HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR (H.P)-INDIA

Syllabus: Choice Based Credit System

[Effective from the Session: 2020-21]

MASTER OF COMPUTER APPLICATIONS (MCA)

CURRICULUM FOR MCA PROGRAMME

Master of Computer Applications (MCA) is a two years post graduate programme. The curriculum of MCA is designed to meet the growing demand of qualified professionals in the field of ICT. It comprises of the core subjects like Database System, Computer Architecture and System, networking, and data structures, core programming languages like C, C++, Java, web programming, Android and Python. Students also get exposure to advanced topics like cyber security, mobile software, IOT, data science etc. Elective papers help students to have an exposure in IoT, image Processing Big Data and Information Security related subjects. The curriculum for MCA Program of study has been designed with credits of 88-120. The credit system enabling quantification of course work, with one credit being assigned to each unit after a student completes its teaching-learning process, followed by passing in Internal Assessment (IA) and End Semester Examination (ESE) Further, Choice Based Credit System (CBCS) to be helpful in customizing the course work for a student, through Core, Electives and Open Electives. All Courses registered by a student in a Semester is to earn credits. In a widely accepted definition, students to earn One Credit by registering

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and passing: One Hour/Week/Semester for Lecture (L) Courses or Tutorials (T); and Two Hour/Week/Semester for Laboratory/Practical (P).

CURRICULUM STRUCTURE

MCA degree programme will have a curriculum with Syllabi consisting of following type of courses:

1. **Foundation Course:** Include Soft Skills and Business Management, Mathematics and Professional and Social Ethos.
2. **Core Theory:** A course, which should compulsorily by studied by a candidate as a core requirement is termed as a Core course. These courses are employability enhancement courses relevant to the chosen program of study. Program core comprises of Theory, Practical, Project, Seminar etc. Project work is considered as a special course involving application of knowledge in solving/ analyzing/exploring a real life situation/ difficult problem and a candidate studies such a courses on his own with an advisory support by a teacher/faculty member .
3. **Elective Courses:** Elective course is generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or with provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill.
4. **Nomenclature Used:** The following Nomenclature is used in this syllabus.
    a) Foundation Courses
    b) Core Theory
    c) Elective
    d) Practical
    e) Industrial Training and Project
5. **Course Plan:** It has been recommended by the AICTE that the suggested Courses Work 88-120 Credits, with 15-30 credits per Semester on an average with built-in flexibility. The courses need to be completed successfully by a student to qualify for the award of the PG degree.

SCHEME OF TEACHING AND EXAMINATION
MASTERS OF COMPUTER APPLICATIONS(MCA)

Semester-I

Course Code	Course Type	Course Title	Periods			Credits	Evaluation Scheme				Total
			L	T	P		ESE	Internal Assessment			
								CT	TA	Total	
MCA-101	Foundation Course	Discrete Mathematical Structures	3	1	0	3	60	24	16	40	100
MCA-102	Foundation Course	Universal Human Values	3	0	0	3	60	24	16	40	100
MCA-103	Core Theory	Computer Fundamentals and Programming in C++	3	1	0	3	60	24	16	40	100
MCA-104	Core Theory	Database Management Systems	3	1	0	4	60	24	16	40	100
MCA-105	Core Theory	Computer Organization and Architecture	3	1	0	4	60	24	16	40	100
MCA-106	Core Theory	Operating Systems	3	0	0	4	60	24	16	40	100
Labs:							**ESVE**	**FW**	**LP**	**Total**	**Sub. Total**
MCA-107	Practical Lab	Lab I : C++ Programming	0	0	3	1	50	25	25	50	100
MCA-108	Practical Lab	Lab II : DBMS	0	0	3	1	50	25	25	50	100
MCA-109	Practical Lab	Lab III: Operating Systems	0	0	2	1	50	25	25	50	100
Total			**18**	**4**	**8**	**24**	**510**	**219**	**171**	**390**	**900**

Legend:	**L**-Lecture	**T**-Tutorial
	P-Practical	**CT**-Class Test
	TA-Teacher's Assessment	**ESE**-End Semester Examination
	ESVE - End Semester Viva-Voce Exam.	**LP** - Lab performance
	FW - Documentation / File work and presentation	

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SCHEME OF TEACHING AND EXAMINATION
MASTERS OF COMPUTER APPLICATIONS(MCA)

Semester-II

Course Code	Course Type	Course Title	Periods			Credits	Evaluation Scheme				Total
			L	T	P		ESE	Internal Assessment			
								CT	TA	Total	
MCA-201	Core Theory	Software Engineering	3	0	0	3	60	24	16	40	100
MCA-202	Core Theory	Data Structures Using C	3	1	0	3	60	24	16	40	100
MCA-203	Core Theory	Java Programming	3	1	0	4	60	24	16	40	100
MCA-204	Core Theory	Web Technology (CSS, Java Script and PHP)	3	1	0	3	60	24	16	40	100
MCA-205	Core Theory	Computer Networks	3	1	0	4	60	24	16	40	100
MCA-206	Elective	Elective –II	3	0	0	4	60	24	16	40	100
Labs:							ESVE	FW	LP	Total	Sub. Total
MCA-207	Practical Lab	Lab IV : Data Structures	0	0	3	1	50	25	25	50	100
MCA-208	Practical Lab	Lab V : Java Programming	0	0	3	1	50	25	25	50	100
MCA-209	Practical Lab	Lab VI: Web Technology	0	0	2	1	50	25	25	50	100
Total			**18**	**4**	**8**	**24**	**510**	**219**	**171**	**390**	**900**

Elective

Sr. No.	Course Type	Course Code	Course Title
1.	Elective	MCA- 206(A)	Artificial Intelligence
2.	Elective	MCA- 206(B)	Software Quality Assurance
3.	Elective	MCA- 206(C)	Computer Graphics
4.	Elective	MCA- 206(D)	Image Processing

Legend:	**L**-Lecture	**T**-Tutorial
	P-Practical	**CT**-Class Test
	TA-Teacher's Assessment	**ESE**-End Semester Examination
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SCHEME OF TEACHING AND EXAMINATION
MASTERS OF COMPUTER APPLICATIONS(MCA)

Semester-III

Course Code	Course Type	Course Title	Periods			Credits	Evaluation Scheme				Total
			L	T	P		ESE	Internal Assessment			
								CT	TA	Total	
MCA-301	Foundation Course	Business Communication	3	0	0	3	60	24	16	40	100
MCA-302	Core Theory	Programming in Python	3	1	0	3	60	24	16	40	100
MCA-303	Core Theory	Android Programming	3	1	0	3	60	24	16	40	100
MCA-304	Core Theory	Cloud Computing and Big Data	3	1	0	4	60	24	16	40	100
MCA-305	Core Theory	Theory of Computation	3	1	0	4	60	24	16	40	100
MCA-306	Elective	Elective –III	3	0	0	4	60	24	16	40	100
Labs:							**ESVE**	**FW**	**LP**	**Total**	**Sub. Total**
MCA-307	Practical Lab	Lab VII: Python Lab	0	0	3	1	50	25	25	50	100
MCA-308	Practical Lab	Lab VIII : Android Lab	0	0	3	1	50	25	25	50	100
MCA-309	Practical Lab	Lab IX: Minor Project	0	0	2	1	50	25	25	50	100
Total			**18**	**4**	**8**	**24**	**510**	**219**	**171**	**390**	**900**

Elective

Sr. No.	Course Type	Course Code	Course Title
1.	Elective	MCA- 306(A)	Data Warehouse and Mining
2.	Elective	MCA- 306(B)	Soft Computing
3.	Elective	MCA- 306(C)	Distributed System
4.	Elective	MCA- 306(D)	Data Analytics

Legend:	**L**-Lecture	**T**-Tutorial
	P-Practical	**CT**-Class Test
	TA-Teacher's Assessment	**ESE**-End Semester Examination
	ESVE - End Semester Viva-Voce Exam.	**LP** - Lab performance
	FW - Documentation / File work and presentation	

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SCHEME OF TEACHING AND EXAMINATION
MASTERS OF COMPUTER APPLICATIONS(MCA)

Semester-IV

Course Code	Course Type	Course Title	Periods			Credits	Evaluation Scheme				Total
			L	T	P		ESE	Internal Assessment			
								CT	TA	Total	
MCA-401	Foundation Course	Operational Research	3	0	0	3	60	24	16	40	100
MCA-402	Foundation Course	Fundamentals of Management	3	0	0	3	60	24	16	40	100
MCA-403	Core Theory	Analysis and Design of Algorithms	3	1	0	4	60	24	16	40	100
MCA-404	Elective	Elective –IV	3	1	0	4	60	24	16	40	100
Industrial Training and Project							**ESVE**	**FW**	**PWP**	**Total**	**Sub. Total**
MCA-405	Major Project	Industrial Training and Project Work	0	0	0	8	100	100	100	200	300
Total			**12**	**2**	**0**	**22**	**340**		**171**	**390**	**700**

Elective

Sr. No.	Course Type	Course Code	Course Title
1.	Elective	MCA- 404(A)	Internet of Things (IoT)
2.	Elective	MCA- 404(B)	Parallel Computing
3.	Elective	MCA- 404(C)	Compiler Design
4.	Elective	MCA- 404(D)	Cyber Security

Legend:	**L**-Lecture	**T**-Tutorial
	P-Practical	**CT**-Class Test
	TA-Teacher's Assessment	**ESE**-End Semester Examination
	ESVE - End Semester Viva-Voce Exam.	**LP** - Lab performance
	FW - Documentation / File work	**PWP:** Project Work Presentation

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MCA-101 Discrete Mathematical Structures

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Foundation Courses

Objective: The main objective of this course is to provide mathematical knowledge of statistics, probability and number theory. After completing the course the student should be competent in handling mathematical problems related with Sets, Probability and Graph theory.

UNIT-I

Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference. **Sets and Relations:** Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering.

(10-L,3-T=13)

UNIT-II

Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem. **Group Theory:** Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory. **(10-L,3-T=13)**

UNIT-III

Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets. **Boolean Algebra:** Boolean Functions and its Representation, Simplifications of Boolean Functions. **(10-L,3-T=13)**

UNIT-IV

Optimization: Linear Programming - Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations, Resource Levelling, Cost Consideration in Project Scheduling.

(10-L,3-T=13)

Text Books:

1. Tremblay J.P. and Manohar R, "Discrete Mathematical Structure with Applications to Computer Science".
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill.
3. Kolman, Dicreter, "Mathematical Structures", Prentice Hall International.

References Books:

1. Liu C.L., "Elements of Discrete Mathematics"
2. Murray Spiegel, John Schiller, R. Alu Srinivasan, Debasree Goswami, "Probability and Statistics", McGraw Hill Education (India) Private Limited.

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MCA-102 Universal Human Values

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hours

Course Type: Foundation Courses

Objective: The main objective of this course is, to aware the students about human values and professional ethics and also aware them about their various social and professional responsibilities. After completing the course the student should be aware about their social and professional responsibilities towards, self, society and nature.

UNIT-I

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, The Basic Human Aspirations-Continuous Happiness and Prosperity, The Program to Fulfil Basic Human Aspirations. **(10 L)**

UNIT-II

Understanding The Harmony At Various Levels: Understanding the Human Being as Co-existence of Self ('I') and Body, Harmony in the Self ('I')- Understanding Myself, **Harmony with the Body**-Understanding *"Sanyama"* and *"Svasthya"*. **(10 L)**

UNIT-III

Harmony in the Family- Understanding Values in Human Relationships, Harmony in the society- From Family Order to World Family Order, **Harmony in Nature**- Understanding the Interconnectednee and Mutual Fulfillment, Harmony in Existence Understanding Existence as Co-existence. **(10 L)**

UNIT-IV

Implications of the Right Understanding: Providing the Basis for Universal Human Values and Ethics Human Conduct, Basis for the Holistic Alternative towards Universal Human Order, Professional Ethics in the Light of Right Understanding, Vision for Holistic Technologies, Production Systems and Management Models, Journey towards the Holistic Alternative. **(10 L)**

Text Books:

1. RR Gaur, R Sangal, GP Bagaria, "A foundation course in Human Values and professional ethics", Excel Book, New Delhi.

2. S. Kannan, K. Srilakshmi, "Human Values and Professional Ethics with relevant case studies", Taxmann Publications Private Limited.

Reference Books:

M. Govindarajan, S. Senthikumar, M.S. Natarajany, "Professional Ethics and Human Values", PHI

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MCA-103 Computer Fundamentals and Programming in C++

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of basic programming tools and various methodologies used in programming. After completing the course the student should be competent in programming tools, methodologies and able to use these tools and methodologies to solve real life problems.

UNIT-I

Basics of computer: Basics of computer and its operation, Classification, Computer organization Computer Software, IO Devices, Memory, Functional Components and their interconnections, MS-word, Excel and Power Point. **Programming Tools:** Problem analysis, Algorithm, Types of Algorithms, Flowchart, Programming Language, Modular programming, Top Down and Bottom up approaches, Type of errors. **(10-L,3-T=13)**

UNIT-II

Object Oriented Programming- Object, Classes, Features. **Language Design and Translation Issues:** Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models. **(10-L,3-T=13)**

UNIT-III

Data Types: Properties of Types and Objects, Scalar and Composite Data Types. **Programming in C++:** Tokens, Identifiers, Variables and Constants; Data types, Operators, Expression, Control statements, Looping, IO Operations, Arrays, Functions, Parameter Passing, Structure and Union. **(10-L,3-T=13)**

UNIT-IV

Object Oriented Programming with C++. Class and Objects, Constructors and Destructors, Overloading, Inheritance, Polymorphism, Pure Virtual Functions, Templates, Exception and Event Handling, Streams and Files, Multi file Programs. **(10-L,3-T=13)**

Text Books:

1. Dr. Pawan Thakur, Dr. S.K. Gandhi "Basic Computer Engineering", Satya Prakashan, New Delhi.
2. Mullis Cooper, "Spirit of C", Jacob Publications.
3. B. Gottfried, "Schaum's Programming with C", Tata McGraw-Hill.
4. Y. Kanetkar, "Let us C", BPB Publications.
5. E. Balagurusamy," Object Oriented Programming in C++", McGraw Hill Education .

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language," Prentice Hall of India.
2. "Complete reference to C"- Tata Mcgraw Hill.
3. Yashwant Kanetkar, "Understanding Pointers in C", BPB Publications.
4. Y. Kanetkar, "Let us C++", BPB Publications.

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MCA-104 Database Management Systems

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Database, various methodologies and applications software used for data base management. After completing the course the student should be competent in data base handling, able to design and manage database for real life problems and the student should by proficient in query handling.

UNIT-I

Database System Concepts and Architecture: Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architectures for DBMS. **Data Modeling:** Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Relational Algebra and Relational Calculus, Codd Rules.

(10-L,3-T=13)

UNIT-II

Normalization for Relational Databases: Functional Dependencies and Normalization. **SQL:** Data Definition and Data Types; Constraints, Queries, Insert, Delete and Update Statements, Views, Stored Procedures and Functions, Database Triggers, SQL Injection. **(10-L,3-T=13)**

UNIT-III

Transaction Management and Concurrency Control: Serializability, Concurrency Control, Locking Scheme and Timestamp- Based Order, Optimistic Scheduling, Multi-version Techniques. **Database security and recovery:** Database security requirements, Data Encryption, Type of failure, recovery concepts, shadow paging. **(10-L,3-T=13)**

UNIT-IV

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. **(10-L,3-T=13)**

Text Books:

1. Desai, B., "An Introduction to Database Concepts", Galgotia Publications, New Delhi.
2. Elimsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.

Reference Books:

1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.
3. M. Tamer Ozsu and Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education Asia.

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MCA-105 Computer Organization and Architecture

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge about computer organization and architecture, instruction format and actual data processing inside CPU. After completing the course the student should be able to understand all the components of computer system, as well as the organization of these components inside computer system, various data processing mechanism used inside CPU.

UNIT-I

Data Representation: Data Types, Number Systems and Conversion, Complements, Fixed Point Representation, Floating Point Representation, Error Detection Codes, Computer Arithmetic - Addition, Subtraction, Multiplication and Division Algorithms. **Digital Logic Circuits and Components:** Digital Computers, Logic Gates, Boolean Algebra, Map Simplifications, Combinational Circuits, Flip-Flops, Sequential Circuits, Integrated Circuits, Decoders, Multiplexers, Registers and Counters, Memory Unit.

(10-L,3-T=13)

UNIT-II

Register Transfer and Micro-operations: Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Micro-operations. **Basic Computer Organization and Design:** Stored Program Organization and Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output, Interrupt. **Programming the Basic Computer:** Machine Language, Assembly Language, Assembler, Program Loops, Subroutines, Input-Output Programming. **(10-L,3-T=13)**

UNIT-III

Micro-programmed Control: Control Memory, Address Sequencing, Design of Control Unit. Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC Computer, CISC Computer. **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing Array Processors. **(10-L,3-T=13)**

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Serial Communication. **Memory Hierarchy:** Main Memory, Auxillary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware. **(10-L,3-T=13)**

Text Books:

1. Morris M. Mano, "Computer System and Architecture", PHI Publications.
2. Stallings and Williams, "Computer Organization and Architecture", Maxwell Macmillan.

Reference Books

1. V.Rajaraman and Radha krishnan, "Introduction to Digital Computer Design", PHI Publications.
2. P.PalChowdhary, "Computer Organization and Design", PHI Publications

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MCA-106 Operating Systems

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge about Operating system (Windows and Linux). After completing the course the student should be able to understand various methodologies used by operating system to manage different types of tasks and able to use Windows and UNIX operating system proficiently.

UNIT-I

Basics of Operating Systems: Operating System Structure, Operations and Services, Types, System Calls, Operating-System Design and Implementation; System Boot. **Process Management:** Process Scheduling and Operations. **Threads:** Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. **(10-L,3-T=13)**

UNIT-II

CPU Scheduling: Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real-Time CPU Scheduling. **Deadlocks:** Deadlock Characterization, Methods **Inter-process Communication:** Communication in Client–Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization. **(10-L,3-T=13)**

UNIT-III

Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files. **Storage Management:** Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure. **Security:** Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses. **(10-L,3-T=13)**

UNIT-IV

Linux Operating Systems: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Inter-process Communication, Network Structure. Windows Operating Systems: Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking. **Windows Operating Systems:** Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking. **(10-L,3-T=13)**

Text Book:

1. Silberschatz, Galvin, "Operating System Concepts", Addison Wesley Publishing Company.
2.Tanenbaum, A.S., "Modern Operating System", Prentice Hall of India Pvt. Ltd.

Reference Books:

1. William Stallings, "Operating Systems", Macmillan Publishing Company.
2. Deitel H.M., "An Introduction to Operating System", Addison Wesley Publishing Company.
3. Kenneth Rosen, Douglas Host, "The Complete Reference", Unix, Tata McGraw Hill.

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MCA-107 Lab I : C++ Programming

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner:50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of MCA-103. After completing the course the student should be competent in handling real life problems on C and C++ platform.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Data Types and Operator, Input/output Functions, Decision making and Looping Statements
2. Functions, Array and Strings
3. Structures
4. Functions Parameter Passing
5. Virtual Functions
6. Class and Objects
7. Constructors and Destructors
8. Overloading
9. Inheritance and Templates
10. Exception and Event Handling
11. Streams and Files

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MCA-108 Lab II: DBMS

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of MCA-104 After completing the course the student should be competent in defining and manipulating database through MySQL/Oracle and proficient in query handling by using MySQL/Oracle.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Data Definition Language
2. Data Manipulation Language
3. Data Control Language
4. Transaction Control Language
5. Constraints
6. Clauses and Sub queries
7. Views
8. Stored Procedures and Functions
9. Database Triggers
10. SQL Injection.

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MCA-109 Lab III: Operating System

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of MCA-106.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Basics of Linux commands/Windows/DOS.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement Bankers algorithm for Dead Lock Avoidance
7. Implement an Algorithm for Dead Lock Detection
8. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
9. Implement Paging Technique and memory management.
10. Implement Threading and Synchronization Applications

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MCA-201 Software Engineering

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide knowledge about various methodologies used in software engineering, various models used in software development. After completing the course the student should be competent in all the phases of software development life cycle, able to develop software by following software engineering principles, and proficiently write reports for software project.

UNIT-I

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), Adptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering.

(10-L,3-T=13)

UNIT-II

Software Requirements: Functional and Non-Functional Requirements, Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modelling, Requirements Review, Software Requirment and Specification (SRS) Document. **Software Design:** Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling; Object-Oriented Design, Data Design, Architectural Design, User Interface Design, Component Level Design. **(10-L,3-T=13)**

UNIT-III

Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM); Software Reliability. **Estimation and Scheduling of Software Projects:** Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort; Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing; Time-line Charts. (10-L,3-T=13)

UNIT-IV

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Tesing; 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. **(10-L,3-T=13)**

Text Books:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House.
2. K.K. Aggrawal and Yogesh Singh, "Software Engineering", New Age International (P) Ltd.

Reference Books:

1. Pressman, R.S., "Software Engineering – A Practitioner's Approach", McGraw Hills.
2. Mall Rajib, "Fundamentals of Software Engineering", PHI, New Delhi.

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MCA 202- Data Structures Using C

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Programming approach and data structures along with C language. After completing the course the student should be competent in data structures, and able to use these tools and methodologies to solve real life problems on C platform.

UNIT-I

Data Structure: Definition, Basic Concepts, ADT **Array:** Definition, Memory Allocation, Single and Multidimensional Array, Addressing Scheme, Sparse Matrices, Polynomial representation. **Link List:** Dynamic memory Allocation, Single Linked and multiply linked list- Different operations, Circular linked lists, Linked lists as an ADT. **Stack and Queue**: Definition and implementation using arrays.

(10-L,3-T=13)

UNIT-II

Trees: Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree, Data Structure for Sets, **Graphs:** Sorting and Searching Algorithms.

UNIT-III

File organization: Structure and Processing of Sequential files, Indexed Sequential and Direct files, Hashing. Algorithm complexity, time-space trade-off between algorithms, **Asymptotic notations:** Big- O, omega, theta. **(10-L,3-T=13)**

UNIT-IV

Sorting and Searching: Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Sequential search, Linear search and their complexity **Design Techniques:** Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound. **(10-L,3-T=13)**

Text books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein. "Introduction to Algorithms,Prentice Hall India.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," Pearson .

References Books:

1.. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford stein, "Introduction to Algorithms", second edition, Prentice Hall India, 2009.
2. Sara. Basse, Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson,
3. R. Motwani and P. Raghavan, "Randomized Algorithms," Cambridge University Press.

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MCA 203 Java Programming

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Object Oriented Programming approach and data structures along with Java programming language tools. After completing the course the student should be competent in Object Oriented programming tools and data structures, and able to use these tools and methodologies to solve real life problems on Java platform.

UNIT-I

Introduction: Object Oriented Programming, History and Basics of Java, Java Data Types, Variables, and Operators, Control Structure and looping, Array and String, **Introduction of Classes:** Fundamental of Classes and Methods, Constructors, Overloading Methods **Exception Handling in Java:** Exception Handling basics, try, catch and finally, throw and throws clause, re-throwing of exceptions, handling user defined exceptions. **(10-L,3-T=13)**

UNIT-II

Extending Classes and Inheritance: Fundamental of Inheritance, Packages and Interfaces, Multithreading Programming. **Working with Abstract Windows Toolkit:** Creating Applets in Java, Working with Graphics and Text, GUI Components, Menus and Layout Managers. **(10-L,3-T=13)**

UNIT-III

Java Swings: Java Foundation Classes, Hierarchy of Java Swing classes, Swing components, **Multimedia Applications:** Multimedia, Images **Look-and-Feel:** Look-and-Feel of Swing GUI Components, Swing's pluggable look-and-feel (PLAF), standard look-and-feels (Nimbus, Motif, Windows). **(10-L,3-T=13)**

UNIT-IV

Event Handling: Introduction, Event Classes and Listener Interfaces. **Accessing Databases with JDBC:** Installing MySQL, Setting up a MySQL User Account, Manipulation Databases with JDBC, RowSet Interface, ResultSet

Text books:

1. R. Nageswara Rao, "Core Java an integrated approach", Dreamtech Press.
2. Paul Deitel, Harvery Deitel, "Java How to Program", PHI New Delhi.
3. . The Complete Reference JAVA by Herbert Schildt, TMH Publication.
4. Beginning JAVA, Ivor Horton, WROX Public.

References Books:

1. Java 2 UNLEASHED, Tech Media Publications.
2. Java 2 API Documentations.

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MCA-204 Web Technology (CSS, Java Script and PHP)

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of web-development Languages and web-designing tools. After completing the course the student should be competent in basic web-development as well as web-designing tools, and able to use these tools and to design and develop web-pages professionally.

UNIT-I

Introduction: Internet, Internet Protocol, HTML, HTML Tags, Introduction to HTML5, New elements, Video/DOM, Audio, Drag and Drop, Canvas/SVG, App Catch, SSE and Tags. Styling Pages (CSS), CSS Properties, Box Model. **Introduction to Dreamweaver:** Dreamweaver tools, Image Processing Tools. **(10-L,3-T=13)**

UNIT-II

Styling Pages (CSS): Introduction, CSS Properties, Box Model, **XML: XML Schema, Custom Markup Language. Introduction to server:** Types of Servers, Types of virtual server, Installing and configuring Web server(Apache/Tomcat/Glassfish/IIS). **(10-L,3-T=13)**

UNIT-III

Introduction to Java Script: Basic functions, Validating form using JavaScript, Enhancing form with JavaScript, JavaScript Libraries. **(10-L,3-T=13)**

UNIT-IV

PHP: Overview of server side scripting, phpinfo(), Form handling, File handling, cookies, Session Tracking; Database access using PHP and **MySQL:** Connecting to database-server, Selecting database, creating query, reading records from database, storing records in database. **(10-L,3-T=13)**

Text Books:

1. Robert Sebesta, "Programming with World Wide web " Pearson.
2. John Duckett, "Beginning with HTML, XHTML, CSS and JavaScript" Wiley Wrox.

References Books:

1. Deitel and Deitel, "XML How to Program", Pearson.
2. Shroff, "Dreamweaver CS6 the Missing Manual", Publishers and Distributors.
3. "Adobe Dreamweaver CS room In a Book", Person.
4. "Photoshop CC The Missing Manual", Shroff Publishers and Distributors.

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MCA-205 Computer Networks

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide knowledge about various protocols and layers used in Computer Networks and basics of various communication mechanisms used to send and receive data. After completing the course the student should be competent in basics of computer networking and communication system, and understand the significance of various protocols and layers used in computer Networks.

UNIT-I

Introduction: Data Communication, Network Components. **OSI Reference Model:** Layered architecture, Functions of layers, TCP/IP reference model, Comparison of OSI & TCP/IP models. Internet, frame relay, ATM, Ethernet, Wireless LAN. **Physical layer:** Theoretical basis for data communications, bandwidth limited signals, maximum data rate of a channel, Public switched telephone networks, mobile telephone system. **(10-L, 3- T=13)**

UNIT-II

Data Link and Mac Layer: Design issues, Framing techniques, Flow control, Error Control, **Data link Control and Protocols:** Simplest Protocol, Stop-and-Wait Protocol, Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access Random Access, Controlled Access, Channelization, **IEEE standards:** 802.3, 802.4, 802.5, 802.11, 802.15.

(10-L,3-T=13)

UNIT-III

Network and transport Layer: Network layer design issues, 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 and datagram sub-networks, definition of quality of service.

(10-L,3-T=13)

UNIT-IV

Internetworking: Tunneling, internet-work routing, fragmentation, **Network layer in Internet**: IP protocol, IP Address, OSPF, BGP, Internet multicasting, Mobile IP, Ipv6.**Transport Layer:** Concept of transport service, elements of transport protocols, a simple transport protocol, Remote procedure call, **Application layer services protocols:** DNS, SMTP, FTP, TELNET, HTTP, WWW. **Case study**: Study of various network simulators, Network performance analysis using NS2. **(10-L,3-T=13)**

Text books:

1. B.A. Forouzan, "Data Communication & Networking", Tata Mcgraw Hill.
2. A.S. Tanenbaum, "Computer Networks", Prentice Hall.

References Books:

1. William Stallings, "Data and Computer Communication", McMillan Publishing Co.
2. Black, Data Networks, PHI.
3. Fred Halsall, "Data Communications, Computer Networks", Pearson Education.

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MCA- 206(A) Artificial Intelligence

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Artificial Intelligence and related technologies. After completing the course the student should be competent in Prolog Programming tools and also able to understand the Artificial Intelligence and its applications for real life problems.

UNIT-I

Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures. **Knowledge Representation:** Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies, Expert Systems, Handling Uncertainty in Knowledge.

(10-L,3-T=13)

UNIT-II

Planning: Components of a Planning System, Linear and Non Linear Planning; Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning. **Natural Language Processing:** Grammar and Language; Parsing Techniques, Semantic Analysis and Prgamatics. **(10-L,3-T=13)**

UNIT-III

Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multi-agent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools. **Fuzzy Sets:** Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy Control System and Fuzzy Rule Based Systems.

(10-L,3-T=13)

UNIT-IV

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. **(10-L,3-T=13)**

Text Book:

1. Dr. Pawan Thakur, Susheela Pathania, "Artificial Intelligence", Satya Prakashan", New Delhi.
2. M. Ganesh, "Introduction to Fuzzy Sets and Fuzzy Logic", PHI Publication.
3. B. Yegnanrayana, "Artificial Neural Networks", PHI Publication.

Reference Books:

1. E. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill.
2. E. Charnaik and D. McDermott," Introduction to artificial Intelligence", Addison- Wesley Publishing.
3. Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publishing Co.

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MCA- 206(B) Software Quality Assurance

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge to assure quality of software. After completing the course the student should be competent in handling various quality assurance issues practically and able to these methodologies in software development.

UNIT-I

Software and Quality Concept: overview, Software perspective, Software Quality, Software Quality Assurance, Software Quality models, Software Quality measurement and metrics. **Assuring Software Quality Assurance (SQA):** life cycle, SQA planning, SQA monitoring and controlling, testing, setting standards and procedures, Developing and controlling relevant metrics, SQA activities revision, process evaluation, software standards. **(10-L,3-T=13)**

UNIT-II

Software Quality Meterics: Objectives, Software metrics, Software Quality metrics framework, Software Quality metrics features, Development of software quality metrics- SATC's approach, Kitchenham's approach, Abreu's approach, Victor's approach, Selection of Software Quality metrics- Size related metrics, complexity metrics, Halstead metrics, quality metrics. **Software Quality Models:** McCall's model, Boehm model, ISO 9126 model, Dromey's Quality model, Non-hierarchical model- Bayesian belief networks, star model, capability maturity models. **(10-L,3-T=13)**

UNIT-III

Software Testing: Introduction, Definition (testing, fault, error, failure, bug, mistake), test oracle, test case, Process, Limitations of Testing. Functional Testing: Boundary Value Analysis- Introduction &Definition, Generalising, limitations, Robustness testing, Worstcase testing, Test cases. Equivalence Class Testing - Introduction & Definition, Weak normal, strong normal, Weak robust, Strong robust, Test cases. Decision Table Based Testing- Introduction & Definition, technique, test cases. **(10-L,3T=13)**

UNIT-IV

Structural Testing: Path testing, DD-path, Test coverage metrics, McCabe's basis path method **Data Flow Testing**: Definition, data flow graphs, data flow model, Data flow testing strategies. **Levels of Testing:** Traditional view of testing levels, Integration Testing (Decomposition based integration), Unit Testing, System Testing. **Metrics and Complexity:** Halstead's Metrics, Token count. Structural Metrics - Definition, Cyclomatic complexity, Hybrid Metrics. **(10-L,3-T=13)**

Text Books:

1. R A Khan, K Mustafa, SI Ahson, "Software Quality- Concepts and Practices", Narosa Publishing House,
2. Boris Beizer, "Software Testing Techniques", Dreamtech press.
3. Paul C. Jorgensen "Software Testing- A Craftsman Approach", CRC Press

Reference Books:

1. Alan C Gillies, "Software Quality: Theory and Management", Cengage Learning, India.
2. Nina S Godbole, "Software Quality Assurance: Principles and Practice", Narosa Publishing House.
3. K.K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publishers.

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MCA- 206(C) Computer Graphics

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge to assure quality of software. After completing the course the student should be competent in handling various quality assurance issues practically and able to these methodologies in software development.

UNIT-I

Review of basic concepts: Antialiasing techniques, 2D viewing, 2D Transformations, **Clipping** : Line clipping ,Polygon Clipping, 3D display methods, 3D Object Representation ,Three-Dimensional Viewing , Projections , 3D Transformations. **(10-L,3-T=13)**

UNIT-II

Fractals: Classification of Fractals, Calculation of fractal dimension. Shape grammars. Visible surface detection algorithms, Surface Rendering Methods, Basic illumination Models, Polygon rendering Methods, Ray-Tracing Methods, Texture Mapping. **(10-L,3-T=13)**

UNIT-III

Computer vision: applications, photometric image formation, digital camera. **Feature-based alignment:** 2D and 3D feature-based alignment, Pose estimation, Geometric intrinsic calibration. Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion. **(10-L,3T=13)**

UNIT-IV

Stereo correspondence: Epipolar geometry, sparse correspondence, dense correspondence, Local methods, Global optimization, Multi-view stereo. Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding. **(10-L,3-T=13)**

Text Books:

1. D Hearn and M. P. Baker, "Computer Graphics C version", Pearson Education.
2. Richard szeliski ,"Computer Vision: Algorithms and applications ", Springer.
3. David A Forsynth and Jean Ponce, "Computer Vision- A modern approach", Pearson education series.

Reference Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle," Digital image processing and computer vision", Cengage learning.
2. Schalkoff R. J., "Digital Image Processing and Computer Vision," John Wiley.
3. E. S. Angel, "Interactive Computer Graphics, A top-down approach with OpenGL," (5e), Pearson Education.

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MCA- 206(D) Image Processing

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of basic Images, Digital Images and various Image Processing Techniques. After completing the course the student should be competent in Image Processing Techniques and can use these techniques to process real Images.

UNIT-I

Introduction: Image Processing, Applications of Image Processing, Elements of Image Processing Systems—Image Acquisition, Processing, Communication, Display Digital Image Processing, Goals of Image Processing, Sources of Images, Image Classification and Formation, Image Representation and Sampling, Basic operations on Images. **Digital Image Fundamentals:** Uniform and Non-uniform Sampling and Quantization, Basic Relationships between pixels— Neighbours of a pixel, Connectivity, Distance Measures, Imaging Geometry—Perspective transformations, Camera Model, Stereo Imaging.

(10-L,3-T=13)

UNIT-II

Image Transforms: Introduction to Fourier Transform, Discrete Fourier Transform, Properties of the Two - Dimensional Fourier Transform, The Fast Fourier Transform (FFT), Inverse FFT, Walsh, Hadamard and Discrete Cosine Transforms. **Image Enhancement:** Histogram Processing, Image Averaging, Smoothing Filters, Sharpening Filters, Low Pass and High Pass Filtering, Generation of Spatial Masks from frequency Domain Specifications.

(10-L,3-T=13)

UNIT-III

Colour Image Processing: Colours Fundamentals, Colour Models, Pseudo-Colour image processing. **Image Restoration:** Degradation Model, Circulant and Non-circulant Matrices, Algebraic Approach to Restoration, Inverse Filtering, Wiener Filter, Constrained Least Square Restoration, Geometric Transformations.

(10-L,3-T=13)

UNIT-IV

Image Compression: Fundamentals, Image Compression models, Low Compression, Image Compressions standards. **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Hough Transform, Thresholding, Region Oriented Segmentation. Representation, Description, recognition and Interpretation Fundamentals.

(10-L,3-T=13)

Text Book:

1. Gonzalez and Woods, "Digital Image Processing", Pearson Publishing Company Ltd.
2. Jain , Anil K. "Fundamentals of Digital Image Processing", Pearson.

Reference Books:

1. Jensen, John R. "Introductory Digital Image Processing", Prentice Hall.
2. Dougherty, Edward R. "Image Processing Digital Techniques".

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MCA- 207 Lab IV : Data Structures

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of **MCA-202**. After completing the course the student should be competent in handling various data structures and different operations on these data structures using C language.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Array
2. Stack
3. Link Lists(linear, circular, doubly linked, inverted)
4. Queues (Simple, Circular Queue, Priority Queue)
5. Different Trees, Binary Search Trees
6. Heap Sort
7. Graph Implementation, Graph traversals
8. Different File Organization
9. Sorting and Searching

MCA- 208 Lab V : Java Programming

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of MCA-203. After completing the course the student should be competent in Applets and Swing components, AWT, Event Handling and JDBC connectivity.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Operators, Control Structure and looping, Array and String
2. Classes and Methods, Constructors, Overloading Methods
3. Exception Handling
4. Extending Classes and Inheritance
5. Working with Abstract Windows Toolkit
6. Java Swings
7. Multimedia Applications
8. Event Handling
9. Event Classes and Listener Interfaces
10. Accessing Databases with JDBC

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MCA-209 Lab VI: Web Technology

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	2	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of **MCA-204**. After completing the course the student should be competent in designing web pages by using HTML , JavaScript, CSS and PHP.

Total Lab Hours: 40

1. Basic to design Form in HTML
2. Styling Pages
3. XML Schema
4. Custom Markup Language.
5. Server Programming
6. Validating form using JavaScript
7. Enhancing form with JavaScript, JavaScript Libraries
8. PHP File handling, cookies, Session Tracking
9. Database access using PHP
10. Connecting to database-server
11. Selecting database, creating query
12. reading records from database

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MCA-301 Business Communication

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hours

Course Type: Foundation Courses

Objective: The main objective of this course is to provide knowledge about formal standards used in Business Communication (Written and Oral). After completing the course the student should be competent in oral and writing communication, and able to handle real life complications in professional communication.

UNIT-I

Introduction to Business Communication: Importance of communication in business, process and models of communication, Types of information- order, advice suggestion, motivation, persuasion, warning and education. **(10 L)**

UNIT-II

Written Communication: Letters, Cover Letter, Differences between bio-data, CV and Resume, Letter for Job Application, Thank You Letter, Letter of Complaint, Memos, Memorandum drafting. E. Communication: Email, Social Media, Website Copy and Reports. **Oral Communication:** Types of oral communication, Barriers to oral communication, Mass Communication – Nature and Scope of Mass Communication, function of mass communication – Media of mass communication. **(10 L)**

UNIT-III

Report Writing: Types, Structure of a report, Methods and Models of Report Writing, Technical Proposal- Concept, Kinds, Layout, and Examples of Technical Proposals. **Types of reports:** progress reports, routine reports – Annual reports – format – Analysis of sample reports from industry – Synopsis and thesis writing. **(10 L)**

UNIT-IV

Spoken and Presentation Skills: Impromptu speech – tackling hesitation, shyness and nervousness in speaking –Public speaking, academic and professional presentations – Group discussions – facilitators and impediments Planning, preparing and delivering a presentation, essentials of presentation - etiquette, clarity, lively delivery – speech rhythm, speech initiators body language – voice, posture & gesture, eye contact, dress codes. Speech Drill, Interviewing, Negotiating a job offer. **(10 L)**

Text Books:

1. R. Pal and JS Korlahhi, "Essentials of Business Communication", Sultan Chand, New Delhi.
2. Andre J. Rutherford, "Basic Communication Skills for Technology", Pearson Education Asia, patparganj, New Delhi

Reference Books:

1. Meenakshi Raman and Prakash Singh, "Business Communication" (Oxford)
2. V. Prasad, "Advanced Communication Skills", Atma Ram Publications, New Delhi.

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MCA-302 Programming in Python

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Python. After completing the course the student can develop web solution software for real life problems.

UNIT-I

Introduction To Python: Installation and Working with Python, Basics, Operators, Data Types , Python String, List And Dictionary Manipulations, Conditional and looping.

(10-L,3-T=13)

UNIT-II

Python Object Oriented Programming: class, object and instances Constructor, class attributes and destructors , Real time use of class in live projects ,Inheritance , overlapping and overloading operators, Multithreading **Python File Operation** : Reading config files in python ,Writing log files in python ,Understanding read functions, read(), readline() and readlines(),Understanding write functions, write() and writelines() ,Manipulating file pointer using seek ,Programming using file operations.

(10-L,3-T=13)

UNIT-III

Python Exception Handling: Avoiding code break using exception handling Safe guarding file operation using exception handling, Handling and helping developer with error code ,Programming using Exception handling, **GUI Programming:** Creating GUI component, Python Database Interaction SQL Database connection using python Creating and searching tables ,Reading and storing config information on database ,Programming using database connections . **(10-L,3-T=13)**

UNIT-IV

Web Programming, Contacting User through Emails Using Python Installing smtp python module, Sending email, Reading from file and sending emails to all users addressing them directly for marketing. **Python Libraries:** Introduction to Scipy, Numpy and MatPlotLib Libraries. **(10-L,3-T=13)**

Text Book:

1. James Payne, "Beginning Python Using python 2.6 and Python 3.1 ", Wiley Publication
2. "Learning Python", 5th edition, O'reilly Publication.

Reference Books:

1. Paul Berry, 2011,"Head First Python". O'REILLY Media, Inc.
2. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving With Python".

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MCA-303 Android Programming

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Android programming and various languages used to create mobile applications. The main emphasis of this course is on Android Operating System and various tools used to create mobile applications for Android Mobiles. After completing the course the student should be competently develop mobile applications for Android on Eclipse IDE.

UNIT-I

Introduction: wireless communication, Mobile computing, Mobile computing architecture, cellular network concepts, location management, handoffs. **Wireless LAN:** WAP Introduction, Architecture, Applications, MAC issues . **Mobile Operating Systems:** Window CE, Palm OS, Symbian OS, J2ME, iOS and android. **(10-L,3-T=13)**

UNIT-II

Introduction to Android: Overview, Open Handset Alliance, Android Internals, Android Architecture. Android development frameworks, Android-SDK, Eclipse, Creating Android Emulator, Android AVD, Android Application Structure, Android Project Framework, Crating a Project. **Android Activities and UI Design:** Intent, Activity, Activity Lifecycle, Manifest, Creating application and new activity, Testing and debugging, Layouts and Layout properties. **(10-L,3-T=13)**

UNIT-III

GUI objects, Advanced UI Programming, **Event** driven Programming in Android (Text Edit, Button clicked etc.) Creating a splash screen, Threads, Understanding Exception handler, Animation, View animation, Drawable animation. **Menu, Dialog, List and Adapters** Creating and Using Handset menu Button, Themes, Dialog, Alter Dialog, Toast in Android, List & Adapters, Manifest.xml File Update. **Notifications:** Notification Manager, Pending Intent, Toast Notifications. **(10-L,3-T=13)**

UNIT-IV

Multimedia Programming using Android: Multimedia audio formats – Creating, Playing, Kill / Releasing Associate video playback with an event. **Database – SQLite:** Shared preferences, Preferences activity, Files access, SQLite, SQLiteOpenHelper, Creating a database, Opening and closing a database, Working with cursors Inserts, updates, and deletes. Location Based Services and Google Maps, Installation of .apk: How to install .apk into your Android Mobile. **(10-L,3-T=13)**

Text Books:

1. J. Schiller, Addition, "Mobile Communications" Wesley Publication.
2. Reto Meier, "Professional Android™ Application Development" Wrox Publications.

Reference Books:

1. A.Mehrotra, "GSM System Engineering", Addition Wesley Publication.
2. M. Taylor, "Understanding WAP", Artech House Publication.
3. Ed Burnette, Pragmatic Programmers "Hello Android, Introducing Google's Mobile Development Platform"

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MCA-304 Cloud Computing and Big Data

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of basic of Cloud Computing, Various Cloud Computing terminologies and Platforms. After completing the course the student should be competent in cloud computing concepts and platforms.

UNIT-I

Introduction to Cloud Computing: Overview, NIST features, Historical Development, Need for Cloud Computing, Principles of Cloud Computing, Roots of Cloud Computing, Challenges and Risk of Cloud Computing. **Cloud Model:** Cloud Reference Model, Service and Deployment Models, Cloud applications.

(10-L,3-T=13)

UNIT-II

Virtualization Technology: Virtualization Structures and Mechanisms, Hypervisor, Full virtualization, Para-virtualization, Hardware Assisted Virtualization , Types of Virtualization, Creating A Virtual Machine. **Cloud Enable Technologies**: Service Oriented Architecture, Web Technologies, Web Services Specifications, SOAP, REST, XML, JSON, AJAX, MASHUPS: User Interface Services, Multi-Tenancy, Mobile Computing, Sky Computing, Load Balancing. **(10-L,3-T=13)**

UNIT-III

Big Data: Overview, Need of Big data, Characteristics, Benefits of Big Data Processing, Big Data Technologies, **HADOOP:** Hadoop Architecture, Hadoop Ecosystem, HDFS Architecture , MapReduce , **Cloud Database NoSQL :** Relational, Non-Relational vs. DBaaS Cloud Database, Cloud Database Architectures, Cloud Databases, Amazon Dynamo Database, HBase, Cassandra, Google BigTable, Hive, MongoDB. **Cloud File System:** Google File System (GFS) Vs Hadoop Distributed File System (HDFS)

(10-L,3-T=13)

UNIT-IV

Cloud Security: Cloud Information Security Fundamentals, Cloud Security Services, Cloud Security Concerns, Security Challenges, Infrastructure Security, Cloud computing security architecture. **Open Source Clouds Platform:** Case Study on Open Source Clouds Platform , Hadoop, OpenStack, Cloud Stack, Eucalyptus, OpenNebula. **Case Study on Commercial Clouds:** Google App Engine, Microsoft Azure, Amazon, Aneka **(10-L,3-T=13)**

Text Book:

1. Dr. Pawan Thakur, Susheela Pathania, "Cloud Computing", Satya Prakashan, New Delhi.
2. GautamShroff, "Cloud Computing", Cambridge Enterprise.
3. Ronald Krutz and Russell "Cloud Security Dean Vines", Wiley-India.

Reference Book:

1. Tim Malhar, S.Kumaraswammy ,"Cloud Security and Privacy" S.Latif(SPD,O'REILLY)
2. Antohy T Velte, "Cloud Computing : A Practical Approach", et.al McGraw Hill,
3. Barrie Sosinsky, "Cloud Computing Bible" by Wiley India

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MCA-305 Theory of Computation

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Automata theory and various other theories used in computation. After completing the course the student should be competent to solve computation problems by applying these theories.

UNIT-I

Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NDFA), Equivalence of DFA and NDFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non Regular Languages, Lexical Analysis.

(10-L,3-T=13)

UNIT-II

Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language.

(10-L,3-T=13)

UNIT-III

Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems

(10-L,3-T=13)

UNIT-IV

Unsolvable Problems and Computational Complexity: Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems.

(10-L,3-T=13)

Text Books:

1. Hopcroft and Ullman., "Introduction to Automata Theory, Languages and Computation" Pearson.
2. Zvi Kohai., "Switching and Finite Automata Theory" ,Tata McGraw Hill

References Books:

1. Manna, "Mathematical theory of computation", McGraw Hill
2. Peter Linz., "Introduction to Formal Languages and Automata Theory", Narosa Publishing.

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MCA-306(A) Data Warehouse and Mining

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: Syllabus deals with importance of Data Warehousing and Mining. Course provides data mining classification, clustering.

UNIT-I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Warehouse and OLAP, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology **Data Preprocessing:** Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage. **(10-L,3-T=13)**

UNIT-II

Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on Data Mining Query Language Architectures of Data Mining Systems. Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases. **(10-L,3-T=13)**

UNIT-III

Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, Constraint-Based Association Mining. **Classification and Prediction:** Issues Regarding Classification and Prediction, Classification By decision tree induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification **(10-L,3-T=13)**

UNIT-IV

Cluster Analysis Introduction : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis. **(10-L,3-T=13)**

Text Books:

1. Jiawei Han , Micheline, "Data Mining Concepts and Techniques", Harcourt India.
2 ARUN K PUJARI,"Data Mining Techniques", University Press

References Books:

1. W. H. Inman "Building the Data Warehouse", Wiley Dreamtech India Pvt. Ltd
2. Paulraj Ponnaiah ,"Data Warehousing Fundamentals", Wiley Student EDITION.

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MCA-306(B) Soft Computing

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: Syllabus deals with importance of Data Warehousing and Mining. Course provides data mining classification, clustering.

UNIT-I

Introduction: Neural Networks, Application Scope of Neural Network, Fuzzy Logic, Genetic Algorithm, Hybrid Systems and Soft computing. Artificial Neural Network: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron and Hebb Network. **(10-L,3-T=13)**

UNIT-II

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy logic, Classical Sets, Operations of Classical Sets, Fuzzy Sets Operations. **Classical Relations and Fuzzy Relations:** Cartesian Product of Relation, Classical, Fuzzy Relations, Tolerance and Equivalence Relations, No interactive Fuzzy Sets. **Membership Functions:** Features, Fuzzification and Defuzzification. **(10-L,3-T=13)**

UNIT-III

Fuzzy Rule Base and Approximate Reasoning: Introduction, Truth Values and Table in Fuzzy Logic, Fuzzy Propositions, Fuzzy Reasoning, Fuzzy Inference System. **Fuzzy Decision Making:** Individual Decision Making, Multi-person Decision Making, Multi-objective Decision Making, Multi-attribute Decision Making. **Fuzzy Logic Control Systems:** Control System Design, Architecture and Operation of FLC system, FLC System Models, Application of FLC Systems. **(10-L,3-T=13)**

UNIT-IV

Hybrid Soft Computing Techniques: Neuro-Fuzzy Hybrid Systems, Generic Neuro-Hybrid Systems, Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems, Simplified Fuzzy ARTMAP. **Applications of Soft Computing:**A Fusion Approach of Multispectral Images with SAR (Synthetic Aperture Rader), Optimization of Traveling Salesmen Problem using Genetic Algorithm Approach, Genetic Algorithm Based Internet Search Technique, Soft computing Based Hybrid Fuzzy Controllers. **(10-L,3-T=13)**

Text Books:

1. S.N. Sivanandam, S.N. Deepa "Principles of Soft Computing", Wiley.
2. Bernadette Bouchon Meunier, "Fuzzy Logic and Soft Computing", World Scientific.

Reference Books:

1. ByDevendra K. Chaturvedi, "Soft Computing: Techniques and its Applications in Electrical Engineering", Springer Science and Business Media.
2. Andrea G.B. Tettamanzi, Marco Tomassini,"Soft Computing: Integrating Evolutionary, Neural, and Fuzzy Systems", Springer Science and Business Media.

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MCA-306(C) Distributed System

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Parallel Computing. After completing the course the student should be competent in basic of Parallel Computing techniques.

UNIT-I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems,. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages . **(10-L,3-T=13)**

UNIT-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. **Distributed Deadlock Detection:** system model, resource Vs communication deadlocks, deadlock prevention, avoidance, centralized dead lock detection, distributed dead lock detection, path pushing algorithms. **(10-L,3-T=13)**

UNIT-III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory. **(10-L,3-T=13)**

UNIT-IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols. **(10-L,3-T=13)**

Text Books:

1. Singhal , Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill.
2. Ramakrishna ,Gehrke," Database Management Systems", Mc Grawhill.
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson.

Reference Books:

1. Tenanuanbaum, Steen," Distributed Systems", PHI.
2. Gerald Tel, "Distributed Algorithms", Cambridge University Press.

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MCA-306(D) Data Analytics Using R-Tool

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of various data analysis techniques and methodologies and to provide a comprehensive knowledge of R-Tool for data analysis. After completing the course the student should be competent in data analysis basics and able to use R-Tool for analysis the data generated by real life software.

UNIT-I

Introduction and preliminaries : The R environment, Related software and documentation, R and statistics, R and the window system, Using R interactively, Getting help with functions and features, R commands, Recall and correction of previous commands , Executing commands from or diverting output to a file, Data permanency and removing objects. **(10-L,3-T=13)**

UNIT-II

Simple manipulations: Numbers and vectors, Vectors and assignment, Vector arithmetic, Generating regular sequences, Logical vectors, Missing values, Character vectors, Index vectors, selecting and modifying subsets of a data set. **Mode and attributes:** Intrinsic attributes, mode and length, Changing the length of an object, Getting and setting attributes, The class of an object. **(10-L,3-T=13)**

UNIT-III

Arrays and matrices: Arrays, Array indexing. Subsections,, Index matrices, The array(), The recycling rule, The outer product of two arrays, Generalized transpose of an array, Matrix facilities, Forming partitioned matrices, cbind() and rbind(). The concatenation function, c(), with arrays, Frequency tables from factors. **(10-L,3-T=13)**

UNIT-IV

Lists and data frames: Lists, Constructing and modifying lists, Data frames, **Reading data from files:**Theread.table() function, The scan() function, Accessing built-in datasets, Loading data from other R packages, Editing data. **Probability distributions:** R as a set of statistical tables, Examining the distribution of a set of data, One- and two-sample tests. **(10-L,3-T=13)**

Text Books:

1. W. N. Venables, "An Introduction to R", R Core Team.
2. Bansal/Goel/Sharma, "MALAB and its Applications in Engineering", Pearson India.
3. Stephen J. Chapman, "MATLAB Programming for Engineers", CENGAGE Learning.

Reference Books:

1. S.N. Alam, "Understanding MATLAB: A Textbook for Beginners", IK International Publishing House Pvt. Ltd.
2. Brian R. Hunt, "A Guide to MATLAB for Beginners and Experienced Users", Cambridge
3. . Y. Kirani Singh, "MATLAB Programming", PHI.

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MCA-307 Lab VII: Python Lab

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voce and written script.

Objective: The main objective of this course is to cover practical implementation part of **MCA-302**. Students can use Python for developing desktop GUI applications, websites and web applications.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Operators, Data Types , Python String, Conditional and looping
2. Object Oriented Programming
3. File Operation
4. Exception Handling
5. GUI Programming
6. Web Programming
7. Python Libraries
8. Python Database Interaction SQL Database

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MCA-308 Lab VIII: Android Lab

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	3	1	50	50	100	3 hours

Course Type: Practical Labs

INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of practical implementation and lab performance in final practical examination, and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice and written script.

Objective: The main objective of this course is to cover practical implementation part of **MCA-303.** Students can use Python for developing desktop GUI applications, websites and web applications.

Total Lab Hours: 40

Suggested List of Practical Topics:

1. Crating a Project
2. Creating applications Android Activities and UI Design
3. Working with GUI objects
4. Advanced UI Programming
5. Event driven Programming in Android
6. Menu, Dialog
7. List and Adapters
8. Notifications
9. Multimedia Programming using Android
10. Database – SQLite

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MCA-309 Lab IX: Minor Project

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	2	1	50	50	100	3 hours

Course Type: Minor Project

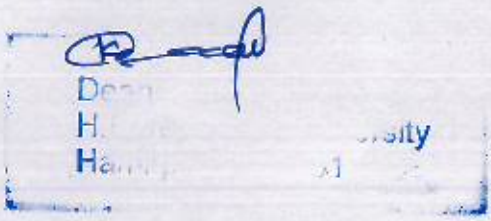
INSTRUCTIONS:

For External Examiner: 50% marks (25 marks) will be awarded on the basis of Minor Project Report and remaining 50% marks (25 marks) will be awarded on the basis of vive-voice .

Objective: The main objective of this course is to develop mobile apps, website, Web based application or any other real life application implementation using any Programming language. After completing the course the student should be competent in develop minor project for real life applications.

Total Lab Hours: 30

One Minor Project must be the part of practical file. Student has to develop a real life application by using Programming tools like Java, Web Technology, Android or Python. The application must be realistic and showing students own work, and must not be copied from any other resource.



MCA-401 Operational Research

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	3	40	60	100	3 hours

Course Type: Foundation Courses

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of optimization techniques and various tools used in Operational Research. After completing the course the student can able to use these tools and techniques to find optimized solution for real life problems.

UNIT-I

Introduction to O.R. – Definition, Uses and Limitations of Optimization method. The Linear Programming Problem: Introduction, Formulation Of LPP, Graphical Solution And Some Exceptional Cases, Canonical And Standard Form Of LPP. The Simplex Method: Solution of LPP By Simplex Method, Exceptional Cases, Artificial Variable Techniques (Big M), Two Phase Of Simplex Method, Problem of Degeneracy.

(10-L,3-T=13)

UNIT-II

The Dual Simplex Method: Dual And Primal Problem, Duality And Simplex Method, dual simplex method,Revised Simplex Method, Solution Of LPP Using Revised Simplex Method. **Networking Scheduling By PERT/CPM:** Introduction, Basic Concepts, Constraints In Network, Construction Of The Network, Time Calculation In Networks, Critical Path Method (CPM), PERT, PERT Calculation, Advantage Of Network (PERT/CPM). **(10-L,3-T=13)**

UNIT-III

The Transportation Problem: Introduction, Basic Feasibility Solution, Standard Transportation Problem, Balanced Transportation Problem, Multicommodity Transportation Problem, Row Minimum, Column Minimum, Matrix Minimum Method, Vogel Approximation Method (VAM), Optimality In Transportation Problem,(stepping stone and modified distribution methods) Degeneracy In Transportation Problem, Assignment And Routing Problem. **(10-L,3-T=13)**

UNIT-IV

Game theory: Significance, essential features and limitations; Maximax and minimax principle, Game with pure & mined strategies, sul-game method (case of 2xn or mx2 methods), Probability method, graphic method, algebraic method. **Inventory Control:**Introduction, Inventory Control, Selective Control Techniques, ABC Analysis Procedure, Economics Lot Size Problems, Problem of EQQ With shortage, Inventory Control Techniques Uncertain Demand, Stochastic Problems. **(10-L,3-T=13)**

Text Book:

1. Kanti Swarup, P.K. Gupta and Manmohan, "Operations Research", Sultan Chand and Sons.New Delhi.
2. V.K. Kapoor, "Operation Research", Sultan Chand and sons, New Delhi.

Reference Books:

1. H.A. Taha, "Operation Research - An Introduction", Macmillan Publications.
2. S.D. Sharma, "Operation Research", Kedar Nath Ram Nath and Company, Meerut.
3. K.K. Chawla, Vijay Gupta, Bhushan K Sharma,"Operations Research: Quantization Analysis for Management", Kalyani Publishers, Kolkata.

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MCA-402 Fundamentals of Management

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hours

Course Type: Foundation Courses

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of basis Management tools and techniques. After completing the course students can implement these Management tools in their respective organization.

UNIT-I

Introduction to management: Organization and the need for management. The management Process. Challenges of management. **Evolution of management thought:** Classical organization theory school. Behavioral school. System approach Scientific Management and Administrative management. Recent developments in management theory. **(10-L)**

UNIT-II

Introduction to Organization design and organization structure: Organization design, Types of organization structures Span of control, Delegation of authority, Authority and Responsibility. **HRM:** Human resource planning, Recruitment, selection, Performance Appraisal. **Decision Making:** Decision making process. Bounded rationality model of decision making. **(10-L)**

UNIT-III

Management and Society: External environment, Social responsibility and ethics. Social responsibility of managers, Making Social responsibility operational. Ethical Issues in management. Social Audit, The tools of ethics. Harassment of Women at work place. **(10-L)**

UNIT-IV

Recent Trends in management: Digital economy, E-Commerce, M-Commerce. **Information systems:** Information and control, Management Information System and Decision Support System, Implementing a computer based MIS, Expert Systems and artificial Intelligence. Opportunities and challenges created by IT. **(10-L)**

Text Books:

1. Dr. Vikas Saraf, Dr. Pawan Thakur, Dr. Lata Yadav, "Entrepreneurship and Management Concepts", S.K. Kataria and Sons, New Delhi.
2. Monappa Arun, Salyajain M.S, "Personal Management", Tata Mc.Graw-Hill Publications.
3. Rudrabasavaraj M.N., "Dynamic Personnel Administration", Himalaya Publishing House, Bombay.

Reference Books:

1. Torrington and Hall, "Personnel Management: A New Approach", Prentice-Hall International Publications.
2. Hellrigel Don, Solum, John W. and Wooden Richard, W., "Oraganisation Behaviour", Web Publishing Company, New York.
3. McCocmio, E.U.,"Human Factor in Engineering in Design", McGraw-Hill Publications, New Delhi.

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MCA-403 Analysis and Design of Algorithms

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Core Theory

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of various Algorithm Designing techniques and their impact on programming. After completing the course the student should be competent in algorithm designing techniques, and able to use these techniques to design various algorithms for real life problems.

UNIT-I

Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations. **Design Techniques:** Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound. **(10-L,3-T=13)**

UNIT-II

Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions. **Graph Algorithms:** Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees. **(10-L,3-T=13)**

UNIT-III

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility. **Selected Topics:** Number Theoretic Algorithms, Polynomial Arithmetic, Fast Fourier Transform, String Matching Algorithms. **(10-L,3-T=13)**

UNIT-IV

Advanced Algorithms: Parallel Algorithms for Sorting, Searching and Merging, Approximation Algorithms, Randomized Algorithms. **(10-L,3-T=13)**

Text Book:

1. Ellis Horowitz, SartajSahni, "Fundamental Of Computer Algorithms".

Reference Books:

1. Aho, Hopcroft, Ullman, "The Design And Analysis Of Computer Algorithms".
2. Sara Basse, "Computer Algorithms – An Introduction to Design and Analysis".

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MCA- 404(A) Internet of Things (IoT)

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: In this course student will explore various components of Internet of things such as Sensors, internetworking and cyber space. In the end they will also be able to design and implement IoT circuits and solutions.

UNIT-I

Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT. **(10-L,3-T=13)**

UNIT-II

Elements of IoT : Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. **Software Components**- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP. **(10-L,3-T=13)**

UNIT-III

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices. **(10-L,3-T=13)**

UNIT-IV

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation **(10-L,3-T=13)**

Text Book:

1. Dr. Pawan Thakur, Susheela Pathania, "Internet of Things (IoT)", Satya Prakashan, New Delhi.
2. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press
3. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Interne of Things: A practical Approach", ETI Labs.

Reference Books:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
3. Adrian McEwen, "Designing the Internet of Things", Wiley

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MCA-406(B) Parallel Computing

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Parallel Computing. After completing the course the student should be competent in basic of Parallel Computing techniques.

UNIT-I

Parallel Computers-Introduction: The Demand of Computational Speed, Types of Parallel Computers, Architectural Features of Message passing Multicomputer, Networked Computers as a Multicomputer Platform, **MIMD Architecture:** Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, PVP, Symmetric Multiple Processors SMP, CC-NUMA, NUMA and COMA Architectures. **Distributed Memory Architecture:** Cluster Architecture - Design and other Issues, MPP Architecture.

(10-L,3-T=13)

UNIT-II

System Interconnection and Gigabit Network Basics of Interconnection Network: Network Topologies and Properties, Buses, Crossbar, and Multistage switches, Gigabit Network Technologies, Comparison of Network Technologies Parallel Programming, **Parallel Programming Models :**Implicit Parallelism, Explicit Parallel Models, Other Parallel Programming Models ;Shared Memory Programming : The POSIX Threads (P-threads) Model, The Open MP Standard. **(10-L,3-T=13)**

UNIT-III

Message Passing Programming : The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM). **Data Parallel Programming:** The Data Parallel Model, The Fortran 90 Approach, Other Data Parallel Approaches. **Performance Metrics and Benchmarks:** Performance Metrics for Parallel Systems, Run Time, Speedup, Efficiency Cost. **(10-L,3-T=13)**

UNIT-IV

Scalability and Speedup Analysis: Amdahl's Law: Fixed Problem Size, **Gustafson's Law:** Fixed Time, Sun and Ni's Law: Memory Bounding, ISO performance Models. **System and Application Benchmarks :** Micro Benchmarks, Parallel Computing Benchmarks, Business and TPC Benchmarks, SPEC Benchmark Family ; Performance v/s Cost, Performance of parallel Computers, Performance of Parallel Programs.

(10-L,3-T=13)

Text Books:

1. Kai Hwang and ZhiweiXu, "Scalable Parallel Computing", McGraw Hill New York.
2. Barry Wilkinson and Michael Allen, "Parallel Programming", Pearson Education Asia.

Reference Books:

1. Steven Brawer, " Introduction to Parallel Programming"
2. M. Shasikumar, Dinesh shikhare and P. Ravi Prakash, "Introduction to Parallel Processing".
3. V. Rajaraman and C. Siva Ram Murthy, "Parallel Computers-Architecture and Programming"

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MCA-406(C) Compiler Design

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

Objective: The main objective of this course is to provide conceptual as well as practical knowledge of architecture and working of compilers. After completing the course the student should be able to understand the architecture and working of compiler.

UNIT-I

Introduction to compilers and interpreters – Overview of compilation and different phases, Issues in compilation – structure of a compiler – compiler writing tools – bootstrapping – notations and concepts for languages and grammars – regular expressions – context free grammar, derivations and parse trees, BNF notations. **(10-L,3-T=13)**

UNIT-II

Context of a lexical analyzer: Construction of lexical analyzer, deterministic and non-deterministic finite automata. Syntax analyzer, context free grammars, top down parsing, brute force parser, recursive descent parser, LL(1) parser, Bottom up parsing, operator precedence parsing, simple precedence parsing, LR parser, LALR parser, YACC – the parser generator. **(10-L,3-T=13)**

UNIT-III

Compile time error handling: error detection, reporting, recovery and repair. Intermediate languages, postfix notation, syntax trees, parse trees, three address code, triples and indirect triples. Translation of assignment statements, Boolean expressions, Syntax Directed Definition, S-attributed, L-attributed, translation Scheme, Applications of Syntax directed translation. **(10-L,3-T=13)**

UNIT-IV

Run time storage management: Storage allocation and referencing data in block structured language, storage allocation. Code optimization, sources of optimization, loop optimization, DAG and optimization of basic blocks. Code generation, a machine model, next use information register allocation and assignment, a simple code generator, code generation from DAG's, Peephole optimization .**(10-L,3-T=13)**

Text books:

1. Alfred V Aho and Jeffery D Ullman, "Principles of Compiler Design", Narosa/Addison Wesley

Reference Books:

1. Aho, Sethi,& Ullman., "Compilers Principles, Techniques and Tools", Addison Wesley.
2. Jean Paul Tremblay and Sorenson., "The Theory and Practice of Compiler Writing" McGraw Hill

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MCA- 404(D) CYBER SECURITY

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hours

Course Type: Elective

The course has been designed to give students an extensive overview of cyber security issues, tools and techniques that are critical in solving problems in cyber security domains. The course aims at providing students with concepts of computer security, cryptography, digital money, secure protocols, detection and other security techniques.

UNIT-I

Cyber Security Concepts: Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners. **(10-L,3-T=13)**

UNIT-II

Cryptography: Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec. **(10-L,3-T=13)**

UNIT-III

System Security: Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation. **(10-L,3-T=13)**

UNIT-IV

Internet Security: Cloud Computing and Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment. **(10-L,3-T=13)**

Text Book:

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.
2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.
3. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi

Reference Books:

1. Atul Kahate, "Cryptography and Network Security", McGraw Hill.
2. V.K. Pachghare, "Cryptography and Information Security", PHI Learning
3. Nina Godbole, "Information System Security", Wiley

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MCA- 405 Industrial Training and Project Work

Teaching Scheme			Credits		Marks		Duration of End Semester Examination
L	T	P	C	Sessional	End Semester Exam	Total	
0	0	10 weeks	8	40	60	300	3 hours

Course Type: Major Project

Instructions:

1. For Student. Students should take this project work very seriously, as these efforts will be considered as 10 week (2 and half months) experience in most of the software companies. Topics selected should be complex and large enough to justify as a MCA project. Please do not undertake the topics/specifications from the MCA-309 (Mini Project). The project should be genuine and original in nature and should not be copied from anywhere else. If found copied the project report will be forwarded to the exam discipline committee of the University as an unfair means case for necessary action.

2. For Internal and External Examiner. Marks distribution for Industrial Training and Project Work

Internal Examiner	200 Marks will be awarded by internal examiner on the bases of Synopsis (2), Presentation (2), Concept and Design of the Project, Contribution in the Project and Project Report.
External	100 Marks will be awarded by external examiner on the bases of Project Report and Vive-Voice. The Project Report (50 Marks), End Semester External Vive-Voice (50 Marks).

Note:

1. In 2nd year (Forth semester) the student has to develop one Major Project. The duration of Industrial Training and Project work will be 10 week (minimum 2 and half months) which will be evaluated by the internal examiner and external examiner. Internal examiner will be appointed by respective college principal or director. External examiner will be appointed by Himachal Pradesh Technical University, Hamirpur.
2. Students have to follow Annexure-I to VIII for Project report.

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GUIDELINES FOR INDUSTRIAL TRAINING AND PROJECT WORK

1.1. Introduction

The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers and Project Managers in any field related to information technology. We had therefore imparted you the comprehensive knowledge covering the skills and core areas of computer science courses with equal emphasis on the theory and practical. The MCA students are encouraged to spend at least 2 and half months working on a project preferably in a software industry or any research organization.

1.2. Objective

The objective of the MCA project work is to develop quality software solution. During the development of the project you should involve in all the stages of the software development life cycle like requirements engineering, systems analysis, systems design, software development, testing strategies and documentation with an overall emphasis on the development of reliable software systems. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices so as to participate and manage a large software engineering projects in future. After the completion of this project work the student should be able to:

1. Describe the SDLC, Evaluate systems requirements, problem definition, Determine how to collect information to determine requirements
2. Evaluate feasibility and Operational feasibility for the project.
3. Work on data collection methods for fact finding.
4. Construct and evaluate data flow diagrams, data dictionaries, process , alternative tools for the analysis process.
5. Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
6. Decide the S/W requirement specifications and H/W requirement specifications.
7. Plan the systems design phase of the SDLC.
8. Distinguish between logical and physical design requirements.
9. Design and evaluate system, evaluate systems inputs, evaluate validity checks for input data.
10. Design and evaluate user interfaces for input, file structures and Estimate storage requirements.
11. Construct and evaluate (ER) diagrams for RDBMS related projects.
12. Decide the various processing systems to include distributed, client/server, online and others. Perform project cost estimates using various techniques.
13. Schedule projects using both GANTT and PERT charts. Perform coding for the project.
14. Documentation requirements and prepare and evaluate systems documentation.
15. Perform various systems testing techniques/strategies to include the phases of testing.
16. Systems implementation and its key problems.
17. Generate various reports
18. Brief the maintenance procedures and the role of configuration management in operations.
19. To decide the future scope and further enhancement of the system.
20. Plan for several appendices to be placed in support with the project report documentation.
21. Work effectively as an individual or as a team member to produce correct, efficient, well organized and documented programs in a reasonable time.
22. Recognize problems that are amenable to computer solutions, and knowledge of the tools necessary for solving such problems.
23. Develop of the ability to assess the implications of work performed.

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24. Get good exposure and command in one or more application areas and on the software
25. Develop quality software using the software engineering principles.
26. Develop of the ability to communicate effectively.

1.3. Duration of the Project

In 2nd year starting of forth semester, the student has to develop one Major Project. The duration of Industrial Training and Project work will be 10 week (2 and half month) which will be evaluated by the internal examiner and external examiner. Internal examiner will be appointed by respective college principal or director. External examiner will be appointed by Himachal Pradesh Technical University, Hamirpur.

1.4. Mode and Type of the Project

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. It is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same in the college within 10 days at the starting of Industrial Training and Project work. Approval of the project proposal is mandatory which will be evaluated by internal examiner appointed by respective college Principal or Director. If approved, the student can commence working on it and complete it. Use the latest versions of the software packages for the development of the project

.

1.5. Eligibility criteria of a Project Guide

A person having Ph.D. / M.Tech. in Computer Science with a minimum of one year of experience.

Or

A person having MCA / M.Sc. (CS/IT) with minimum 2 years experience, preferably in software development.

1.6. Arrangement Of Contents Of Project Report

The sequence in which the project report material should be arranged and bound should be as follows:

1. Title page (Annexure I)
2. Title page (Annexure II)
3. Certificate of Originality (Annexure III)
4. Industry/Company Certificate (Annexure IV)
5. Project-Team Certificate (Only if applicable) (Annexure V)
6. Acknowledgement (Annexure VI)
7. Table of Contents (Annexure VII)
8. Project Report pages as per table of contents.

1.7. Number of Copies to be Submitted

Students should submit three copies to the Head of the Department on or before the specified date along with the soft copy of project report and executable file of application software properly write in CR, entitled "Title of the Project Report", "Name" and "Roll No" of the candidate with black or blue permanent marker. The Head of the Department should send

1. One copy to the University. (After final viva-voice)
2. One copy to the Department library. (After final viva-voce)
3. One copy to the Internal Examiner (Before final viva-voce) and
4. One copy to the student concerned (Not to be submit to the Head of the Department).

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1.8. Size of Project Report

The size of project report should not be less than 100 pages and should not exceed 150 pages of typed matter reckoned from the first page of INTRODUCTION to the last page.

1.9. Arrangement of Contents of Project Report

The sequence in which the project report material should be arranged and bound should be as follows:

1. Title page (Annexure I)
2. Title page (Annexure II)
3. Certificate of Originality (Annexure III)
4. Industry/Company Certificate (Annexure IV)
5. Project-Team Certificate (Only if applicable) (Annexure V)
6. Acknowledgement (Annexure VI)
7. Table of Contents (Annexure VII)
8. Project Report pages as per table of contents.

1.10. Page Dimensions and Margin

The dimensions of the final bound copies of the project report should be 290mm x 205mm. Standard A4 size (297mm x 210mm) paper may be used for preparing the copies.

The final five copies of the project report (at the time of submission) should have the following page margins:

Top edge	:	30 to 35 mm
Bottom edge	:	25 to 30 mm
Left side	:	35 to 40 mm
Right side	:	20 to 25 mm

The project report should be prepared on good quality white paper preferably not lower than 80 grams /Sq. Meter. Tables and figures should conform to the margin specifications. Large size figures should be photographically or otherwise reduced to the appropriate size before insertion.

1.11. Typing Instructions

The impressions on the typed copies should be black in color. The font used for entire project report should be Times New Roman with following sizes and styles.

Text Type	Size	Style	Illustration
Main headings	16	Bold/ UPPERCASE	1. Introduction
Division headings	14	Bold/ Capitalized Each Word	2.4. Feasibility Analysis
Sub-division headings	12	Bold/ Capitalized Each Word	2.4.1.Technical Feasibility
Normal text	12	Normal / Sentence case	Any text under Division headings or Sub-division headings
Any highlighted word under normal text	12	Bold/ Sentence case	Any highlighted text under Division headings or Subdivision headings
Bibliography and References	10	Normal/Sentence case	Bibliography and reference items.

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Uniformity in the font of letters in the same project report shall be observed. A sub-heading at the bottom of a page must have at least two full lines below it or else it should be carried over to the next page. The last word of any page should not be split using a hyphen. One and a half spacing should be used for typing the general text. Single spacing should be used for typing:

1. Long Tables
2. Long quotations
3. Foot notes
4. Multiline captions
5. References

All quotations exceeding one line should be typed in an indented space – the indentation being 15mm from either margins. Double spacing should be used for typing all the Certificates and Acknowledgement. Don't alter the format mentioned under Annexure I, II, III, V and VII. The text for Annexure IV and VI will be decided by the Industry/Company, Candidate respectively.

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Annexure-I (Format of Cover Page)

TITLE OF PROJECT REPORT

By

Name of Student

A PROJECT REPORT

Submitted to the

HIMACHAL PRADESH TECHNICAL UNIVERSITY (HPTU)

HAMIRPUR, H.P.

In partial fulfillment of the requirements

for the award of the degree

of

MASTER OF COMPUTER APPLICATIONS (MCA)

IN

4th Semester Training

<College Logo>

Month, Year

Name of the Department

College/Institution Name

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Annexure-II (Format for inside Cover Page)

PROJECT REPORT

ON

TITLE OF PROJECT

SUBMITTED IN PARTIAL FULFILLMENT FOR AWARD OF

DEGREE

In

MASTER OF COMPUTER APPLICATION

(BATCH)

BY

NAME OF THE STUDENT

ROLL NO

UNDER THE GUIDANCE OF

NAME OF GUIDE (Internal, External)

College Logo

Name of the Department

College/ Institution Name

Month, Year

HIMACHAL PRADESH TECHNICAL UNIVERSITY,
HAMIRPUR-H.P.

Dean
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Annexure-III

CERTIFICATE OF ORIGINALITY

I hereby declare that the Project entitled **"Title of the Project"** submitted to the Department of Computer Applications, **Name of the College** in partial fulfillment for the award of the Degree of **MASTER OF COMPUTER APPLICATIONS** in session <Session> in an authentic record of my own work carried out under the guidance of Dr./Ms./Mr. **"External and Internal Guide Name"** and that the Project has not previously formed the basis for the award of any other degree.

Place: (Signature of the candidate)

Date: **Name of Student**

(Roll No.)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

(Signature of Internal Guide) (Signature of External Guide)

Name **Name**

Designation **Designation**

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INDUSTRY/COMPANY CERTIFICATE

Industry/Company Certificate on the letter head of respective company duly signed by External Guide/Project Manager/Supervisor.

Date:

(Name of External Guide/Project Manager/Supervisor)

Designation:

Name of Organization:

Address:

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PROJECT-TEAM CERTIFICATE

(In case the entire project is developed by team not by an individual student)

Name of the Project:

Team Members Details

Sr. No.	Name of Candidate	College/Institute Name	University /Organization
1.			
2.			
3.			
4.			

I hereby declared that the project entitled **"Title of the Project",**is developed by the above mentioned team. In the team **"Name of candidate"**have developed/designed the following module(s) under the esteemed guidance of **"Name of External Guide with his/her Designation".**

1. Details of module one including its name and candidate's responsibilities.
2. Details of module twoincluding its name and candidate's responsibilities.
3. .....
4. .....

Date:

(Name of Project Manager/Supervisor)

Designation:

Name of Organization:

Address:

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Annexure-VI

ACKNOWLEDGEMENT

Acknowledgement should be brief and should not exceed one page when typed double spacing.

Date:

Signature of Candidate

Name:

Roll No.:

Annexure-VII

TABLE OF CONTENTS

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