifying Constraints & Indexes in SQL, Database Triggers, SQL Injection.
Relational Data Base Management System: RDBMS, Basic structure, Date Base Structure & its manipulation in an RDBMS, Storage Organization.
Conventional Data Models: An overview of Network and Hierarchical Data Models.

UNIT – III

Relational Data Base Design: Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF, Algorithms for Query Processing and Optimization;
Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.
Concurrency Control Techniques: Locking Techniques, Time stamp ordering, Multi-version Techniques, Optimistic Techniques, Granularity of Data items.

UNIT – IV

Recovery Techniques: Recovery concepts, Recovery Techniques in centralized DBMS, Object and Object-Relational Databases; Database Security and Authorization.
Data Base Security: Introduction to Data base Security issues.
Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.

Text Book:

1. Elmasri And Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson. ISBN-10: 0-13-397077-9.ISBN-13: 978-0-13-397077-7.

Reference Books:

1. Bipin C. Desai: An Introduction to Database System, Galgotia Publication, N. Delhi.
2. Raghu Rama krishnan& Johannes Gehrke: Database Management Systems, 2 nd edition, Mcgraw Hill International Edition.
3. Peter Rob, Carlos Colonel: Database system Design, Implementation, and Measurement, Cengage Learning, 2 nd Ed.
4. C.J. Date: An Introduction to Data Bases Systems 7 th Edition, Addison Wesley N. Delhi.
5. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts" Sixth Edition. ISBN 978-0-07-352332-3

Course Outcomes:

By the end of the course, Students will be able to
CO 1. Understand the concept of database and techniques for its management.
CO 2. Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model.
CO 3. Normalize the database.
CO 4. Write queries using Relational Algebra.
CO 5. Describe the file organization schemes for DBMS.
CO 6. Describe and use features for Concurrency and Recovery.
CO 7. Understand data security standards and methods.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 203 Software Engineering **L T**
3 1

Course Objectives:
Introduce students to software development life cycle and models for developing and effective and efficient software. Identify software requirements for manual or automated real-world systems. Compare and contrast software process models and software development methodologies. Provide the student with the opportunity to practice software development skills. Provide students with opportunities to develop basic computing skills with respect to preparation of documents and also to be able to check the correctness of a software design.

UNIT – I

Evolving Role of Software, Software Engineering, Changing nature of Software, Software Myths, Terminologies, Role of management in software development
Software Process Models: Software Process, Generic Process Model –Framework Activity, Task Set and Process Patterns; Process Lifecycle, Prescriptive Process Models, Project Management, Component Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models –Extreme Programming (XP), Adaptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering
Software Life Cycle Models: Build & Fix Model, Water Fall Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Comparison of Models, Other Software Processes, Selection of a Model
Software Requirements Analysis & Specifications: Requirements Engineering, Types of Requirements, Feasibility Studies, Requirements Elicitation, Developing Use Cases, Requirements - Analysis Documentation, Software Requirement and Specification (SRS) Document. Validation and Management .

UNIT – II

Software Architecture: Its Role, Views, Component & Connector View and its architecture style, Architecture Vs Design, Deployment View & Performance Analysis, Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and (RMMM); Software Reliability.
Software Project Planning: Relationship to lifecycle, project planning, project control, project organization, configuration management, version control, quality assurance, metrics Size estimation, Cost Estimation, COCOMO, COCOMO – II, Software Risk Management Project Scheduling and Staffing, Time-line Charts.

UNIT – III

Function Oriented Design: Design principles, Module level Concepts, Notation & Specification, Structured Design Methodology and Verification.
Object-Oriented Design: OO Analysis & Design, OO Concepts, Design Concepts, UML – Class Diagram, Sequence & Collaboration Diagram, Other diagrams & Capabilities,

Design Methodology – Dynamic and Functional Modeling, Internal Classes & Operations
Detailed Design: PDL, Logic/Algorithm Design, State Modeling of Classes, Verification – Design Walkthroughs, Critical Design Review, Consistency Checkers.

UNIT – IV

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Testing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing.
Software Configuration Management: Change Control and Version Control; Software Reuse, Software Re-engineering, Reverse Engineering.

Text Book:

1. R.S. Pressman, **Software Engineering: A Practitioner's Approach** (6th ed.), McGraw-Hill, 2006

Reference Books-

1. P. Jalote, **An Integrated Approach to Software Engineering** (3rd ed.), Narosa Publishing House, 2005
2. K.K. Aggarwal and Y. Singh, **Software Engineering** (revised 2nd ed.), New Age International Publishers, 2006
3. Sommerville, **Software Engineering** (6th ed.), Pearson Education, 2004 Douglas Bell,
4. **Software Engineering for Students** (4th ed.), Addison-Wesley, 2005.

Course Outcomes:

By the end of the course, Student will able to :
CO 1: Describe the software development life cycle as well as describing the various software development model.
CO 2: Illustrate the software requirement specification, and system design.
CO 3: Understand the advantages and disadvantages of each model.
CO 4: Learn project planning and can apply in course projects.
CO 5: Understand type of testing and enhance skills in the field of software testing.
CO 6: Design high quality software products.
CO 7: Learn skill of software requirement specification and software quality assurance techniques.

Note: In each theory paper, nine questions are to be set. Two questions areto set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 204 Computer Graphics **L T**
3 1

Course Objectives:
The Course is introduced to impart students with conceptual knowledge of the graphics techniques and algorithms. To study the multimedia concepts and various I/O technologies. It will enable the students to develop their creativity.

UNIT – I

Introduction: Definition Of Computer Graphics And Its Applications, Video Display Devices- Raster-Scan Displays, Random-Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays Input Devices: Keyboard, Mouse, Trackball and Space ball, Joysticks, Digitizers, Image Scanners, Touch Panels, Light Pens, Voice Systems.

UNIT – II

Output Primitives: Line Drawing Algorithms (DDA, Bresenhaum's Circle) Generating Algorithm: Midpoint Circle Drawing Algorithm, Ellipse Generating Algorithm, Midpoint Ellipse Generating Algorithm, Character Generation, 2D Transformations: Translation, Rotation, Scaling, Reflection, Shear, Composite Transformation-Translation, Rotations, Scaling.

UNIT – III

Two Dimensional Viewing: Window-To-Viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping–(Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping, Nicholl-Lee-Nicholl Line Clipping), Polygon Clipping–(Sutherland-Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping), Curve Clipping, Text Clipping.
Three Dimensional Concepts: Three Dimensional Display Methods–Parallel Projection, Perspective Projection, Surface Rendering.
Three Dimensional Transformations: Translation, Rotation, Scaling, Reflection, Shear.

UNIT – IV

Curves and Surfaces: Bezier Curves, B-Spline Curves, Fractal Geometory Methods, Octrees.
Visible-Surface Detection Methods: Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan Line Method, Depth Sorting Method.
Concept of Shading: Modeling Light Intensity, Diffuse And Specular Reflection, Refracted Light, Concept Of Shading Methods.

Text Book:

1. D. Hearn and M.P. Baker, **Computer Graphics** (4th ed.), Prentice–Hall of India, 2010.

Reference Books:

1. J.D. Foley, A van Dam, S.K. Feiner and J.F.Hughes, Computer Graphics: Principals and Practices (3rd ed.), Addison-Wesley, MA, 2013.
2. D.F. Rogers, Procedural Elements in Computer Graphics (4th ed.), McGraw Hill Book Company, 2019.
3. D.F. Rogers and A.J. Admas, Mathematical Elements in Computer Graphics (2nd ed.),McGraw Hill Book Company, 1990

Course Outcomes:

By the end of the course, students will be able to :
CO 1: Get Familiar with the principles of graphical user interfaces.
CO 2: Learn the introductory concepts in computer graphics and multimedia processing.
CO 3: Explain the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two and three dimensions.
CO 4: apply the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
CO 5: Use techniques which will allow them to create user-friendly interfaces for computer applications.
CO 6: Learn the fundamentals of animation, parametric curves and surfaces, and spotlighting.
CO 7: Apply graphic programming techniques to design and create computer graphics.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

Electives

MCA-E01 Theory of Computation L T
3 1

Course Objectives:
Understanding the inherent capabilities and limitations of computers is a fundamental question in computer science. To answer this question, we will define formal mathematical models of computation, and study their relationships with formal languages. Topics will consist of three central areas of the theory of computation: automata, computability, and complexity. Students will also learn that not all problems are solvable by computers, and some problems do not admit efficient algorithms. Throughout this course, they will strengthen their rigorous mathematical reasoning skills.

UNIT – I

Automata-introduction to finite automata, structural representations, automata and complexity, Alphabets, strings, languages, problems, Chomsky hierarchy, Deterministic Finite Automata, non-deterministic Finite Automata, Finite Automata With Epsilon Transition.
Regular Expression and languages- regular expressions, finite automata and regular expressions, applications, algebraic laws, pumping lemma for regular languages, closure properties, equivalence and minimization of automata.

UNIT – II

Context Free Grammars and languages- introduction to context free grammars, parse trees, applications of CFG, ambiguity in grammars and languages.
Pushdown Automata- definition of pushdown automata, languages of a PDA , equivalence of PDA and CFG, deterministic PDA, non-deterministic PDA, properties of context free languages, normal forms, pumping lemma, closure properties, decision properties.

UNIT – III

Turing Machine-problems that computer cannot solve, the turing machine, programming techniques for Turing machines, extensions to the basic turing machine, restricted Turing machines, Turing machines and computers.

UNIT – IV

Un-decidability- a language that is not recursively enumerable, an un-decidable problem that is RE, un-decidable problems about turing machines, other un-decidable problems.
Intractable problems- the classes P and NP, an NP complete problem, a restricted satisfiability problem, additional NP complete problems.

Text Book-

1. J. E. Hopcroft, R. Motwani, and J. D. Ullman, Introduction to Automata Theory,

languages, and computation (2nd ed.), Addison-Wesley, 2001.

Reference Books-

1. H.R. Lewis, C.H. Papadimitriou, C. Papadimitriou, Elements of the Theory of Computation (2nd ed.), Prentice-Hall, NJ, 1997.
2. J.A. Anderson, Automata Theory with Modern Applications, Cambridge University Press, 2006.

Course Outcomes:

By the end of the course, students will be able to
CO 1: Understand key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.
CO 2: Explain the models of computation, including formal languages, grammars and automata, and their connections.
CO 3: State and explain the Church-Turing thesis and its significance.
CO 4: Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
CO 5: Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

Himachal Pradesh University

(NAAC Accredited "A" Grade)

Gyan Path, Summerhill,

Shimla -171005

MASTER OF COMPUTER APPLICATIONS

Syllabus of MCA 2nd Year

(Effective from MCA Session 2021 onwards)

(Credit Based System)

Department of Computer Science

Under the Faculty of Physical Sciences

Himachal Pradesh University

Shimla - 5

MCA-301 **Data Mining Using R** L=3, T=1

Course Objectives: The objective of this course is to provide the in-depth coverage of data mining and integration aspects along with its implementation in R programming language.

UNIT – I

Data Warehouse: A Brief History, Characteristics, Architecture for a Data Warehouse. Data Mining: Introduction, Motivation, Importance, Knowledge Discovery Process, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues; Data Pre-processing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, Outliers.

UNIT – II

Data Mining Techniques: Clustering-Requirement for Cluster Analysis, Clustering Methods- Partitioning Methods, Hierarchical Methods, Decision Tree-Decision Tree Induction, Attribute Selection Measures, Tree Pruning. Association Rule Mining-Market Basket Analysis, Frequent Itemset Mining using Apriori Algorithm, Improving the Efficiency of Apriori. Concept of Nearest Neighborhood and Neural Networks.

UNIT – III

Data Integration: Architecture of Data Integration, Describing Data Sources: Overview and Desiderate, Schema Mapping Language, Access Pattern Limitations, String Matching: Similarity Measures, Scaling Up String Matching, Schema Matching and Mapping: Problem Definition, Challenges, Matching and Mapping Systems, Data Matching: Rule- Based Matching, Learning- Based Matching, Matching by Clustering.

UNIT – IV

R Programming: Advantages of R over other Programming Languages, Working with Directories and Data Types in R, Control Statements, Loops, Data Manipulation and integration in R, Exploring Data in R: Data Frames, R Functions for Data in Data Frame, Loading Data Frames, Decision Tree packages in R, Issues in Decision Tree Learning, Hierarchical and K-means Clustering functions in R, Mining Algorithm interfaces in R.

Text Books:

1. J Hanes, M. Kamber, Data Mining Concepts and Techniques, Elsevier India.
2. A.Doan, A. Halevy, Z. Ives, Principles of Data Integration, Morgan Kaufmann Publishers.

3. S. Acharya, Data Analytics Using R, McGraw Hill Education (India) Private Limited.

Reference Books:

1. G.S. Linoff, M.J.A. Berry, Data Mining Techniques, Wiley India Pvt. Ltd.
2. Berson, S.J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw-Hill.
3. J.Horbulyk, Data Integration Best Practices.
4. Jared P. Lander, R For Everyone, Pearson India Education Services Pvt. Ltd

Course Outcomes:

By the end of the Course, Student will be able to:
CO1:understand the fundamental concepts of data warehousing and data mining;
CO2:acquire skills to implement data mining techniques;
CO3:learn schema matching, mapping and integration strategies;
CO4:implement data mining techniques in R to meet the market job requirements.

NOTE: In Each theory paper. Nine questions are to be set. Two questions are to be set from each Unit and Candidate is required to attempt one question from each unit. Question number nine is Compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all five questions are to be attempted.

MCA-302 **Web Technologies** L=3, T=1

Course Objectives:
The Course is designed to provide the Basic understanding of Web Technologies. This Course enables the Student to create both Static and Dynamic Web Pages using HTML5,CSS,JAVASCRIPT, AJAX and PHP. Extra emphasis is placed on building Mobile Responsive Websites using various frameworks like BOOTSTRAP.

UNIT I

Web Terminologies: Internet, WWW, Web Browser, Understanding how Web Browser Communicate with Web Server,Web Server, Uniform Resource Locator (URL), Hyper Text Transfer Protocol Secure (HTTPS).

HTML5 Introduction:Structure of HTML5 Program, Heading Styles, Text Styles, Other Text Effects;*List*: Definition, Creating Ordered and Unordered Lists, Adding Images, Creating Tables, Multimedia, Graphics;*Form:* Tags, Elements, Input Types, Text Area, Checkboxes, Submit Button, Frames, Audio Tag, Video Tag, i-frame, Form Validation, Designing Static Web Pages with HTML5.CSS 3.0:Concepts and its Properties i.e. Border, Backgrounds, Fonts, Text Effects, Buffering, Web Log, Web Cache Positioning, CSS Selectors, CSS List, CSS Tables, CSS Menu Design.Using BOOTSTRAP to build mobile responsive website.

UNIT II

JavaScript Introduction:Variables, Obtaining User Input, Operators, Control Structure, Looping Constructs, Break and Continue Statements, User Defined Functions, Recursion and Iterations, Array Declaration and Memory Allocation, Passing Array as an Argument to Function, Basic Form Validation in JavaScript;**JavaScript Objects:** Date, String, Boolean, Window, Document, Cookies, Document Object Model (DOM), Event Handling using JavaScript.

UNIT III

PHP Introduction:Installing and Configuring PHP and MYSQL, Variables, Basic Data Types, Operators, Constants, Array, Looping with Associative Array using each() and foreach(), Objects, Strings Processing,Form Processing, Connecting to Database, Performing Basic Database operations (Insert ,Update , Delete , Select etc.), Setting Query parameter, Executing Query Join (Self Join, Inner Join, Outer Join, Cross Join),Cookies, Create Session, Accessing Data from Database into HTML page.

UNIT IV

AJAX Introduction: Creating Simple Ajax Application, Create an XMLHttpRequest Object,Interacting with the Web Server Using XMLHttpRequest Object, Difference between Ajax and Non-Ajax Applications.

Working with PHP and AJAX: Process Clients Requests, Accessing Files Using PHP,Implementing Security and Accessibility in AJAX; Application: Introduction, Secure AJAX Applications.

Text Books:

1. Kogent Learning, Web Technologies: HTML, JavaScript, PHP, JAVA, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.
2. Deitel H.M., Deitel P.J., Internet &World Wide Web: How to Program, Pearson Education.

Reference Book:

1. BoronczykNaramore, Beginning PHP, Apache, MYSQL Web Development, Wiley India Pvt. Ltd.
2. Thomas Powell, Ajax: The Complete Reference Book.

Course Outcomes:

By the end of the Course, Student will be able to:
CO1:understand about Basic Terminologies of Web Development.
CO2:design Web Pages using HTML5 and CSS.
CO3:design Mobile Responsive Website Using BOOTSTRAP.
CO4:understand Object and Data Validation Using JavaScript.
CO5:apply JavaScript methods in building various Interactive UI Projects.
CO6:build Dynamic Website using Server Side PHP Programming and Database Connectivity.
CO7:create Web Application using AJAX.

NOTE: In Each theory paper. Nine questions are to be set. Two questions are to be set from each Unit and Candidate is required to attempt one question from each unit. Question number nine is Compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all five questions are to be attempted.

MCA-303 **Information Security** L=3, T=1

Course Objectives: To understand how cryptography can be used as an effective tool in providing assurance concerning privacy and integrity of information. To recognize the concept of encryption/decryption. To describe the different types of ciphers along with the identification of the characteristics of a good cipher. To provide skills to design security protocols for solving security problems. To develop skills necessary to help organizations in designing, testing and implementing well-planned information security measures for information systems.

UNIT – I

Introduction: Security Attacks: Motives, vulnerabilities, Defense strategies and techniques, Various Attacks- DoS, DDoS, Session Hijacking and Spoofing, Phishing, Buffer Overflow, Format String Attacks, SQL Injection, Malicious Software, Prevention and Detection, Data Protection, Response, Recovery and Forensics.

Basics of Cryptography: Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Other Cipher Properties- Confusion, Diffusion, Block and Stream Ciphers

UNIT – II

Secret Key Cryptography: Data Encryption Standard (DES), Strength of DES, Block Cipher, Design Principles and Modes of Operations, Triple DES.

Public Key Cryptography: Principles of Public Key Cryptosystems, RSA Algorithm, DiffieHellman Key Exchange algorithm

UNIT – III

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm, Message Authentication Codes – Message Authentication Requirements and Functions, HMAC, Digital signatures, Digital Signature Schemes, Authentication Protocols, Digital Signature Standards. Authentication Applications-Kerberos, Key Management and Distribution, X.509 Directory Authentication service, Public Key Infrastructure.

Electronic Mail Security-Pretty Good Privacy, S/MIME, Operating System Protection-Memory and Address protection, File Protection Mechanism, User Authentication. Database Security-Security Requirement, Reliability and Integrity, Sensitive data, Multilevel Databases.

UNIT – IV

IP Security: Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining security Associations, Internet Key Exchange, Web Security: Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Electronic Payment.

Intrusion Detection Systems and Firewalls Intruders, Intrusion Detection, Password Management, Firewalls Need, Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted systems.

Text Books:

1. 'Cryptography and Network Security- Principles and Practices' by William Stallings, 8th Edition, Prentice Hall Publication
2. 'Network security and Cryptography' by Bernard Menezes, 1 st Edition, Cengage Learning Publication
3. 'Computer Security- Principles and Practice' by William Stallings, 1 st Edition, Pearson Education

Reference Books:

1. 'Network Security Essentials' by William Stallings, 4th Edition, Pearson Publication
2. 'Applied Cryptography' by Bruce Schneier, Edition 2001, Wiley & Sons Inc
3. 'Cryptography and Network', 2nd edition, by Behrouz A Fourouzan, Debdeep Mukhopadhyay, TMH.

Course Outcomes:

By the end of the Course, Student will be able to:

CO1:understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application

CO2: gain knowledge on the notions of various types cryptography techniques.

CO3:understand and analyze the various cryptography techniques, their principles and applications.

CO4:identify and analyze the applications of security techniques and technologies in solving real life security problems.

CO5:understand, analyze and evaluate the security of information systems.

CO6: analyze and interpret the mechanisms to provide security for communicating information.

NOTE: In Each theory paper. Nine questions are to be set. Two questions are to be set from each Unit and Candidate is required to attempt one question from each unit. Question number nine is Compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all five questions are to be attempted.

MCA-E02 Artificial Intelligence & Expert Systems L=3, T=1

Course Objectives: The objective of the course is to provide the knowledge of artificial intelligence and expert systems. To enable the understanding of the concepts, methods, and techniques of Natural Language processing, genetic algorithms, and neural networks. To prepare students to be in a position to develop a system based on artificial intelligence.

UNIT – I

Overview of A.I.: Definition of AI, The Importance of AI, previous works in the history of AI, AI and related fields, Problem spaces and Search. Knowledge: General concepts-Definition and Importance of Knowledge, Knowledge-Based Systems, Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition of Knowledge.

UNIT – II

Natural Language Processing: Overview of Linguistics, Grammar and Language, Parsing Techniques, Semantic Analysis and Pragmatics. Multi Agent Systems: Agents and Objects, Agents and Expert Systems, Generic Structure of Multiagent Systems, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.

UNIT – III

Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle, Problem Solving using GA.

Artificial Neural Networks (ANN): Supervised, Unsupervised and Reinforcement Learning, Single Perceptron, Multi-Layer Perceptron, Self-Organizing Maps, Hopfield Network.

UNIT – IV

Pattern Recognition: Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech. Expert Systems: Definition, Rule Based System Architecture, Non-Production System Architecture, Basic Components of Expert system.

Text Books:

1. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems.” Prentice-Hall, India.
2. P. H. Winston, “Artificial Intelligence”, Addison Wesley.

Reference Books:

1. A.Rich and K. Knight, “Artificial Intelligence”, Tate McGraw Hill.
2. E. Charnaik And D. Mcdermott, “Introduction To Artificial Intelligence”, Addison-Wesley Publishing Company.
3. N. J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kauffman.
4. T. Dean, J. Allen and Y. Aloimonos, “Artificial Intelligence: Theory and Practice”, Benjamin/Cummings.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: analyze different approaches for artificial intelligence.

CO2:identify and select optimal solutions for different situations and projects.

CO3: implement the knowledge through practicing AI systems.

CO4: conduct independent research in artificial intelligence and expert systems and apply that knowledge in their future research and practice.

CO5: evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E03 **Cloud Computing** L=3, T=1

Course Objectives: To study the fundamental concepts of cloud computing, enabling technologies, cloud service models and security concerns.

UNIT – I

Cloud Computing: Definition, roots of cloud computing, characteristics, cloud architecture, deployment models, service models. Virtualization: benefits & drawbacks of virtualization, server virtualization, virtualization of - operating system, platform, CPU, network, application, memory and I/O devices etc.

UNIT – II

Cloud Computing Service Platforms – compute services, storage services, database services, application services, queuing services, e-mail services, notification services, media services, content delivery services, analytics services, deployment & management services, identity & access management services and their case studies.

UNIT – III

Cloud Technology: Introduction to Cloud Technologies, Study of Hypervisors Compare SOAP and REST Web-services, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services, Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications, Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo.

UNIT – IV

Cloud security fundamentals: issues, threats, data security and information security, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture: Architectural Considerations-General Issues,Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security Cloud computing security challenges: Virtualization security management, virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands-on Approach, University Press.

2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing – Principles and Paradigms, Wiley India Pvt. Ltd
3. S. Acharya, Data Analytics Using R, McGraw Hill Education (India) Private Limited.
4. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
5. Enterprise Cloud Computing by Gautam Shroff, Cambridge
6. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Books:

1. Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited
2. Saurabh Kumar, Cloud Computing, Wiley India Pvt. Ltd.
3. Shailendra Singh, Cloud Computing, Oxford
4. Coulouris, Dollimore and Kindber, Distributed System: Concept and Design, Addison Wesley
5. Michael Miller, Cloud Computing, Dorling Kindersley India
6. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill
7. Google Apps by Scott Granneman,Pearson
8. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
9. Cloud Computing: A Practical Approach, Antohy T Velte, et.al McGraw Hill.
10. Cloud Computing Bible by Barrie Sosinsky, Wiley India
11. Stefano Ferretti et.al., QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing

Course Outcomes:

By the end of the course, the students will be able to:
CO1: understand core issues of cloud computing and enabling technologies;
CO2: design services based on cloud computing platforms;
CO3: evaluate the cloud technologies.
CO4: analyse the cloud securities.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E04 **Cyber Law** L=3, T=1

Course Objectives: To study the fundamental concepts of Cyber Laws, Cyber Crimes, Contractual aspects, IT Acts and regulations and sections for digital services.

UNIT – I

Cyber Law: Introduction, Definition, nature & Scope of Cyber Laws. Sociolegal Implications of Computer Science, Cyber Laws.
Cyber Crimes: Definition & Kinds of Cyber Crimes. International and Foreign Developments. Common Cyber Offences: Pheakering, Internet Frauds, Hackers, Stalking, E-Mail, Security Invasion, Money Laundering, Data Diddling, Theft of Information.

UNIT – II

Contractual Aspects: Hardware Contracts: User Requirement Specification, Negotiation, Sales & Leases, Delivery & Payment, Seller's Obligations, Buyer's Remedies. Software Contract: Selecting Software, Types of Software, What is Software, Software License, Principal Commercial Terms, Warranties, Software Maintenance; Liability: Contractual Liability, Strict Liability, Negligence, Criminal. Miscellaneous (Briefly); Copyright & Patent Protection, Evidence, Protecting Confidential Information.

UNIT – III

The Information Technology Act, 2000: Introduction: Definition, A Brief Summary of the Act. Digital Signature & Electronic Governance (Sections 3 to 10) Secure Electronic Records & Secure Digital Signatures (Sections 14 to 16).

UNIT – IV

Regulation of Certifying Authorities (Sections 17 to 34). Digital Signature Certificates (Sections 35 to 39). Duties of Subscribers (Sections 40 to 42). Penalties, Adjudication Offences (Sections 45 to 47 & Sections 65 to 78). Cyber Regulations Appellate Tribunal (Sections 48 to 64).

Text Books & Reference Books:

1. The Information Technology Act, 2000.
2. Chris Reed (Ed.), Computer Law, 1996: Universal Law Publishing Co. Pvt. Ltd.
3. Mittal D.P., Law of Information Technology (2000): Taxmann's.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: understand the different cyber laws, crimes and offences.

CO2: identify the contractual aspects with respect to cyber laws.

CO3: gain knowledge on IT Acts.

CO4: acquire information about regulations and sections for digital services.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E05 Distributed Data Base Management System L=3, T=1

Course Objectives: To study the Distributed Data Processing concepts, architectures, query processing and reliability of Distributed Database Management Systems.

UNIT – I

Distributed Data Processing: Introduction, Fundamentals of Distributed Data Base Management System (Transparent management of distributed & replicated data, Reliability, Improved performance, System expansion), Disadvantages of Distributed Data Base Management System (Complexity, Cost, Distribution of control, Security, Distributed database design, Query processing, Directory Mgmt, concurrency control, Deadlock Mgmt, Reliability, OS support, Heterogeneous databases, Relationship). Relational Data Base Management System: Basic Concepts, Data Modeling for a Database, Records and Files, Abstraction and Data Integration, The Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS. Data Models, Data Associations, Data Models Classification, Entity Relationship Model, Relational Data Model. Normalization: Dependency structures, Normal forms.

UNIT – II

Distributed Data Base Management System Architecture: Architectural models for distributed DBMS (Autonomy, Distribution, Heterogeneity, and Architectural alternatives), Client/server systems, Peer-to-peer Distributed Systems. Distributed Database Design: Design Strategies (Top-Down Design & Bottom-Up design process), Design issues (reasons for fragmentation, alternatives, Degree & Correctness rules of fragmentation, Allocation alternatives, Information requirement. Fragmentation: Horizontal, Vertical, Hybrid Fragmentation. Allocation: Problem, Information requirement, Allocation model, Solution methods.

UNIT – III

Query Processing: Problem, objectives, Complexity of Relational Algebra operations, Characterization of query processing (Language, Types of Optimization, Optimization timing, Statistics, Decision sites, Exploitation of network topology & Replicated fragments, Use of semijoins), Layers of Query processing (Query decomposition, Data localization, Global & Local query optimizations). Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanism, Locking based concurrency control algorithm (centralized 2pl, primary copy 2pl, distributed 2pl), Timestamp based concurrency control algorithm (conservative

&multiversion TO algorithm), Optimistic concurrency control algorithm, Deadlock management, prevention, avoidance, detection & resolution.

UNIT – IV

Distributed DBMS Reliability: Reliability concepts & measures (system, state & failures, reliability & availability, mean time between failures/repair), Failures & fault tolerance in distributed system (reason for failures, fault tolerance approaches & techniques), Failures in Distributed DBMS (transaction, system, media & communication failure), Local reliability protocols (architectural considerations, recovery, information execution of LRM commands, checkpointing, handling media failure), Distributed Reliability Protocols (Components, Two-Phase commit protocol, Variation of 2PC).

Text Books:

1. M. Tamer Ozsu & Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education Asia.
2. Desai, B., "An Introduction to Database Concepts." Galgotia Publications, New Delhi.

Reference Books:

1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elimsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.
3. Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: understand the different fundamental concepts of Distributed Data processing.
CO2: gain the knowledge about the architecture of DDBMS.
CO3: design and implement the queries.
CO4: evaluate the Distributed Database Management Systems.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E06 Management of Software Projects L=3, T=1

Course Objectives: To study and understand the Software Project Management Concepts, Project Management models, risk management, cost estimation, monitoring and controls.

UNIT – I

Introduction to Software Project Management: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.

An Overview of Project Planning: Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning

Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.

UNIT – II

Selection of an Appropriate Project Approach: Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods,

Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.

Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom- up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.

UNIT – III

Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.

Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.

Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.

UNIT – IV

Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.

Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management,

Health and Safety, Some Ethical and Professional Concerns. Working in Teams: Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.

Text Books and Reference Books:

1. Bob Hughes, Mike Cotterell, Rajib Mall "Software Project Management", TMH, 6th 2018.
2. Shailesh Mehta, "Project Management and Tools & Technologies – An overview", SPD, 1st, 2017.
3. Walker Royce, "Software Project Management", Pearson, 2005.

Course Outcomes:

By the end of the course, the students will be able to:
CO1: learn and understand the Software Project Management concepts.
CO2: implement software project management models.
CO3: analyze and design the software projects.
CO4: evaluate the software projects.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E07 **Open Source Software** L=3, T=1

Course Objectives: To study and understand the free and open source software platforms. Implement PHP and MYSQL for development of applications.

UNIT – I

Open Source: Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions.

LINUX: Introduction to Linux Essential Commands - Filesystem Concept - Standard Files 1. The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction 2. String Processing - Investigating and Managing Processes - Network Clients - Installing Application.

UNIT – II

APACHE: Introduction: Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess.

UNIT – III

MYSQL: Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT – IV

PHP: Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

Text Book:

1. James Lee and Brent Ware,"Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", , Dorling Kindersley(India) Pvt. Ltd, 2008.

Reference Book:

1. Eric Rosebrock, Eric Filson,"Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together", Published by John Wiley and Sons, 2004.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: learn and understand the free and open source software.

CO2: explore and the configuring APACHE platform.

CO3: create and design databases.

CO4: design an application using PHP and MYSQL.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E08 **Image Processing** L=3, T=1

Course Objectives: Provide an introduction to the basic concepts and methodologies for digital image processing. To develop a foundation that can be used as a basis for further studies and research. Introduce the students to the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images.

UNIT – I

Digital Image Fundamentals: Introduction to Digital Image Processing and its applications; Components of an Image Processing System.
Image Representation and Description: Image Representation ; Digital Image Properties; Boundary descriptors; Regional descriptors; Steps in Digital Image Processing; Elements of Visual perception; Image Sensing and Acquisition; Image Sampling and Quantization; Relationship between Pixels; Color Representation.
Data Structures for Image Analysis: Levels of Image Data Representation; Traditional Image Data Structures: Matrices, Chains, Topological Data Structures, Relational Structures; Hierarchical Data Structures: Pyramids, Quadtrees, Other Pyramidal Structures.

UNIT – II

Image Pre-Processing: Pixel Brightness Transformations: Position-Dependent Brightness Correction, GrayScale Transformation; Geometric Transformations: Pixel Co-ordinate Transformations, Brightness Interpolation; Local Pre-Processing. Image Enhancement: Spatial Domain: Gray level transformations; Histogram processing; enhancement using arithmetic and logic operators; Basics of Spatial Filtering; Smoothing and Sharpening Spatial Filtering. Frequency Domain: Introduction to Fourier Transform; Filtering in the Frequency Domain; Smoothing and Sharpening frequency domain filters; Homomorphic Filtering.

UNIT – III

Image Restoration and Segmentation: Noise models; Mean Filters; Order Statistics; Adaptive filters; Noise Reduction by Frequency Domain Filtering; Inverse and Wiener filtering; Constrained Least Squares Filtering. Segmentation: Point, line, and Edge Detection; Edge Linking and Boundary detection; Thresholding; Region based segmentation; Edge based Segmentation; Segmentation by Morphological Watersheds; Matching. Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing.

UNIT – IV

Wavelets and Multiresolution Processing: Background: Image Pyramids; Subband coding; Multiresolution expansions. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing,Hit-or-Miss Transforms, Some Basic Morphological Algorithms. Compression – Fundamentals ; Image Compression models; Error-Free Compression; Variable Length Coding, LZW coding, Bit-Plane Coding, Lossless Predictive Coding; Lossy Compression: Lossy Predictive Coding, Transform Coding, wavelet Coding; Image Compression Standards.

Text Book:

1. Rafael C. Gonzales, Richard E. Woods, Digital Image Processing, Pearson Education.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, Third Edition ,Tata McGraw Hill .
2. Anil Jain K., Fundamentals of Digital Image Processing, PHI Learning.
3. Willliam K Pratt, Digital Image Processing, John Willey.
4. Malay K. Pakhira, Digital Image Processing and Pattern Recognition, First Edition, PHI Learning.
5. S. Jayaraman, S. Esakkirajan and T. Veerakumar, Digital Image Processing, McGraw Hill
6. B. Chanda ,D.DuttaMajumder, Digital Image Processing and Analysis, Prentice Hall of India.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: get acquainted with digital image fundamentals and its applications and get acquainted with the image representation and description methods;

CO2: learn and perform image pre-processing and enhancement to improve the image for further processing;

CO3: reconstruct photometric properties degraded by the imaging process and partition a digital image into multiple segments;

CO4: represent and analyse images at different resolutions, process images according to their shapes, and apply compression techniques to reduce the storage space of images.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E09 **Distributed Systems** L=3, T=1

Course Objectives: To study and understand the concepts of Distributed Systems, communications, synchronization and distributed web-based system.

UNIT – I

Introduction and Architectures: Definition of a Distributed System, Goals and Types of distributed systems, Architecture Styles, System Architectures, Middleware, Self-management in Distributed Systems with examples of Astrolabe, Globule and Jade. Processes: Threads, Virtualization, Clients, Servers and Code Migration

UNIT – II

Communication: Remote Procedure Call, Message-Oriented, Stream Oriented and Multicast Communication Naming: Names, Identifiers and Addresses, Flat naming, Structured Naming and Attribute-Based Naming.

UNIT – III

Synchronization: Clock Synchronization, Logical Clocks: Lamport's Logical Clocks and Vector Clocks, General Introduction to the Concepts of Replication and Fault Tolerance Distributed File Systems: Client-Server Architecture in NFS, Cluster-based Architecture in Google, Symmetric Architectures, RPC in NFS.

UNIT – IV

Distributed Web-Based Systems: Architecture Processes i.e. clients, Apache Web Server and Web Server Clusters, Communication i.e. HTTP and Simple Object Access Protocol, Web Proxy Caching. Case studies of Mach, Chorus and Amoeba distributed operating systems

Text Book:

1. Distributed Systems: Principles and Paradigms, 2nd ed by Tanenbaum, A. and van Steen, M., Prentice Hall, 2007.

Reference Books:

1. Distributed Systems: Concepts and Design, 4rd ed by Coulouris, G, Dollimore, J., and Kindberg, T., Addison-Wesley, 2006.
2. Introduction to Reliable Distributed Programming - Rachid Guerraoui and Louis
3. Rodrigues, Springer-Verlag, Berlin, Germany, 2006.
4. Elements of Distributed Computing - Vijay K. Garg, Wiley, 2002.

5. Distrubuted Computing: Principles and Applications by M. L. Liu, Pearson Education, 2008

Course Outcomes:

By the end of the course, the students will be able to:

CO1: understand the concepts and architecture of Distributed Systems.

CO2: learn and understand the different communication processes.

CO3: analyze the different synchronizations.

CO4: implement of distributed web-based systems.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E10 Object-Oriented Software Engineering L=3, T=1

Course Objectives: To teach the student the essential and fundamental aspects of object oriented concepts along with their applications. To teach the student to analyse, design and implement object-oriented software systems by means of a mid-sized project. To learn software development life cycle for Object-Oriented solutions for Real-World Problems. To learn various modelling techniques to model different perspectives of object-oriented software design (UML). Students will learn the application of software architectures in various settings, including the application of design patterns, frameworks and toolkits.

UNIT – I

Introduction to Software Development: The Challenges of Software Development – An Engineering Perspective – Object-Orientation - Iterative Development Processes.
Process Models: Life cycle models – Unified Process – Iterative and Incremental – Workflow – Agile Processes.

UNIT – II

Modeling –OO Systems: Requirements Elicitation – Use Cases – Unified Modeling Language, Tools.
Analysis: Analysis Object Model (Domain Model) – Analysis Dynamic Models – Non-functional requirements – Analysis Patterns.

UNIT – III

Design: System Design, Architecture – Design Principles - Design Patterns – Dynamic Object Modeling – Static Object Modeling – Interface Specification – Object Constraint Language.
Design Patterns: Introduction – Design Patterns in Smalltalk MVC – Describing Design patterns –Catalog of Design Patterns- Organizing the Catalog –How Design Patterns Solve Design Problems – How to select a Design Pattern – How to use a Design Pattern – What makes a pattern? – Pattern Categories – Relationship between Patterns – Patterns and Software Architecture.

UNIT – IV

Implementation, Deployment and Maintenance: Mapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management – Maintenance.

Recent Trends: Recent Trends in Object oriented Software Development.

Text Book:

1. Carol Britton and Jill Doake, A Student Guide to Object-Oriented Development (Oxford: Elsevier, 2005).

Reference Books:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable object-oriented software‖, Addison-Wesley, 1995.
2. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd ed, Pearson Education, 2004.
3. Ivar Jacobson, Grady Booch, James Rumbaugh, The Unified Software Development Process, Pearson Education, 1999.
4. Alistair Cockburn, Agile Software Development 2nd ed, Pearson Education, 2007.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: identify and select suitable Process Model for the given problem and have a thorough understanding of various Software Life Cycle models.

CO2: analyse the requirements of a given software project and produce requirement specifications (SRS).

CO3: design the Usecase Diagrams, Sequence Diagrams, Class Diagram, State Diagrams, and Deployment Diagrams by applying the UML Standards.

CO4: apply the knowledge of object-oriented modelling concepts and design methods with a clear emphasis on Unified Modelling Language (UML) for a moderately realistic object oriented system.

CO5: apply various software architectures, including frameworks and design patterns, when developing software projects.

CO6: apply the various Testing, Deployment and Configuration Management strategies for their projects.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E11 **Simulation and Modeling** L=3, T=1

Course Objectives: To introduce the fundamental concepts relevant to simulation and modeling. To understand the concept of queuing system and models, random number importance in simulation. To impart knowledge of various discrete events. To understand and implement Simulation Languages Simulation in C++, GPSS/ MATLAB/Network Simulators.

UNIT – I

Fundamentals Definition and reasons for simulation, Continuous (time-oriented) and discrete (event) systems, Modeling/programming simple deterministic systems, Rates and system dynamics.

Concepts in Simulation Stochastic variables; discrete vs continuous probability, Monte Carlo Simulations; Monte Carlo methods, Normally distributed random numbers, Monte Carlo V/S Stochastic Simulations.

UNIT – II

Queuing Models Single server queuing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queuing model. Determining the events and variables, Event graphs for inventory model. Random Numbers: Introduction to Random Numbers, Importance of Random Numbers in Simulation, MidSquare random number generator, Residue method, Arithmetic Congruential generator, Testing Numbers for Randomness, Chi-Square Test.

UNIT – III

Discrete Event System Simulation Discrete events; representation of time; queues and servers; generation of arrival patterns; resource seizing; departures simulation of a telephone system and computer networks; simulating components of an operating system; delayed calls; modeling policies; priority queues; tasks; gathering statistics; counters and summary statistics; measuring utilization and occupancy; recording distributions and transit times.

UNIT – IV

Introduction to a Simulation Languages Simulation in C++, GPSS/ MATLAB/Network Simulators.

Text Books and Reference Books:

1. Law and Kelton, “Simulation Modeling and Analysis”, McGraw-Hill.
2. J. Banks, J. Carson and B. Nelson, “Discrete-Event System Simulation”, Prentice-Hall.

3. K.A. Dunning “Getting Started in GPSS”, Engineering Press, San Jose, CA.
4. P. Fishwick, “Simulation Model Design and Execution”, Prentice-Hall.

Course Outcomes:

By the end of the course, the students will be able to:
CO1:understand and analyze the concept of simulation.
CO2:implement different models and methods.
CO3: simulate the different model and system.
CO4: apply the concepts of simulation languages.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA-E12 **Software Quality and Testing** L=3, T=1

Course Objectives: The objective of the course is to provide the basic knowledge of the concepts of quality assurance. To enable the understanding of the concepts, methods, and techniques of software testing. To prepare students to be in a position to develop error free and quality software.

UNIT – I

Introduction: Definition of Quality, QA, QC, QM and SQA, Software Quality Factors, Nature of Errors.

Software Quality Management: Metrics – Concept and Developing Metrics, Different Types of Metrics, Complexity Metrics, Software Quality Metrics, Objectives of Quality Measurement, Process Metrics, Product Metrics, Limitations of Software Metrics, Cost of Software Quality.

UNIT – II

Software Quality Assurance: Concepts, Quality Movement, Background Issues and SQA Activities, Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Statistical Quality Assurance, Software Reliability, SQA Plan, The ISO 9001 Quality Standard, Six Sigma, Informal Reviews.

UNIT – III

Software Testing and its Strategies: Testing, Verification and Validation, Test Strategies for Conventional and Object Oriented Software, Unit Testing, Integration Testing, Validation Testing, Alpha and Beta Testing, System Testing, Recovery Testing, Security Testing, Stress Testing, Performance Testing, Metrics for Source Code, Metrics for Testing, Debugging Process, Debugging Strategies.

UNIT – IV

Testing Techniques: Software Testing Fundamentals, Black Box and White Box Testing, Basis Path Testing, Flow Graph Notation, Independent Program Paths, Graph Matrices, Control Structure Testing, Condition Testing, Data Flow Testing, Loop Testing, Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis.

Text Book:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw Hill.

Reference Books:

1. Douglas Bell, "Software Engineering for Students – A Programming Approach", Pearson Education.
2. Donna C. S. Summers, "Quality Management", Prentice-Hall.

Course Outcomes:

By the end of the course, the students will be able to:

CO1: analyze different approaches to software testing and quality assurance,

CO2: identify and select optimal solutions for different situations and projects.

CO3: implement the knowledge acquired in practice.

CO4:conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice.

CO5: evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

NOTE: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.