

H.P. TECHNICAL UNIVERSITY HAMIRPUR (HP)



Syllabus

[Effective from the Session: 2015-16]

Master of Computer Applications

FIRST YEAR**Semester-I**

Course Type	Course Code	Course Title	Periods			Evaluation Scheme					Credits
			L	T	P	ESE	Internal Assessment			Total	
							CT	TA	Total		
C-SD	MCA-101	Programming Methodologies (C,C++)	3	1	0	60	24	16	40	100	4
C-IT	MCA-102	Fundamental of IT and Digital Electronics	3	1	0	60	24	16	40	100	4
C-IT	MCA-103	Computer Architecture	3	1	0	60	24	16	40	100	4
C-IT	MCA-104	Software Engineering	3	1	0	60	24	16	40	100	4
F-SBM	MCA-105	Business Communication	3	0	0	60	24	16	40	100	3
C-SD	MCA-106	Programming-Lab	0	0	3	50	25	25	50	100	1
C-IT	MCA-107	IT-Lab	0	0	3	50	25	25	50	100	1
Total			15	4	6	400	170	130	300	700	21

Semester-II

Course Type	Course Code	Course Title	Periods			Evaluation Scheme					Credits
			L	T	P	ESE	Internal Assessment			Total	
							CT	TA	Total		
C-SD	MCA-201	Object Oriented Programming and Data Structures Using Java	3	1	0	60	24	16	40	100	4
C-IT	MCA-202	Data Base Management System	3	1	0	60	24	16	40	100	4
C-IT	MCA-203	Computer Networks	3	1	0	60	24	16	40	100	4
C-IT	MCA-204	Operating System	3	1	0	60	24	16	40	100	4
F-MT	MCA-205	Mathematics	3	1	0	60	24	16	40	100	4
C-SD	MCA-206	Data Structures-Lab	0	0	3	50	25	25	50	100	1
C-IT	MCA-207	DBMS-Lab	0	0	3	50	25	25	50	100	1
Total			15	5	6	400	170	130	300	700	22

Legend:L-Lecture

T -Tutorial

P- Practical

CT- Class Test

TA- Teacher's Assessment

ESE-End Semester Examination



SYLLABUS

CBCS

(2015-16)



(First Year)

Semester -I

MCA-101 Programming Methodologies (C, C++)

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course. At least 50% questions are based on applied knowledge remaining 50% questions are based on concepts and illustration of concepts with practical approach.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Programming Tools: Problem analysis, Algorithm, Types of Algorithms, Flowchart, Modular programming, Top Down and Bottom up approaches, Type of errors, **Object Oriented Programming-** Object, Classes, Features of Object Oriented Programming, **Overview of C/C++** - History & Features of C & C++, General Structure of C Program, Data types, Constants and Variables, Operators and expressions, Storage Classes, Different types of expressions and their Evaluation, Conditional Expression, Assignment statement, Enumerated data type, Redefining/ Creating data types, Type casting.

(10-L,3-T=13)

Section-B

Input/Output- Unformatted and formatted I/O Functions, **Control Statements-** Decision making using *if*, *if-else*, *elseif* and *switch* statements, Looping using *for*, *while* and *do-while* statements, Transferring Program controlling *goto*, *break* and *continue* statements, **Functions-** Library functions (Standard Input/output and Math libraries), User defined functions, Defining a function, *return* statement, invoking a Function, specifying and passing arguments to a function, Local, External, static, and register variable, block structure, recursive functions.

(10-L,3-T=13)



Section-C

Pointers- Definition, Need of pointers, Types of Pointers, Declaring Pointers, Accessing Values via Pointers, Operations on Pointer, Pointer to Pointer, Pointer to function, Invoking a function through Pointer, Self-referencing pointers, **Array & strings-** Introduction to arrays, Declaring arrays, Initializing, arrays, Processing arrays, Pointers to array, Array of Pointers, Passing arrays as arguments to functions, Introduction to strings, Pointers to strings, Passing strings and Arrays of strings as arguments to a function. **(10-L,3-T=13)**

Section-D

Structures- Declaring a structure type, Declaring Variables of structure type, Initializing Structures, Accessing Elements of structures, Arrays of structures, Nested structures, Pointers to structures, Union. **Data files-** Definition of data files, Types of files, Input/output Streams, File opening modes, Description of various library functions for file handling, Updating files, Accessing data randomly from file. **Preprocessors-** Definition, Types of preprocessors, Conditional and Unconditional preprocessors. **Dynamic memory allocation-** Allocating a block of memory - Malloc, Allocating multiple blocks of memory - Calloc, Releasing the used space - Free, Altering the size of block – Realloc. **(10-L,3-T=13)**

TEXT BOOKS:

1. Ajay Mittal, "Programming in C a Practical Approach", Pearson Publication.
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.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language," Prentice Hall of India.
2. Kernighan B.W. & Ritchie D. M., "The C Programming Language", PHI Publications
3. "Complete reference to C"- Tata McGraw Hill
4. Yashwant Kanetkar, "Understanding Pointers in C", BPB Publications.



MCA-102 Fundamentals of IT and Digital Electronics

L T P Credits
3 1 0 4

Sessional: 40 Marks
Exam: 60 Marks
Total: 100 Marks
Duration of exam: 3 Hours

Objective: The main objective of this course is to provide conceptual as well as practical knowledge about computer system, Information technology, the role of digital electronic in the working of computer system and practical knowledge of Different components of Microsoft Office. After completing the course the student should be competent in DOS commends, designing of digital circuits and have proficient knowledge in Office automation tools like Microsoft Office.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course. At least 40% questions are based on applied knowledge remaining 60% questions are based on concepts and illustration of concepts with practical approach.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Introduction: Characteristics of Computers, Input/output Devices, Storage Units, CPU, Computer System. Primary and Secondary Storage Devices, Mass Storage Devices: USB thumb drive. Managing disk Partitions, Multimedia Application, Common multimedia file formats, Software types, High level languages, Free domain software, Microsoft Windows- An overview of different versions of Windows, File management through Windows, Basic troubleshooting in Windows. Security tools firewalls and antiviruses. DOS Internal and External Commands. An overview of Linux, File handling in Linux, Installation of Virtualization tool (Virtual Box/VMware) **(10-L,3-T=13)**

Section-B

Digital Electronics: Number systems, conversion between various number systems, Error detection and correction codes, Logic gates, Boolean algebra, Demorgan's theorem. Minimization techniques, K-Map, Sum of Product, Product of Sum. Combinational and sequential circuits: Full Adder, Full Subtractor, FlipFlops, Integrated Circuits, Characteristics of digital logic families-TTL, ECL, CMOS. Digital components: Decoders, multiplexers, registers, shift registers, binary counters. **(10-L,3-T=13)**



Section-C

Word Processing: Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards. **Presentation Package:** Creating and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Animations in Slide Shows, Printing Presentations. **(10-L,3-T=13)**

Section-D

Spreadsheet Package: Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts. Integrating word processor, spread sheets, web pages. Indian IT Act, Intellectual Property Rights – issues. Applications of information Technology (Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems etc.). **(10-L,3-T=13)**

Text Books:

1. P.K. Sinha and P. Sinha, "Foundations of Computing", BPB Publication.
2. Fundamentals of Computer, JB Dixit, Luxmi Publications.
3. Microsoft office Bible, John Walkenbach Herb, Wiley India
4. Rajaraman V. & Radhakrishnan, —An Introduction to Digital Computer Design, PHI.
5. 2. Morris M. M., —Digital Logic and Computer Design, PHI

Reference Books:

1. ITL Educational Society, "Introduction to IT", Pearson Education, 2009.
2. Miller M, "Absolute Beginners Guide to Computer Basics", Pearson Education, 2009.
3. Turban, Mclean and Wetherbe, "Information Technology and Management" John Wiely & Sons.
4. Balagurusamy E, "Fundamentals of Computers", 2009, Tata McGraw-Hill
5. D'Suoza & D'souza, "Learn Computer Step by Step", Pearson Education, 2006.
6. Kulkarni, "IT Strategy for Business", Oxford University Press
7. "The Complete reference Unix" Second Ed, Tata McGraw Hills.
8. The Conceptual Guide to Openoffice.org, Gabriel Gurley R, Concise Concepts Inc



MCA-103 Computer Architecture

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Digital components: integrated circuits, decoders, multiplexers, registers, shift registers, binary counters, memory unit.

Register transfers & micro-operations: Register Transfer Language, Register transfer, Bus & memory transfers, Arithmetic loops, Logic loops, Shift loops, Arithmetic, logic, shift unit. **Basic computer organization & design:** Instruction codes, Computer registers, Computer Instructions, Timing & Control, Instruction cycle, memory reference instruction, I-O interrupt, Design of basic computer, Design of accumulator logic. **(10-L,3-T=13)**

Section-B

Programming the basic computer: Machine language, Assembly language, Assembler, program loops, programming arithmetic and logic operations, subroutines, input-output programming. **Micro-programmed Control:** Control Memory, Address sequencing, Design of control unit. **Central Processing Unit:** General Register Organization, Stack organization, Instruction formats (zero, one, two, three), Address Instructions, Addressing Modes (direct, indirect, Immediate, relative, indexed), Data transfer & manipulation, Program control, RISC. **(10-L,3-T=13)**

Section-C

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors. **Computer Arithmetic:** Addition & Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations, Decimal Arithmetic unit, Decimal Arithmetic operations. **(10-L,3-T=13)**



Section-D

IO Organization: Peripheral devices, I/O interfaces, asynchronous data transfer, Modes of Data transfer, Priority Interrupts, DMA, I-O processors, Serial Communication. **Memory Organization:** Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory, Memory management hardware. **Multiprocessors:** Characteristics, **Interconnection structures:** Time Shared, Common bus, Multi-port, Crossbar switch, Multistage, Inter-processor arbitration, Inter-processor communication & synchronization, cache coherence. **Parallel Computing:** Parallel Virtual Machine and message passing interface, Libraries, and calls. Advanced architectures today's Fastest Computer. **(10-L,3-T=13)**

Text Books:

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

Reference Books

1. V.Rajaraman & Radhakrishnan, —Introduction to Digital Computer Design, PHI Publications.
2. P.Pal Chowdhary, —Computer Organization & Design, PHI Publications



MCA-104 Software Engineering

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Introduction: Evolving Role of Software, Software Engineering, Changing nature of Software, Software Myths, Terminologies, Role of management in software development Software Process and desired Characteristics, **Software Life Cycle Models:** Build & Fix Model, Water Fall Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Comparison of Models, Other Software Processes, Selection of a Model, **Software Requirements Analysis & Specifications:** Requirements Engineering, Types of Requirements, Feasibility Studies, Requirements Elicitation, Requirements - Analysis Documentation, Validation and Management. **(10-L,3-T=13)**

Section-B

Agile Methodology: Agile Modeling, Its use and advantages, Scrum, Advantages and disadvantages of agile Modeling. **Software Architecture:** It's Role, Views, Component & Connector View and its architecture style, Architecture Vs Design, Deployment View & Performance Analysis, Documentation, Evaluation. **Software Project Planning:** Size estimation, Cost Estimation, COCOMO, COCOMO – II, Software Risk Management. **(10-L,3-T=13)**

Section-C

Function Oriented Design: Design principles, Module level Concepts, Notation & Specification, Structured Design Methodology, Verification. **Object-Oriented Design:** OO Analysis & Design, OO Concepts, Design Concepts, Noun Phrase Analysis, Sequence & Collaboration Diagram, CRC cards, UML – Class Diagram, Other diagrams & Capabilities, Design Methodology – Dynamic and Functional Modeling, Internal Classes & Operations. **Detailed Design:** PDL, Logic/Algorithm Design, State Modeling of Classes, Verification – Design Walkthroughs, Critical Design Review, Consistency Checkers. **(10-L,3-T=13)**



Section-D

Coding: Programming Principles & Guidelines, Coding Process, Refactoring, Verification. **Software Metrics:** What & Why, Token Count, Data Structure Metrics, Information Flow Metrics, Object-Oriented Metrics, Use Case Oriented Metrics, Web Engineering Project Metrics, Metric Analysis. **Software Maintenance & Certification:** Maintenance, MaintenanceProcess and Models, Estimation of Maintenance Costs, Regression Testing, Reverse Engineering, Software Re engineering, Configuration Management, Documentation, Requirements of Certification, Types. **(10-L,3-T=13)**

Text Books:

1. Pankaj Jalote, —An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House.
2. K.K. Aggrawal and Yogesh Singh, —Software Engineering, 3rd Edition, New Age International (P) Ltd.

Reference Books:

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



MCA-105 Business Communication

L T P Credits
3 0 0 3

Sessional: 40 Marks
Exam: 60 Marks
Total: 100 Marks
Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

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

Section-B

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 & Scope of Mass Communication, function of mass communication – Media of mass communication. **(10 L)**

Section-C

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)**

Section-D

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. Essentials of Business Communication by R. Pal and JS Korlahhi, Sultan Chand & Sons, New Delhi.
2. Basic Communication Skills for Technology by Andre J. Rutherford, Pearson Education Asia, Patparganj, New Delhi 92

Reference Books:

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



MCA-106 Programming Lab

L T P Credits
0 0 3 1

Sessional: 50 Marks
Exam: 50 Marks
Total: 100 Marks
Duration of exam: 3 Hours

Objective: The main objective of this course is to cover practical implementation part of **MCA-101**. After completing the course the student should be competent in handling real life problems on C and C++ platform.

INSTRUCTIONS:

1. **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.

Suggested List of Practical Topics:

1. Different data Types
2. Different Operators
3. Input/output Functions
4. Decision making statement
5. Looping Statements
6. Functions
7. Array and Strings
8. Pointers
9. Structures
10. Preprocessor
11. Dynamic Memory Allocation
12. File handling



MCA-107 IT Lab

L T P Credits

0 0 3 1

Sessional: 50 Marks

Exam: 50 Marks

Total: 100 Marks

Duration of exam: 3 Hours

Objective: The main objective of this course is to cover practical implementation part of **MCA-102**. After completing the course the student should be competent in handling DOS Internal and External commands, handling virtual machine (VirtualBox/ VMware) and proficient in office automation tools like MS-Office.

INSTRUCTIONS:

1. **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.

Suggested List of Practical Topics:

1. DOS Internal and External Commands
2. Creating virtual machine (VirtualBox/VMware)
3. Windows File Management
4. Linux File Management
5. Security through firewall and antivirus
6. Basic troubleshooting (Windows environment)
7. Formatting and printing document (word processor)
8. Table operations in Word processor
9. Mail merge and macro
10. Creating presentation with different objects
11. Creating a database in spread sheet
12. Formula and functions in spreadsheet



Semester –II

MCA-201 Object Oriented Programming and Data Structures Using Java

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course. At least 50% questions are based on applied knowledge remaining 50% questions are based on concepts and illustration of concepts with practical approach.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Object Oriented Programming: Introduction to OOP's Paradigm, Characteristics of OOP's. **History and Basics of Java:** Java's History and Creation, Java's Magic: Byte-code, it's Features, Architecture of Java Virtual Machine, and Importance of Java for the Internet, JDK, Java Program Structure and Java's Class Library, Java Data Types, Variables, and Operators, Operator Precedence. Scope of Variables, Control Structure **Array and String:** Declaration and Definition, String Handling Using String Class and it functions. **Input/ Output in Java:** I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Wrapper classes. **Introduction of Classes:** Fundamental of Classes & Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, Variable **this**, Overloading Methods. **(10-L,3-T=13)**

Section-B

Extending Classes and Inheritance: Fundamental of Inheritance, Using Existing Classes, Polymorphism, Multiple Levels of Inheritance, Super keyword, super-class constructor, Abstraction through Abstract Classes, Using Final Modifier. **Packages & Interfaces:** Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface, Multiple Inheritance through Interfaces. **Multithreading Programming:** Understanding Threads, The Java Thread Model and life cycle of thread, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter-thread communication, Deadlocks., **File Handling:** Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits. **Collections:** Array List, Linked List, collections Methods, Stack, Sets, Maps. **(10-L,3-T=13)**



Section-C

Introduction to data structure: data structure Definition, types of data structures. **Arrays:** Memory representation and various operations. Address calculation, sparse arrays. **Linked List:** Definition, type (linear, circular, doubly linked, inverted), representing linked lists in memory, advantages of using linked list over arrays, various operations on Linked list (traversal, insertion, deletion). **Stacks:** Definition & concepts of stack structure, Implementation of stacks, Operation on stacks (push & pop), Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation, quick sort technique to sort an array, recursion). **Queue:** Definition & concept of queues, implementation of queue, operation on queues (insert & delete), Type of queues (circular queue, priority queue).

(10-L,3-T=13)

Section-D

Trees Structures: Tree, Binary Trees, Tree Traversal Algorithms (Pre-Order, In-Order, Post- Order), Threaded Trees, Trees in various Sorting & Searching Algorithms & their Complexity (Heap Sort, Binary Search Trees). **Graphs:** Description of graph structure, Implementing graphs in memory, Graph traversals (Depth First Searching, Breadth First Searching, and Shortest Paths Problems). **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. **Sorting & Searching:** Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Sequential search, Linear search and their complexity.

(10-L,3-T=13)

Text books:

- 1.R. Nageswara Rao, "Core Java an integrated approach", Dreamtech Press (12 February 2008)
2. Paul Deitel, Harvey 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.
5. Hubbard John. R, "Schaum's outline of Data Structures with C++", Tata McGraw- Hill, 2007.
6. Langsam Y, Augenstein M.J and Tanenbaum A. M, "Data Structures Using C and C++", Second Edition, Pearson Education, 2007.
7. Kruse R, Tonodo C.L. and Leung B, "Data Structures and Program Design in C", Pearson Education, 2007.
8. Robert Lafore, "Data Structures and Algorithms in Java (2nd Editons)", Sams Publishing.

References Books:

1. JAVA 2 UNLEASHED, Tech Media Publications.
2. JAVA 2(1.3) API Documentations.
3. Horowitz E, Sahni S and Mehta D, "Fundamentals of Data Structures in C++", Galgotia Publiction, 2009.
4. Weiss M A, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2007.
5. Litvin G, "Programmking with C++ and Data Structures", Vikas Publishing House.



MCA-202 Data Base Management System

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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 be proficient in query handling.

INSTRUCTIONS:

1. For Paper Setters: The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course. At least 50% questions are based on applied knowledge remaining 50% questions are based on concepts and illustration of concepts with practical approach.

2. For candidates: Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Introduction: Basic Concepts, Records and Files, Abstraction and Data Integration, Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS. Data Associations, Data Models. **Classification:** Relational Data Model, Network Data Model, Hierarchical Model. Manipulation, Updates, Implementation of data models, ER Diagrams. **Relational Model:** Relational Database, Relational Algebra, Relational Calculus. Relational Database Design, Relational Scheme and Relational Design. **(10-L,3-T=13)**

Section-B

Anomalies in a Database: A Consequence of Bad Design, Universal Relation, Functional Dependency, Relational Database Design. Relational Database Manipulation, SQL, Data Manipulation, Basic Data Retrieval, Condition Specification, Arithmetic and Aggregate Operators. **Normalization:** 1NF, 2NF, 3NF, BCNF, 4NF, and other higher normal forms. **(10-L,3-T=13)**

Section-C

SQL Join: Multiple Tables Queries, Set Manipulation, Categorization, Updates, Views. **SQL Programming:** Procedures, Cursors, Triggers. Concurrency Management, Serializability, Concurrency Control, Locking Scheme, Timestamp- Based Order, Optimistic Scheduling, Multiversion Techniques, Deadlock and Its Resolution. Database Security, Integrity, and Control, Security and Integrity, Threats, Defense Mechanisms, Integrity. **(10-L,3-T=13)**



Section-D

Introduction to DDBMS: Fundamentals of DDBMS (Transparent management of distributed & replicated data, Reliability, Improved performance, System expansion), Types of DDBMS. Overview of three-tier Client server architecture. Data Fragmentation, Replication and allocation techniques for distributed database design. Query processing, concurrency control and recovery in DDBMS.

(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 Ozsü & Patrick Valduriez, —Principles of Distributed Database Systems||, Pearson Education Asia.



MCA-203 Computer Networks

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

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. Attacks on Computers & Computer security-Need for security, approaches, principles, types of attacks, Cryptography concept and techniques, Symmetric Key algorithms-(DES), Asymmetric key algorithms-RSA, Digital signature , Firewalls. VoIP, E-mail security, Web security, social issues in network security. **(10-L,3-T=13)**

Section-B

Physical layer: Theoretical basis for data communications-Fourier analysis, bandwidth limited signals, maximum data rate of a channel, Public switched telephone networks, mobile telephone system. **Data Link and Mac Layer:** Design issues, Framing techniques, Flow control, Error Control, **Data link Control and Protocols:** For noiseless Channel – Simplest Protocol, Stop-and-Wait Protocol, For Noisy Channel-- Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective-Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access-- Random Access-- MA, CSMA, CSMA/CD, CSMA/CA, Controlled Access— Reservation, Polling, Token passing, Channelization-- FDMA, TDMA, CDMA, and IEEE standards-- 802.3 (Ethernet), 802.4 (Token Bus), 802.5 (Token Ring), 802.11(Wireless LAN), 802.15 (Bluetooth). **(10-L,3-T=13)**

Section-C

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 & datagram sub-networks, definition of quality of service, **Internetworking:** Tunneling, internet-work routing, fragmentation, **Network layer in Internet:** IP protocol, IP Address, OSPF, BGP, Internet multicasting, Mobile IP, Ipv6.**Transport Layer:** Concept of transport service, elements of transport protocols, a simple transport protocol, Remote procedure call, Performance issues in computer networks. **(10-L,3-T=13)**



Section-D

Application layer services protocols:DNS, SMTP, FTP, TELNET, HTTP,WWW. Network Configuration &**Socket Programming:**Configuration of networking in Linux using ifconfig, route, bind, etc; configuration of firewall and masquerading in Linux; network troubleshooting and performance monitoring using netstat, ping, tcpdump, etc.Configuration and performance measurement of commonly-used Linux servers such as E-Mail (sendmail, pop3/imap) and Web (Apache). Socket programming - TCP and UDP, peer-to-peer applications; reliable communications using unreliable datagrams; client-server using RPC; concurrent servers using threads or processes. **(10-L,3-T=13)**

Text books:

1. B.A. Forouzan, —Data Communication & Networking, 4th Edition Tata Mcgraw Hill.
2. A.S. Tanenbaum, —Computer Networks, Prentice Hall, 1992, 4th edition.

References Books:

1. William Stallings, —Data & Computer Communication, McMillan Publishing Co.
2. Black, —Data Networks, PHI, 1988.
3. Fred Halsall, —Data Communications, Computer Networks, Pearson Education



MCA-204 Operating System

L T P Credits

3 1 0 4

Sessional: 40 Marks

Exam: 60 Marks

Total: 100 Marks

Duration of exam: 3 Hours

Objective: The main objective of this course is to provide conceptual as well as practical knowledge about Operating system (Windows and UNIX). 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.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

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

(10-L,3-T=13)

Section-B

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

Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions. **Deadlocks:** Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

(10-L,3-T=13)

Section-C

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal , external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation. **File System Interface:** File Concept, Access Methods–sequential, direct, index, Directory Structure–single-level, two-level, tree-structured, acyclic-graph, general graph.

(10-L,3-T=13)



Section-D

File System Implementation: File System Structure, Allocation Methods-contiguous allocation, linked allocation, indexed allocation, Free Space Management-bit vector, linked list, grouping, counting, Directory Implementation linear list, hash table, Efficiency and Performance, **Recovery:**consistency checking, backup and restore. **Secondary Storage Structure:** Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling, Selection of A Scheduling Algorithm, Disk Management-disk formatting, boot block, bad blocks. **UNIX:**Operating System, Structure of UNIX Operating System, UNIX Commands, Interfacing with UNIX, Editors & Compilers for UNIX. **(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. 1995.

Reference Books:

1. William Stallings, —Operating Systems, Macmillan Publishing Company.
2. Deitel H.M., —An Introduction to Operating System, Addison Wesley Publishing Company, 1984.
3. Kenneth Rosen, Douglas Host, The Complete Reference, Unix, Tata McGraw Hill



MCA-205 Mathematics

L T P Credits
3 1 0 4

Sessional: 40 Marks
Exam: 60 Marks
Total: 100 Marks
Duration of exam: 3 Hours

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 statistics, probability and basis number theory.

INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 4-12 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course. At least 70% questions are based on applied knowledge remaining 30% questions are based on concepts and illustration of concepts with mathematical approach.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

Section-A

Measure of Central Value: Average, Types of Averages, Arithmetic Mean, Weighted Arithmetic Mean, Median, Mode, Geometric Mean, Weighted Geometric Mean, Harmonic Mean, Weighted Harmonic Mean, Relationship among the averages. **Measures of Dispersion:** Measuring Variation, Methods of studying variation, Range, Interquartile Range or the Quartile Deviation, Percentile Range, Mean Deviation, Standard Deviation, Combined Standard Deviation, Variance, Lorenz Curve.

(10-L,3-T=13)

Section-B

Skewness, Moments and Kurtosis: Skewness, Measures of Skewness, Karl Pearson's Coefficient of Skewness, Bowley's Coefficient of Skewness, Kelly's Coefficient of Skewness, Moments, Measure of Skewness based on Moments, Measures of Kurtosis. **Correlation and Regression Analysis:** Correlation, Types of Correlation, Methods of studying Correlation, Karl Pearson's Coefficient of correlation, Rank Correlation Coefficient, Correlation in Time Series, Regression, Use of Regression Analysis, Difference between correlation and Regression analysis.

(10-L,3-T=13)

Section-C

Probability and Expected Value: Classical or a priori Probability, Relative Frequency Theory of Probability, Calculation of Probability, Addition Theorem of Probability, Multiplication Theorem, Conditional Probability, Bayes' Theorem, Random Variable and Probability Distribution.

Theoretical Distributions: Binomial Distribution, Coefficient of Binomial, Multinomial Distribution, Negative Binomial Distribution, Poisson Distribution, Hypergeometric Distribution, Normal Distribution, Areas under the normal Curve, Fitting a Normal Curve, Methods of fitting.

(10-L,3-T=13)



Section-D

The Fundamental Theorem of Arithmetic: Introduction, Divisibility, Greatest Common Divisor, Prime Numbers, The Fundamental Theorem of Arithmetic, The Series of Reciprocals of the Primes, The Euclidean Algorithm, The Greatest Common Divisor of More Than Two Numbers. **Arithmetical Functions and Dirichlet Multiplication:** Introduction, The Möbius Function $\mu(n)$, The Euler Totient Function $\varphi(n)$, A Relation Connecting φ And μ , A Product Formula For $\varphi(n)$, The Dirichlet Product Of Arithmetical Functions, Dirichlet Inverses And Möbius Inversion Formula, The Mangoldt Function $\Lambda(n)$, Multiplicative Functions, Multiplicative Functions And Dirichlet Multiplication, The Inverse of a Completely Multiplicative Function, Liouville's Function $\lambda(n)$. **(10-L,3-T=13)**

Text Books:

1. S.P. Gupta Statistical Methods, Sultan Chand & Sons, New Delhi
2. Tom M. Apostol Introduction to Analytic Number Theory, Narosa Publishing House, New Delhi
3. John Stillwell, "Elements of Number Theory", Springer Publisher.

References Books:

1. Shailesh A. Shirali and C.S. Yogananda, "Number Theory", Universities Press (2003)
2. V.K. Krishnan, "Elementary Number Theory: A Collection of problems with solutions", Universitites Press, first edition (2012)
3. Murray Spiegel, John Schiller, R. Alu Srinivasan, Debasree Goswami, "Probability and Statistics (Schaum's Outline Series)", McGraw Hill Education (India) Private Limited; 3 edition (21 January 2010)
4. Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", Wiley India Private Limited; Fourth edition (2009)



MCA-206 Data Structure Lab

L T P Credits
0 0 3 1

Sessional: 50 Marks
Exam: 50 Marks
Total: 100 Marks
Duration of exam: 3 Hours

Objective: The main objective of this course is to cover practical implementation part of **MCA-201**. After completing the course the student should be competent in handling various data structures and different operations on these data structures using Java platform and proficiently implement all the object oriented concepts using Java platform.

INSTRUCTIONS:

1. **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.

Suggested List of Practical Topics:

1. Java Basics, Control Structure
2. Arrays and Strings
3. Fundamentals Of Classes
4. Extending Classes and Inheritance
5. Packages & Interfaces
6. Exception Handling
7. Multithreading Programming
8. Input/ Output in Java
9. Link Lists(linear, circular, doubly linked, inverted)
10. Queues (Simple, Circular Queue, Priority Queue)
11. Different Trees, Binary Search Trees
12. Heap Sort
13. Graph Implementation, Graph traversals
14. Different File Organization
15. Sorting & Searching



MCA-207 DBMS Lab

L T P Credits

0 0 3 1

Sessional: 50 Marks

Exam: 50 Marks

Total: 100 Marks

Duration of exam: 3 Hours

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 defining and manipulating database through MySQL/Oracle and proficient in query handling by using MySQL/Oracle.

INSTRUCTIONS:

1. **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.

Suggested List of Practical Topics:

1. Data Definition Language
 - a. Create
 - b. Alter
 - c. Drop
2. Data Manipulation Language
 - a. Insert
 - b. Select
 - c. Delete
 - d. Update
3. Clauses
 - a. Where
 - b. Having
 - c. Order By
 - d. Group By
 - e. Exists
 - f. In
 - g. Notin
 - h. Any
4. Arithmetic and Aggregate Operators
5. Set Manipulation operations
6. Joins
7. Natural, Inner, Outer
8. Sub queries
9. Data Control Language
10. Transaction Control Language

