MCA SYLLABUS

UNDER

NON-CHOICE BASED CREDIT SYSTEM

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2018-19, 2019-20, 2020-21.

UNIVERSITY OF JAMMU
JAMMU

MCA COURSE STRUCTURE

Semester-Wise Distribution of Courses and Credits

Semester I

Course No.	Title	Credits	Contact hours per week L-T-P
MCA102	Problem Solving & Programming in C	4	4-0-0
MCA103	Computer Organization & Assembly Language	4	4-0-0
MCA107	Operating System Principles	4	4-0-0
MCA108	Discrete Mathematics	4	4-0-0
MCA190	Practical (based on C and Unix/Linux)	6	0-0-10
	Total:	**22**	**16-0-10**

Semester II

Course No.	Title	Credits	Contact hours per week L-T-P
MCA203	Data Structures using C-Language	4	4-0-0
MCA208	Database Management System	4	4-0-0
MCA209	Computer Architecture & Microprocessor	4	4-0-0
MCA212	Computer Networks	4	4-0-0
MCA213	Application Programming using Java	4	4-0-0
MCA290	Practical (based on Data Structures, Oracle and Java)	6	0-0-10
	Total:	**26**	**20-0-10**

Semester III

Course No.	Title	Credits	Contact hours per week L-T-P
MCA310	Algorithm Design& Analysis	4	4-0-0
MCA311	Computer Graphics	4	4-0-0
MCA313	Web Technologies	4	4-0-0
MCA314	Management Information System	4	4-0-0
MCA390	Practical (based on Computer Graphics and Web Technologies)	6	0-0-10
	Total:	**22**	**16-0-10**

Semester IV

Course No.	Title	Credits	Contact hours per week L-T-P
MCA420	Theory of Computation	4	4-0-0
MCA422	Numerical & Statistical Computing	4	4-0-0
MCA423	Software Engineering	4	4-0-0
MCA424	Optimization Techniques	4	4-0-0
Elective-I MCA425 MCA426 MCA427 MCA428	(any one of the following) Python Big Data Analytics with R Machine Learning Internet of Things	4	4-0-0
MCA490	Practical (based on Numerical & Statistical Methods and Python/R)	6	0-0-10
	Total:	**26**	**20-0-10**

Semester V

Course No.	Title	Credits	Contact hours per week L-T-P
MCA504	Artificial Intelligence	4	4-0-0
MCA511	Principles of Complier Design	4	4-0-0
MCA518	.NET Technology & C#	4	4-0-0
Elective-II MCA516 MCA519	(any one of the following) Mobile Technologies PHP	4	4-0-0
MCA590	Practical (based on .NET and PHP/ Mobile Technologies)	6	0-0-10
	Total:	**22**	**16-0-10**

Semester VI

MCA601

PROJECT WORK: 26 credits

The project in sixth semester shall carry 650 marks distributed as follows:

Project Component		**Marks**
Mid-Semester Presentation & Internal Evaluation		250
End-Semester Evaluation	Project Evaluation	250
	Project Viva-voce	150
	Total:	**650**

PASSING CRITERIA

The minimum number of marks required to pass each theory paper and practical paper from Semester-I to V shall be 40% (separately in the internal assessment and the university examination).
The minimum number of marks required to pass Project work in VI semester examination shall be 50%.
The candidate must pass the MCA examination within six years of the initial admission to the first semester of the course as a regular candidate.

ATTENDANCE REQUIREMENT

The minimum attendance requirement for a regular student to appear in a Semester Examination is 75% of the total number of lectures and seminars (as per syllabus) conducted in the semester. The Head of the Department may condone shortage in attendance of a student in a semester upto five attendances in each course.

A candidate who falls short of attendance in more than half the total number of courses in any semester shall have to apply for new admission/enrolment in that semester in order to earn fresh eligibility to appear in the examination.

A candidate who falls short of attendance in half or less than half the total number of courses in any semester and promoted to next semester after fulfilling the conditions as per MCA statues, shall have to repeat those courses alongwith the candidates of next academic session, the department will make arrangements of extra classes for such students.

SCHEME OF EVALUATION

Theory Courses

Each theory paper shall be of total 100 marks in case of 4 credit course. The distribution of marks is as follows:

Examination	**Weightage**
Written Examination *(at the end of each semester to be conducted by the university)*	80%
Internal Assessment	20%

Internal Assessment

For each course, there shall be two tests/assignments. The scheme of internal assessment is as follows:

Course	**Test/Assignment-I**	**Test/Assignment-II**	**Attendance**	**Total**
Four Credit Course	8 marks	7 marks	5 marks	20 marks

SCHEME FOR PAPER SETTING

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

Practical Courses

Each practical course carries 150 marks distributed as follows:

Practicals				**Marks**
Internal Evaluation	I	Program Implementation & Viva-Voce	55 marks	75
	II	Practical File	10 marks	
	III	Attendance	10 marks	
External Evaluation				75
Total				150

Internal Evaluation

Guidelines for internal Assessment of practical courses

- Performance of the students will be evaluated based on a comprehensive system of continuous evaluation.
- For each practical course, students will be given regular assignments by the concerned practical teachers.
- The implementation of assignments will be assessed & evaluated and viva-voce will be conducted at least once in every fifteen days and then a set of further assignments may be given.
- Record of the Internal evaluation components I (Program Implementation & Viva-voce) shall be maintained regularly by the concerned teachers.
- At the end of the semester the Internal evaluation components II (Practical File) & III(Attendance) will be evaluated and consolidated with the record of components I to prepare the final award for Internal Practicals.

External Evaluation

The practical examination shall be conducted by external and internal examiners. The external examiner shall be the incharge of the practical examination and will decide the distribution of marks for various components of the examination in consultation with the internal examiner.

CRITERIA FOR PROMOTION OF A STUDENT TO NEXT HIGHER SEMESTER

Semester-I to Semester-II

The candidates shall be enrolled in second semester provided they secure pass marks in internal assessment in all the courses of first semester and who are otherwise found eligible under the MCA statutes.

Semester-II to Semester-III

The admission to third semester shall be open to only those candidates who secured pass marks in at least 12 credit's courses of first semester in the University examination and in the internal assessment in all courses of second semester.

Semester-III to Semester-IV

The candidates shall be enrolled in fourth semester provided they secure pass marks in internal assessment in all the courses of third semester and who are otherwise found eligible under the MCA statutes.

Semester-IV to Semester-V

The admission to fifth semester shall be open to only those candidates who secured pass marks in at least 12 credit's courses of third semester in the University examination and in the internal assessment in all courses of fourth semester.

Semester-V to Semester-VI

The candidates shall be enrolled in sixth semester provided they secure pass marks in internal assessment in all the courses of fifth semester and who are otherwise found eligible under the MCA statutes.

MCA-FIRST SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination: 3 Hrs	
Examination to be held: December 2018, 2019, 2020	

COURSE NO: MCA102
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

Course Objectives & Learning Outcomes:

- The course aims to provide exposure to problem-solving through programming.
- It aims to train the student to the basic concepts of the C-programming language.
- To compare the various programming constructs and choose the right one for the task in hand.
- To choose the right data representation formats based on the requirements of the problem.
- By learning the basic programming constructs they can easily switch over to any other language in future.

UNIT-I Problem Solving & C Basics
Steps for problem solving, Computer as a tool for problem solving. Program Design tools: Algorithm, Psuedocode and Flowchart Designing.
History of C, Characteristics of C, Introduction to GCC, compiling, linking and running a C–program, Using MAKE Utility.
C Program Structure, Data Types, Variables and Constants, Printing Out and Inputting Variables, Constants, Type-Casting, Operators and Expressions, Order of Precedence.

10 HOURS

UNIT-II Control Statements & Arrays
Conditional Statements, Program Loops and Iteration, Library functions. Syntax, semantic, linker, logical and runtime errors.
Single and Multi-dimensional Arrays, Strings, Basic String Handling Functions.

10 HOURS

UNIT-III Functions & Further Data Types
Functions, Passing Parameters, Recursion, Storage classes. Standard C Preprocessor Directives. Standard Formatted & unformatted I/O Functions;
Defining New Data Types, Structures, Unions, Enumerated Types, Bitwise Operators, Bit Fields.

10 HOURS

UNIT-IV Pointers & Files
Pointers: Pointers arithmetic, constant void pointers. Dynamic Memory Allocation, Pointers to Pointers, Pointer to array, Array of pointers, Command line input, Pointers to a Function.
Files Character and Line Based I/O, Formatted I/O, Block I/O, File Positioning.

10 HOURS

UNIT-V File Accessibility & Graphics Programming
File Accessibility and Directories (access, stat, chmod, chown, chdir, chroot), ProcessControl: (Running Linux Commands from C, fork(), the exec family, wait(), exit()).
Graphics Programming: OpenGL Basics, OpenGL Utility Toolkit (GLUT), Defining window, Display mode, OpenGL Functions, Primitives (Points, Lines, Polygons) and Attributes, Simple graphics programs.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2018, 2019, 2020

COURSE NO: MCA102
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

SUGGESTED READINGS:

1. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI., 2000.
2. Shubhnandan S. Jamwal, "Programming in C", Pearson Publications, 2014.
3. Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science A Structured Programming Approach Using C", PHI, 3rd Edition, 2007.
4. Jeri R. Hanly and Elliot B. Koffman, "Problem Solving and Programming in C", Pearson, 5th Edition 2007.
5. Yashwant Kanetkar, "Let us C", BPB Publications, 2002.
6. Edward Angel, "OpenGL- A primer", 3rd Edition, Addison-Wesley 2007.
7. Kurt Wall, Mark Watson, and Mark Whitis, "Linux Programming Unleashed", SAMS.
8. Mark Mitchell, Jeffrey Oldham, and Alex Samuel, "Advanced Linux Programming", New Riders Publishing, 2001.
9. Edward Angel, "Interactive Computer Graphics", 5th Edition, Addison-Wesley 2009.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FIRST SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2018, 2019, 2020	

COURSE NO: MCA103
COURSE TITLE: COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE

Course Objectives & Learning Outcomes:

- To describe how data is represented in computer memory.
- To demonstrate how fundamental high-level programming constructs are implemented at the machine-language level.
- To write assembly language program that can input, process and output results.
- To demonstrate the basic computer architecture.
- Students will be to apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer based systems.

UNIT–I Binary Systems
Overview of digital computers, Binary Numbers, Number systems, Number based Conversions, Integer & floating point representation using IEEE FORMAT, Rules of Floating point Arithmetic, parity, Error detection and correction methods using Hamming technique, ASCII code representation, Rules of addition/subtraction for r's, (r-1)'s complements, BCD, excess–3 codes.

10 HOURS

UNIT–II Boolean Algebra & Logic Gates
Basic Theorems and functions, Boolean Expressions, Laws of Boolean Algebra, De–Morgan laws, simplification of Boolean Expressions using SOP, POS, K–map. Logic gates, AND, OR, NOT, NAND, XOR, NOR, XNOR Gates & their design.

10 HOURS

UNIT–III Combinational Circuits
Introduction, Half & Full adders & subtractors, parallel adders and subtractors. Encoder, decoder, Multiplexer, De-Multiplexer, code converters.

10 HOURS

UNIT-IV Sequential circuits & Memory organization
Sequential circuits, Basic memory cell, Flip-flops and their types, triggering of flip flops, Registers and their types, bi-directional register.
Memory Hierarchy, Memory and its types, characteristics of memory, memory address map to CPU, cache memory.
I/O devices FD/HD disks, VDU; I/O organization, Modes of I/O transfer like DMA, programmed control, interrupts technique.

10 HOURS

UNIT–V Microprocessor & Assembly Language
Microcomputer organization, microprocessor organization, Instruction set, addressing modes, stack, subroutines and interrupts, memory organization and I/O interface.
Need and use of Assembly Language, Types of Assemblers (TASM and MASM), assembly Language programming structure, Instruction Sets (operands and opcodes), description of Registers, writing and executing simple assembly programs.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2018, 2019, 2020

COURSE NO: MCA103
COURSE TITLE: COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE

SUGGESTED READINGS:

1. Gear, C. W.: "Computer Organization and Programming", McGraw–Hill.
2. Tannenbaum, A. S.: "Structured Computer Organization", Prentice-Hall of India.
3. Mano, M. M.: "Computer System Architecture", Prentice–Hall, of India.
4. Langholz, G., Grancioni, J. and Kandel, A.: "Elements of Computer Organization", PHI.
5. Hayes: "Computer Architecture and Organization", McGraw–Hill International Edition.
6. Sloan, M. E.: "Computer Hardware and Organization", 2nd Edn, Galgotia publ. Pvt. Ltd.
7. Floyd: "Digital Fundamentals", 3rd edn, Universal bookstall, and pvt. ltd
8. R. K Gaur: "Digital Electronics and microprocessor"-dhantpat Rai pub.
9. Peter Abel: "Assembly language and Programming".

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(5x7 = 35 marks)

Section B
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(3x15 = 45 marks)

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MCA-FIRST SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2018, 2019, 2020	

COURSE NO: MCA107
COURSE TITLE: OPERATING SYSTEM PRINCIPLES

Course Objectives & Learning Outcomes:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication.
- To learn the mechanisms involved in memory management in contemporary OS.
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- To brief the students about basic concepts of OS like Unix/Linux and programs using shell programming.

UNIT-I Introduction to Operating Systems

Evolution of operating systems, operating systems concepts, types of operating systems, different views of the operating system, operating system services, System calls, Types of system calls. Operating system Structure, Layered Approach, Microkernels, Virtual machines.

10 HOURS

UNIT–II Process Management

Process concept, operation on processes, Inter-process communication, mutual exclusion, Process scheduling, Basic Concepts, Scheduling criteria, Scheduling algorithms,
Process Synchronization, Inter process Synchronization, Critical section Problem, Semaphores, Monitors, Message passing.
Deadlocks, System Model, Deadlock characterization, Deadlock prevention, Deadlock avoidance.

10 HOURS

UNIT–III Memory Management

Memory management, swapping, contiguous memory allocation, relocation & protection, Memory management, Paging, Segmentation, Intel Pentium Segmentation, Intel Pentium Paging, Virtual memory, demand paging, performance of demand paging, Page replacement algorithms: FIFO, Optimal, LRU, Counting based page replacement.

10 HOURS

UNIT–IV File & I/O Management

Files system structure, file system implementation, Directory Implementation.
Allocation Methods, contiguous allocation, Linked allocation, Indexed allocation Disk organization, disk space management, disk scheduling, Disk Management, RAID Structure.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2018, 2019, 2020

COURSE NO: MCA107
COURSE TITLE: OPERATING SYSTEM PRINCIPLES

SUGGESTED READINGS:

1. Silberschart, Galvin, Gagne, "Operating System Concepts", 9th Edition, WSE Wiley, 2016.
2. Andrew. S. Tanenbaum, "Modern operating systems", 4th Edition, Pearson Prentice Hall, 2018
3. Milan Milenkovic, "Operating system-concepts and design", 2nd Edition, McGraw Hill International Edition, 2005
4. A. S. Godbole, "Operating systems", 3rd Edition, Tata McGraw hill, 2017.
5. Deitel H. M., "Operating System", 3rd Edition, Pearson Publications, 2012.
6. Madnick & Donovan, "Operating Systems", Tata McGraw Hill, 2003.
7. Sumitabha Das, "UNIX Concepts and Application", 4th Edition, Tata McGraw Hill, 2017.
8. Richard L. Petersen, "The Complete Reference Linux", 6th Edition, Tata McGraw Hill, 2010.

NOTE FOR PAPER SETTERS

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(5x7 = 35 marks)

Section B
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(3x15 = 45 marks)

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MCA-FIRST SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2018, 2019, 2020	

COURSE NO: MCA108
COURSE TITLE: DISCRETE MATHEMATICS

Course Objectives & Learning Outcomes:

- Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion.
- To analyze algorithms and programs such as finding Fibonacci numbers, Tower of Hanoi problems using recurrence relations and recursion.
- Students will learn core ideas in graph theory.
- Students will be able to model problems in Computer Science using graphs and trees.

UNIT–I Counting Techniques
Basics of counting pigeon hole principles, permutation and combination, Recurrence Relations & their solution (Homogeneous & non-homogenous), Divide & Conquer Recurrences, Decision trees.

10 HOURS

UNIT–II Posets, Hasse Diagram, Lattices and Fuzzy
Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices.
Introduction to fuzzy systems, fuzzy sets, equality of fuzzy sets, normal fuzzy sets, containment, support of a fuzzy set. Alpha-level sets. Basic operation of Fuzzy sets.

10 HOURS

UNIT–III Graphs
Introduction to Graphs; Incidence and degree; Handshaking Lemma; Isomorphism; Subgraphs and Union of graphs; connectedness; Walks, Paths and Circuits; Components; Connectedness Algorithm, shortest path Algorithms, Eulerian graph; Fleury's algorithms, Hamiltonian graph-Necessary conditions and sufficient conditions; Travelling saleman problem; Bipartite graphs; Directed Graphs, Binary relations, connectedness in directed Graph.

10 HOURS

UNIT–IV Trees
Properties of trees; Pendant vertices in a tree: Center of a tree; Rooted an binary trees; Spanning Trees–spanning tree algorithms; Fundamental circuits; Spanning trees of a weighted graph, cutsets and cut-Vertices; Fundamental cutsets; connectivity and separativity.

10 HOURS

UNIT–V Planar graphs &Coloring
Combinatorial and geometric dual; Kuratowski's graphs; Detection of planarity; Thickness and crossings.
Colorings: Vertex coloring, Chromatic number; Chromatic polynomial, The four colour problem, edge coloring, Coloring algorithms.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2018, 2019, 2020

COURSE NO: MCA108
COURSE TITLE: DISCRETE MATHEMATICS

SUGGESTED READINGS:

1. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall, 2018.
2. Babu Ram, "Discrete Mathematics", Pearson Publications, 2011.
3. F. Harary, " Graph Theory", Addison-Wesley Publications Camp, 2001
4. J. P Trembly and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1st Edition, McGraw Hill.
5. V. Krishnamurthy, "Combinatorics Theory and Applications", Affiliated East-West Press Pvt. Ltd, 2008
6. B. Kolman, R. Busby, "Discrete Mathematical Structures", 6th Edition, Pearson Publications, 2015.

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(5x7 = 35 marks)

Section B
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(3x15 = 45 marks)

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MCA-FIRST SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: MCA190
PRACTICAL

Practical will be based on C and Unix/Linux.

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MCA-SECOND SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA203
COURSE TITLE: DATA STRUCTURES USING C-LANGUAGE

Course Objectives & Learning Outcomes:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques.
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To understand step by step approach in solving problems with the help of fundamental data structures.
- Student will be able to analyze algorithms and its correctness.
- Student will be able to choose appropriate data structure as applied to specified problem definition.

UNIT–I Fundamental Notations
Primitive and composite data types, self-referential structures, Algorithms, Types of data structures, Operations, Time and space complexity of algorithms, Asymptotic notation.

10 HOURS

UNIT–II Linear Data Structures
Arrays, Linked lists, Stacks, Queues, operations and their complexities, Implementations, Applications.

10 HOURS

UNIT–III Non-Linear Data Structures
Trees, Binary Trees, Traversing binary trees, Threaded binary trees, Binary search trees, heaps, Graphs, Traversing graphs.

10 HOURS

UNIT–IV Indexing Structures
ISAM, m-way trees, B–trees, B+–trees, Hashing techniques for direct access, collision in hashing, collision resolution.

10 HOURS

UNIT–V Sorting
Internal and External sorts, Bubble sort, Insertion sort, Selection sort, Shell sort, Quick sort, Radix sort, Merge sort, Types of merging.

10 HOURS

SUGGESTED READINGS:

1. Vishal Goyal, "A Simplified Approach to Data Structures", Shroff Publishers Pvt. Ltd, 2014.
2. GAV Pai, "Data Structures and Algorithms", Tata McGraw Hills, 2017.
3. Seymour Lipschutz, "Data Structures with C", Schaum Outlines, 2011.
4. Reema Thareja, "Data Structures using C", 2nd Edition, Oxford University Press, 2014.
5. Peter Brass, "Advanced Data Structures", 1st Edition, Cambridge University Press, 2008.

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2019, 2020, 2021

COURSE NO: MCA203
COURSE TITLE: DATA STRUCTURES USING C-LANGUAGE

6. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Universities Press (India) Pvt. Ltd, 2008.
7. Yedidiah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, "Data Structures using C and C++", 2nd Edition, Pearson Prentice Hall, 2007.
8. Adam Drozdek, "Data Structures and Algorithms in C++", 2nd Edition, Thomson Asia Pvt. Ltd, 2001.
9. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education India, 2001.
10. Jean-Paul Tremblay and Paul G. Sorenson, "Introduction to Data Structures with Application", 2nd Edition, Tata McGraw-Hill, 2001.

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(5x7 = 35 marks)

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(3x15 = 45 marks)

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MCA-SECOND SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA208
COURSE TITLE: DATABASE MANAGEMENT SYSTEM

Course Objectives & Learning Outcomes:

- To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve-efficiently, and effectively-information from a DBMS.
- Design ER-models to represent simple database application scenarios and convert them into relational tables
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- To familiarize students with the basic issues of transaction processing and concurrency control.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).

UNIT-I Database Management System Concepts
File based system, Need of Database Management System, Components of DBMS, Data independence, Three level architectural of Database, Centralized and client server architecture for DBMS, Introduction to hierarchical and network data models, Conventional file organizations, Inverted files.

10 HOURS

UNIT–II Relational Data Model
Relational data models, Entity relationship model, Conversion of ER diagrams to Relational Database Design, Joins, Relational algebra and relational calculus concepts, Queries using relational algebra and calculus.

10 HOURS

UNIT–III Normalisation
Concept of keys, Functional dependencies, Inference rules, Covers, Closure, Equivalence of functional dependencies, Multivalued dependencies, Theory of normalization, Normal forms (1st to 5th).

10 HOURS

UNIT–IV Concurrency Control
Transaction processing, Deadlocks, Concurrency control, Locking techniques, Timestamp ordering, Recovery management, Recovery techniques, Distributed Database Concepts.

10 HOURS

UNIT–V SQL
SQL query processing, Table creation and management, Inbuilt functions, Data integrity constraints, Views, Joins, Operators, Privileges, roles and security policies.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2019, 2020, 2021

COURSE NO: MCA208
COURSE TITLE: DATABASE MANAGEMENT SYSTEM

SUGGESTED READINGS:

1. Bipin C. Desai, "An Introduction to Database Systems", West-publishing company, 2012.
2. Elmasri, Navathe, Somayajulu, Gupt, "Fundamentals of Database Systems", Pearson Education, 1992.
3. Date, C. J., "An Introduction to Database Systems", Addison Wesley Pearson Education, 2014.
4. Narayan S. Umanath, Richard W. Scamell, "Data Modelling and Database Design", Thomson Course Technology India Edition.
5. R. A. Parida, Vinod Sharma, "The power of Oracle 9i", Firewall Media Publications.
6. DeshPande, "SQL/PL for Oracle 8 & 8i".

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-SECOND SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA209
COURSE TITLE: COMPUTER ARCHITECTURE & MICROPROCESSOR

Course Objectives & Learning Outcomes:

- To familiarize students with the components of digital electronics, logical organization and the hardware and corresponding algorithms for computer arithmetics.
- To study memory organization and the functions of each element of a memory hierarchy.
- To understand processor performance at different levels of processing.
- To familiarize students with the design of a Hardware descriptive language.
- To help the students in understanding and analyzing different hardware designs, mathematical models and design integrated applications on different software platforms.

UNIT–I Digital Electronics
Semi-conductor, p-type, n-type formation, pn junction & its characteristics, Bipolar and MOSFET transistors as current controlled and voltage controlled Switch, Basic design for AND, OR, NOT, NAND, NOR using RTL, DTL, TTL, MOS Technology, Tristate logic.

10 HOURS

UNIT–II Sequential Circuits & Computer Arithmetic
Sequential circuits: Sequence generator, counters, A/D & D/A converters.
Computer Arithmetic: Flowchart, Hardware design & algorithm for signed magnitude & 2's complement form for addition, subtraction, multiplication & division methods, floating point arithmetic.

10 HOURS

UNIT–III Memory & Register Organization
Memory: 2D/3D Static RAM, Static and Dynamic Memory, Types of ROM, associative memory and interleaved memory, Random access, Sequential access, direct access, virtual memory, cache memory.
Register transfer logic and micro-operation.

10 HOURS

UNIT–IV Microprocessor & Control Design
Internal structure of MPU, ALU & Micro-programmed control unit. Instruction format, Bit Slices, I/O interface adapter (Serial and Parallel), Memory read, Memory write, Memory map and I/O map, Interrupts and its types.

10 HOURS

UNIT–V Parallel Processing and VHDL
Classification of parallel machines, pipeline processing, Vector processing, multiprocessor system architecture-multiport memory, crossbar switch, timeshared common-bus, dual-bus, Bus arbitration.
VHDL: Introduction, Need and importance of VHDL, characteristics, basic components of VHDL.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2019, 2020, 2021

COURSE NO: MCA209
COURSE TITLE: COMPUTER ARCHITECTURE & MICROPROCESSOR

SUGGESTED READINGS:

1. Malvino, A. P., Leach, D. P., "Digital Principles and Applications", Tata McGraw-Hill, 2011.
2. Millman and Halkias, "Integrated Electronics", McGraw-Hill.
3. Khambata, J., "Microprocessor and Microcomputer", John Wiley and Applications, PHI.
4. Liu, Y. Gibson, G. A., "Microcomputer Systems: The 8086/808", Family, PHI, 2015
5. AlexandridisNikitas, A., "Microprocessor System Design Concepts", Galgotia Publications.
6. Stone, S., "Introduction to Computer Architecture", Galgotia Publications, 2ndEdn.
7. Mano, M. M., "Computer System Architecture", Prentice-Hall, 2017.
8. Volnei A. Pedroni, "Circuit design with VHDL".

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-SECOND SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA212
COURSE TITLE: COMPUTER NETWORKS

Course Objectives & Learning Outcomes:

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To study the fundamentals of Physical layer, and explain the types of transmission media with real time applications.
- To study data link layer concepts, design issues, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To explore the basic knowledge of cryptography and network security.

Unit-I Fundamentals of Communication

Fundamentals of Communication, Modulation, Data Encoding, OSI reference model, TCP/IP model, network standardization, Inter-networking. Physical layer, Switching Technique, Transmission media, Co-axial, Twisted Pair and Fiber Optic Cables, Transmission Impairments, Electromagnetic Spectrum, Communication, Radio waves, Microwaves, Satellites, GSM, CDMA.

10 HOURS

Unit-II Data Transmission and Media access Concepts

Data Link layer, Design issues, Frame, Error detection and correction, Flow Control, Elementary Data link protocols, Character-oriented and Bit-oriented Protocols, Sliding window protocols.
Channel allocation methods, TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision free protocols, IEEE standard 802 for LANS, Ethernet, Token Bus, Token ring.

10 HOURS

Unit-III Network Establishment Concepts

Network Layer, Store and Forward Packet Switching, Connectionless and Connection-oriented services, Virtual Circuit, Routing Algorithms, Shortest path, Flooding, Link State, Distant vector, Hierarchical, Broadcast and Multicast Routing. OSPF, BGP, Congestion, Congestion control algorithms.

10 HOURS

Unit-IV Internet Protocols

TCP/TP Protocol, IP Addresses, Classes of IP Addresses, Subnets, IPv6, Network layer in the Internet, Internet Control Protocols, ARP, RARP, BOOTP, DHCP, Transport Layer, Protocol Stack, TCP and UDP, Transport Services Primitives, Sockets, Socket Programming concept.

10 HOURS

Unit V Network Application

Application layer, Name service (DNS) Domain Hierarchy, Name servers, Name resolutions, Traditional applications, Telnet, FTP, SMTP, MIME, World wide web-HTTP, HTTP Methods.
Network security-Cryptographic Algorithms, DES, AES, RSA, Key exchange methods

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2019, 2020, 2021

COURSE NO: MCA212
COURSE TITLE: COMPUTER NETWORKS

SUGGESTED READINGS:

1. Andrew S. Tanenbaum, "Computer Networks", 5 e, 2013, Pearson Education Asia.
2. Behrouz A. Forouzan, "Data Communications and Networking", 4e, 2004, Tata McGraw Hills.
3. William Stallings. "Data and Computer Communication", 7e, 2016, Pearson Education Asia.
4. Prakash C. Gupta, "Data Communications and Computer Networks", PHI
5. Michael A. Miller, "Data and Network Communications", 2e, Delmar Thomson Learning.
6. James F. Kurose and Keith W. Ross, "Compter Networking", 3e, Pearson Education.
7. William A. Shay, "Understanding Data Communications and Networks", 2e, Thomson Asia Pvt. Ltd.
8. Peter Norton and Dave Kearns, "Complete Guide to Networking", ie, Techmedia India Ltd.
9. Douglas E. Comer, "Internet networking with TCP/IP Vol I & II", 3e, PHI.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-SECOND SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA213
COURSE TITLE: APPLICATION PROGRAMMING USING JAVA

Course Objectives & Learning Outcomes:

- To gain knowledge about Java language.
- To understand the fundamentals of object-oriented programming in Java.
- To understand the basic principles of web application programming.
- Students will be able to design dynamic web application using database connectivity.

UNIT –I Java Language Basics
Features, Object Oriented concepts, Java Virtual Machine Concepts, Primitive Data Type And Variables, Java Keywords, Java Operators, Expressions, Control Statements and Arrays.
Class and Objects, Static methods, Constructors, Method Overloading.

10 HOURS

UNIT –II Inheritance, Packages and Interfaces
Inheritance, Access Control, Method Overriding, Garbage Collection, Abstract Classes, Polymorphism
Packages, Interfaces, Exceptions Handling, Types of Exceptions, Writing Exception Subclasses, Multithreading, Synchronization in Java.

10 HOURS

UNIT –III I/O, Files & Applets Programming
I/O in Java, Byte Stream Classes, Character Stream Classes, Reading and Writing to Console, Reading and Writing Files, The Transient and Volatile Modifiers, The String and String Buffer Class.
The Applet Class, An Applet Skeleton, Adding images & sound, Passing parameters to an applet.

10 HOURS

UNIT –IV AWT & Networking
AWT Components, Building User Interface with AWT, Handling Events, Event Delegation Model (Events, Listeners, interfaces, Anonymous Classes). Layouts and Layout Manager, Introduction to Swing Components.
Networking: InetAddress class, URL class, TCP sockets, UDP sockets.

10 HOURS

UNIT–V Database Connectivity
JDBC Overview, JDBC implementation, Connection class, Statements, Types of statement objects (Statement, PreparedStatement and CallableStatement), Types of resultset, ResultSetMetadata, Catching Database Results, Handling database Queries, JDBC and AWT.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2019, 2020, 2021

COURSE NO: MCA213
COURSE TITLE: APPLICATION PROGRAMMING USING JAVA

SUGGESTED READINGS:

1. Herbert Schildt–"Java The Complete Reference", Tata Mcgraw Hill, Tenth edition, 2017.
2. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
3. Shubhnandan S. Jamwal, "Java 9", The Team, Shroff Publishers and Distributor Pvt Ltd, 2018.
4. E. Balagurusamy, " Programming with JAVA", Tata McGraw Hill, Fifth edition.
5. Dietel & Dietel, "Java How to Program", Pearson Education, Eleventh edition.
6. Steven Holzner, "Java2 Black Book", Dreamtech Press.
7. George Reese, "Database Programming with JDBC and Java", 2nd Edition, O'Reilly.
8. Bruce Eckel, "Thinking in Java", Prentice Hall.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-SECOND SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: MCA290
PRACTICAL

Practical will be based on Data Structures, Oracle and Java.

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MCA-THIRD SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2019, 2020, 2021	

COURSE NO: MCA310
COURSE TITLE: ALGORITHM DESIGN & ANALYSIS

Course Objectives & Learning Outcomes:

- To design and analysis of various algorithms used in computer science and engineering.
- The students would be able to learn the significance and various aspects of development of algorithms.
- At the end of this course, students would be able to analyze and compare the algorithms on the basis of complexity and design efficient algorithms.

UNIT –I Review of Algorithms and Data Structures
Introduction to algorithm analysis: Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms. Recursion and Induction: recursive procedures, induction proofs, proving correctness, recurrence equations, recursion. Randomized Algorithms: Basic of Probability Theory, Description of Randomized algorithms, Identifying the repeated Elements, Partiality Testing, Advantages and Disadvantages of using randomized algorithms.

10 HOURS

Unit –II Basics of Analysis
Asymptotic Bounds, Concept of Efficiency of an Algorithm, Well Known Asymptotic Functions & Notations;
Well Known Sorting Algorithms, Comparison of Sorting Algorithms, Best-Case and Worst-Case Analyses, Average-Case Analysis, Amortized Analysis.

10 HOURS

Unit–III Design Techniques-I
Divide-and-Conquer, General Method, Multiplication of two n-bit numbers, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix multiplication, Exponentiation.
Dynamic Programming, General Method, The Problem of Making Change, The Principle of Optimality, Chained Matrix Multiplication.

10 HOURS

UNIT–IV Design Techniques-II
Backtracking, General method, n-queen's problem, Sum of subsets problem.
Greedy Algorithms, General Method, Knapsack problem, Job sequencing with deadlines, Minimum Spanning Trees, Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Single Source Shortest Path Algorithm.

10 HOURS

UNIT–V Classification of Problems & Graphs Algorithms
Non-Deterministic Algorithms, Introduction to NP-Completeness, Establishing NP-Completeness of Problems, NP-Completeness Proofs, NP-Hard Problems.
Graphs Algorithms, Traversing Trees, Depth-First Search, Breadth-First Search, Best-First Search & Minimax Principle, Topological Sort.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2019, 2020, 2021

COURSE NO: MCA310
COURSE TITLE: ALGORITHM DESIGN & ANALYSIS

SUGGESTED READINGS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, MIT Press, 2009.
2. E. Horowitz, S. Sahni, S. Rajasekaran, "Computer Algorithms", 2nd Edition, Universities Press, 2008.
3. Saara Baase and Allen Van Gelder, "Computer algorithms- Introduction to Design and Analysis", 3rd Edition, Pearson Education, 1999.
4. R. C. T. Lee, S. S. Tseng, R. C. Chang & Y. T. Tsai, "Introduction to the Design and Analysis of Algorithms: A Strategic Approach", 2nd Edition, Tata McGraw-Hill, 2009.
5. M. T. Goodrich and R. Tomassia, "Algorithm Design Foundations, Analysis and Internet examples", 1st Edition, John Wiley and sons, 2006.
6. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", 3rd Edition, Pearson Education, 2008.

NOTE FOR PAPER SETTERS

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Section A
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(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-THIRD SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2019, 2020, 2021	

COURSE NO: MCA311
COURSE TITLE: COMPUTER GRAPHICS

Course Objectives & Learning Outcomes:

- To introduce the components of a graphics system and make students familiar with building approach of graphics system components and algorithms related with them.
- To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
- To make students able to implement the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

UNIT-I Introduction to Computer Graphics

Concept of Computer Graphics and its applications; Graphics input and output devices. Video display devices: Refreshing display devices, Random scan display device, Raster scan devices, Flat Panel Devices, color CRT, Direct View Storages Devices. Input Devices, Hard Copy Devices.

10 HOURS

UNIT-II Graphic Primitives

Concept of Graphic Primitives, points, lines etc., Line (DDA and Bresenham line algorithm), Circle (Polar, Bresenham and Mid-point circle algorithm), Ellipse (Polar and Midpoint ellipse algorithm), Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), character generation; Aliasing, half toning, Sampling, Filtering Techniques.

10 HOURS

UNIT-III Geometric Transformations

2-dimensional Graphics: 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations.
3-dimensional Graphics: 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection), Composite transformations.

10 HOURS

UNIT-IV Viewing & Clipping Transformations

Introduction; objectives of viewing transformation; Concept of projections: parallel projection, orthographic and oblique projections, isometric projections, perspective projections (concept of vanishing points, single point, perspective transformation, 2-point and 3-point perspective transformation and general perspective transformation with COP at the origin.
Clipping Operations: Point and Line clipping, Cohen- Sutherland and Cyrus–Beck Line Clipping algorithms.

10 HOURS

UNIT-V Three-Dimensional Object Representation

Polygon surfaces, Polygon tables, plain equation, polygon meshes, Bezier curves &Surfaces, properties of Bezier curves, Hermite Interpolation.
Hidden line and surface elimination algorithms: z-buffer, scan-line, sub-division, Painter's algorithm. Illumination Models: Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Halftoning, Dithering. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2019, 2020, 2021

COURSE NO: MCA311
COURSE TITLE: COMPUTER GRAPHICS

SUGGESTED READINGS:

1. Hearn, D. Baker, and P. M., "Computer Graphics", 2nd Edition Prentice-Hall, 2013.
2. A. P Godse, "Computer Graphics", 4th edition, Technical publications Pune, 2015.
3. Newman, W. Sproul, R. F., "Principles of Interactive Computer Graphics", 2nd Edition, McGraw Hill, 2001.
4. Rogers, D. F, "Procedural Elements for Computer Graphics", 2nd Edition McGraw-Hill, 2003.
5. S. Harrington, " Computer Graphics: A Programming Approach", 2nd Edition, Tata McGraw- Hill, 1987.
6. Rogers, D. F., "Mathematical Elements of Computer Graphics", 2nd Edition, McGraw Hill Education, 2017.
7. R. A. Plastock and G. Kalley, "Computer Graphics", McGraw Hill, 2017.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

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(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-THIRD SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2019, 2020, 2021	

COURSE NO: MCA313
COURSE TITLE: WEB TECHNOLOGIES

Course Objectives & Learning Outcomes:

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to write a server side java application called Servlet/JSP to catch form data sent from client, process it and store it on database.
- Students will be able to connect web applications to a DBMS and perform operations on DBMS table.

UNIT-I HTML
Text Formatting Tags, META Tag, Adding Lists, Table, Embedding objects, Paragraphs, Formatting, Links, Head, Images, Tables, Lists, Blocks, Layout, Forms, Colors, Color values, Frame and Form, Form Controls, CSS, Defining Styles, Elements of Style, Linking a Style Sheet to an HTML Document, In-line Styles, External Style Sheets, Internal Style Sheets, Introduction to XML.

10 HOURS

UNIT-II JavaScript
Variables, String manipulation, Mathematical Functions, Statements, Operators, Arrays, and Functions, Data and Objects, Regular Expressions, Built-in Objects, Events, Opening a New Window, Messages and Confirmations, The Status Bar, Writing to a Different Frame, Rollover, Buttons, Moving Images.

10 HOURS

UNIT-III Servlets
Servlet Life Cycle, Servlet Request and Response Disadvantages of Servlets, Reading Headers
JSP: Scripting Elements, JSP Expression, JSP Declaration, Predefined variables/objects, using user defined functions, working with Databases Using JSP, Inserting, Updating, and Deleting Database Records.

10 HOURS

UNIT-IV ASP.NET
ASP. NET Standard Controls: Label, Textboxes, buttons, hyperlink, checkboxes, Regular expressions.
Server pages: Creating Server pages, page Life Cycle, HTTP Request Object, HTTP Response Object, Postback, Tracing & Debugging ASP. NET page.

10 HOURS

UNIT-V Server Control
State Management and Types of State Management, HTTP Cookies, HTTP Session, HTTP Application, Query String Method, State Management using Postback URL, View State.
Validation Controls, Data Bind Control and Types of Data Bind Control, Repeater, Data List, Grid View, Form View, Detail View.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2019, 2020, 2021

COURSE NO: MCA313
COURSE TITLE: WEB TECHNOLOGIES

SUGGESTED READINGS:

1. H. M. Deitel, P. J. Dietel and A. B. Goldberg, "Internet and Worldwide Web", 4th edition, Pearson Education.
2. Chris bates, "Web Programming", 2nd Edition, Wiley Dreamtech India.
3. Ramesh Bangia,, "Multimedia and Web Technology", 2nd Edition, Firewall Media.
4. James Jaworski, "Mastering Javascript and Jscript", 2nd Edition, BPB.
5. Phil Hana, "JSP: The complete Reference", Osborne/McGraw-Hill, 2001.
6. Jeff Rule, "Dynamic HTML", 1st Edition, Dreamtech Press.
7. Jose Annunziato and Stephanie Fesler Kaminaris, "Java Server pages in 24 Hours", 1st Edition, Techmedia.
8. https: //www. w3schools. com/
9. https: //www. Javatpoint. com/

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-THIRD SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2019, 2020, 2021	

COURSE NO: MCA314
COURSE TITLE: MANAGEMENT INFORMATION SYSTEM

Course Objectives & Learning Outcomes:

- To recognize contemporary MIS theory and how information systems support business strategy, business processes, and practical applications in an organization.
- Interrelate how various support systems can be used for business decisions and to sustain competitive advantage.
- Students will have ethical awareness and moral reasoning applied to a MIS problem, issue or case study.

Unit- 1Management Information and Control Systems

Management Information Systems: An Introduction, Objectives, Historical Background, Status of MIS in Organizations, Framework for Understanding Management Information Systems, Organization and Information System— Two Way Relationship, Systems View, Role of MIS at Various Management Levels, MIS as a Technique for Making Programmed Decisions, Decision-Assisting Information Systems, System Vulnerability and Abuse, Creating a Control Environment and Developing a Control Structure, Auditing Information System.

10 HOURS

UNIT-II Building Information and Languages Systems

Objectives, Computer Based Information Systems and its Classification, Office Automation Systems, Communication Systems, Transaction Processing Systems, Enterprise Information Systems, Decision Support Systems, Execution Systems, Redesigning the Organisation with Information Systems, Business Values of Information Systems, outsourcing Information System, Advantages and Disadvantages of Outsourcing, Ensuring Quality with Information System.

10 HOURS

Unit- III Decision Support Systems and Electronic Commerce

Decision Support Systems: Introduction, Understanding DSS- MIS and DSS-Decision making-types of decisions, Analytics and Business Intelligence- BI techniques, Difference between DSS, MIS and EIS, Components of DSS, Group DSS. Case Studies.

Electronic Commerce: Introduction, E-commerce Technology, Business over internet- networks-electronic data interchange (EDI)-online payment technology- Mobile commerce- ecommerce-portals- search engines-direct selling- auctions- aggregators, E-business.

10 HOURS

Unit-IV Managing Social Media and IT Function

Managing Social Media: Introduction, Social Dynamics of the Internet, Services of the Internet-Blogs-Social Networks, Technology of the Internet- Twitter-Rating-Tagging/folksonomies, Social issues-Media impact-Collaboration-Emergence of order, Social Networks in the Enterprise.

Managing IT Function: Introduction, Challenges of Managing the IT function- Modern IT environment-Centralisation versus Decentralisation-IT security-Technology selection, Vendor Management- vendor selection-vendor contracts and service levels-Ongoing relationship management- vendor retention or termination.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2019, 2020, 2021

COURSE NO: MCA314
COURSE TITLE: MANAGEMENT INFORMATION SYSTEM

Unit –V Ethical Issues

Introduction, Ethics in Information Society, Information Rights, Privacy and Freedom in an Information Society, Protecting Computer Equipment and Files, Limiting Logical Access to Computer Systems, Disaster Recovery Plan, Computer Virus and Prevention, Key issues- Workplace Monitoring- Power over users.

10 HOURS

SUGGESTED READINGS:

1. Kenneth, Laudon and Jane Laudon, "MIS: Managing the Digital Firm", Pearson Education, 2006.
2. James, A. O'Brien, "Introduction to Information Systems" Tata McGraw Hill, 2006.
3. Goyal, D. P., "Management Information Systems", Macmillan India Ltd, 2007
4. Turban, E.,McLean, E. and Wetherbe, J., "Information Technology for Management: Making Connections for Strategic Advantage",John Wiley and Sons, 2001.
5. Jawadekar, W. S., "Management Information Systems", Tata McGraw Hill, 2004.
6. Bishop Matt, "Computer Security: Art and Science", Addison-Wesley Pub Co; 1st edition, 2002.
7. Pfleeger Charles P &Pfleeger Shari L.,"Security in Computing", Prentice Hall PTR, third edition, 2002.
8. Post Gerald, V.,and Anderson David, L., "Management Information Systems", Tata McGraw-Hill, New Delhi, 2003.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A

Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B

It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-THIRD SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: MCA390
PRACTICAL

Practical will be based on Computer Graphics and Web Technologies.

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA420
COURSE TITLE: THEORY OF COMPUTATION

Course Objectives & Learning Outcomes:

- To apply mathematical foundations, algorithmic principles and computer science theory to the modeling and design of computational systems.
- To demonstrate knowledge of basic mathematical models of computation and describe how they relate to formal languages.
- To understand the limitations of computers and know about unsolvable problems.

UNIT–I Regular Languages and Expressions
Sets, Relations and Functions, Symbols, Alphabet, Strings, Backus-Naur Form, Languages, Grammar, Classification of Grammars, Regular Set, Regular expressions, Algebra of Regular expressions, Regular grammar, Regular languages, Closure properties of Regular languages, Applications of regular expressions.
10 HOURS

UNIT–II Finite Automata
Deterministic Finite Automata (DFA) Non-Deterministic Finite Automata (NFA), ε-NFA, Equivalence Finite Automata, Equivalence of Regular Expression and Finite Automata, Pumping Lemma for Regular Languages, Applications of finite automata, Mealy and Moore Machines.
10 HOURS

UNIT–III Context Free Grammar (CFG)
Production rules and derivation, Types of Productions, Reduction of Grammar, Chomsky Normal Form, Griebach Normal Form, Pushdown Automata (PDA), Equivalence between CFG and PDA, Context Free Language, Closure properties for context free languages, Pumping Lemma for Context free languages, Applications of Context Free Grammar.
10 HOURS

UNIT–IV Turing Machines
Description, Transition diagram, Roles of Turing machine, Church-Turing Thesis, Modular Construction of complex Turing machines, Extensions of Turing machines, Non-Deterministic Turing Machines. Universal Turing Machine, Turing acceptable and Turing decidable languages.
10 HOURS

UNIT–V Function Theory
Recursive Function Theory and Unsolvable Problems Partial, total and constant functions, Primitive recursive functions; Unbounded minimalisation and μ-recursion.
Decidable and Undecidable Problems, The Halting Problem, Reduction to Another Undecidable Problem, Undecidability of Post Correspondence Problem.
10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA420
COURSE TITLE: THEORY OF COMPUTATION

SUGGESTED READINGS:

1. H. R. Lewis and C. H. Papadimitriou, "Elements of the Theory of Computation", Prentice Hall of India, 2nd Edition.
2. J. E. Hopcroft, R. Motwani and J. D Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education Asia, 3rd Edition, 2008.
3. Michael Sipser, "Introduction to the Theory of Computation, Thompson", Second Edition, 2006.
4. Jeffrey Shallit, "A Second Course in Formal Languages and Automata Theory", Cambridge University Press, 2008.
5. K. L. P. Mishra and N. Chandrasekaran, "Theory of Computer Science", Prentice Hall, 3rd Edition. 2006.
6. Rogers H., "Theory of Recursive Functions and effective computing", Mcgraw-Hill, 1987.
7. J. C. Martin, "Introduction to Languages and Theory of Computation", Tata Mcgraw Hill, 3rd Edition, 2007.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

-x-

MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA422
COURSE TITLE: NUMERICAL AND STATISTICAL COMPUTING

Course Objectives & Learning Outcomes

- To demonstrate understanding of numerical and statistical methods in support of the analysis, design and application for problem solving in the field of information technology.
- To compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Raphson method.
- To apply method of interpolation and extrapolation for prediction.
- To recognize elements and variable in statistics and summarize qualitative and quantitative data.

UNIT-I Solutions of Equations

Iterative Methods: Zeros of a single transcendental equation; Newton-Raphson Methods, Rate of Convergence of NR method; Polynomial Evaluation; Birge vieta Methods.
Solutions of Simultaneous Linear equations–Gauss elimination method and pivoting, III conditioned equations and refinement of solutions; Gauss–Seidal interactive Method, Gauss-Jacobi method.

10 HOURS

UNIT-II Numerical differentiation and Integration

Numerical differentiation and Integration, Solutions of Differential Equations; Modified Euler's Method, Runga-Kuta method (2^{nd} and 4^{th}); Automatic error monitoring, Numerical Integration Newton's cotes of Integration. Trapezoidal rule, Simpson's 1/3rd and 3/8th rule.

10 HOURS

UNIT-III Basics of Statistics and Interpolation

Basic Statistics: Measures of central tendencies:-Mean, Median, Mode; Measures of dispersion: Range variance and standard deviation; Frequency distribution and cumulative frequency distributions; Linear correlation coefficient; Linear regression; Non-linear regression.
Interpolation: - Newton's Forward, Backward & Langrange's interpolation.

10 HOURS

UNIT-IV Probability

Discrete Probability Distributions: Binomial (Derivation, mean and variance and fitting of Binomial distribution), Poisson (Poisson as a limiting case of Binomial distribution, mean and variance and fitting of Poisson distribution.
Normal distribution, mean and variance of normal distribution. Student's T- test.

10 HOURS

UNIT-V Statistical and Sampling Theory

Concept of Population, Sample; Importance of Sampling and its advantages, Sampling distributions (mean, standard deviation and probability distribution).
Statistical decisions, hypothesis testing, type-1 and type-2 errors, level of significance, one tailed and two tailed tests. Comparison sample means (analysis of variance, ANOVA-one way);
Chi-square testing (test of independence, testing of goodness of fit, population variance).

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA422
COURSE TITLE: NUMERICAL AND STATISTICAL COMPUTING

SUGGESTED READINGS:

1. Stoer, Bullrich, "Computer Oriented Numerical Methods, Springer Verlag", 2nd Edition, 1980.
2. S. D. Conte & Carl De Boor, "Elementary Numerical Analysis, Macgraw hill", 3rd Edition, 1980.
3. Krishnamurthy, "E. V., Sen, S. K.: Computer Based Numerical Algorithm", East West Press, 2nd Edition, 1984.
4. Rajaraman, V., "Computer Oriented Numerical Methods, Prentice Hall India", 3rd Edition, 1993.
5. Draper, N. A., Smith, H, "Applied Regresion Analysis", John-Wiley and Sons, 3rd Edition, 1998.
6. Anderson, T. W, "An Introduction to Multivariate Statistical Analysis", John-Wiley and Sons, 3rd Edition, 2009.
7. Morrison, D. F., "Multivariate Statistical Methods", McGraw-Hill, 2nd Edition, 1978.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA423
COURSE TITLE: SOFTWARE ENGINEERING

Course Objectives & Learning Outcomes:

- To gain knowledge of basic SW engineering methods and their appropriate application.
- To understand software testing approaches such as unit testing and integration testing.
- To produce efficient, reliable, robust and cost-effective software solutions.
- Students will be able to perform independent research and analysis.
- Students will be able to analyze, design, verify, validate, implement, apply, and maintain software systems.

UNIT-I Introduction
Evolution of Software Engineering, Software Engineering: A layered technology, process frame work and software engineering paradigms, Software process technology, Software Requirements Analysis, Analysis Principles, Modeling the system architecture, Software prototyping and specification.

10 HOURS

UNIT-II Software Design
Design Process, Concepts, Principles, Architectural Design, Data Design, Mapping requirements into Software Architecture, Effective modular design, Procedural Design, Interface design, HCI design.

10 HOURS

UNIT-III Software Quality Planning and Project Management
Evaluation of individual projects: Technical assessment, cost-benefit analysis (Evaluation Techniques), and Risk evaluation, Concept of Software Project Management and its importance,
software cost estimation techniques, different types of project metrics, Models for cost estimation (COCOMO, Putnam's, function point), Introduction to project scheduling, project schedules, project and activities, scheduling activities, Schedule development methods (Critical Path Method, Critical Chain Scheduling, PERT).

10 HOURS

UNIT-IV Software Quality Assurance
Introduction, Quality Planning, Quality Assurance, Quality Control, Tools and Techniques of Quality Control, Pareto analysis, Six Sigma, Cost of Quality, software quality metrics (McCal's Quality Model, Boehm's Quality Model, Dromey's Quality Model), Capability maturity models.

10 HOURS

UNIT-V Software Testing and Maintenance
Testing Issues, Testing Object-Oriented Systems, Testing Techniques: White Box Testing, Black-Box Testing, Testing Strategies: Unit Testing, Integration and Validation testing, System Testing, Introduction to maintenance, characteristics, maintenance task, Reverse Engineering, Re-engineering, Clean room Software engineering.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA423
COURSE TITLE: SOFTWARE ENGINEERING

SUGGESTED READINGS:

1. Roger, S. Pressman, "Software Engineering: A practitioner's Approach", McGraw Hill, 5th Edition.
2. Walker Royce, "Software Project Management", Pearson Education, 2004.
3. Pankaj Jatlote, "An Integrated Approach to Software Engineering", Narosa Publication, 3rd Edition.
4. Shari Lawrence, PF Legger, "Software Engineering Theory and Practice", Pearson Education, 2nd Edition.
5. R. E. Fairley, "Software Engineering Concepts", McGraw Hill.
6. Ian Sommerviille, "Software Enginering", Pearson Education.
7. Robert S. Arnold, "Software Re-engineering", IEEE Comp. Society, 2003.
8. Lorenz and Kidd, "Object Oriented Software Metrics", Prentice Hall.
9. Booch, "Object-Oriented Analysis and Design with Applications", Addison-Wesley, 3rd Edition, 2007.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA424
COURSE TITLE: OPTIMIZATION TECHNIQUES

Course Objectives & Learning Outcomes:

- To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
- To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.
- To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

UNIT-I Linear programming

Overview of Optimization Techniques, Tools, Phases, Limitations and Applications.Formulation of A Linear Programming Problem with Different Types of Constraints, Requirements, Assumptions, Merits and Demerits, Applications of LP, Graphical Analysis, Graphical Solution, Multiple, Unbounded Solution and Infeasible Problems and Its Applications

Simplex Method: Principle, Computational Aspect, SM With Several Decision Variables. Two Phase LP Problem, Multiple, Unbounded Solution, Infeasible Problems, Dual Simplex Problems, Sensitivity and Duality Analysis in LP.

10 HOURS

UNIT-II Transportation and Assignment Problem

Transportation Problem (TP): Structure and Formulation of TP, Procedure for TP, Methods for Finding Initial Solution and Optimality, Unbalanced, Maximization, Degeneracy, Transshipment in TP.

Assignment Problem (AP): Approach, Procedure and Maximization, Unbalanced and Crew Assignment Problems.

Network Analysis: Shortest Path Problem, Minimum Spanning Tree Problem, Maximum Flow Problem, Minimum Cost Flow Problem, Project Planning and Control with PERT and CPM.

10 HOURS

UNIT-III Sequencing and Replacement Models

Sequencing problems: Processing N-Jobs through Two, Three, M Machines, Processing of N-Jobs through M Machines.

Replacement decisions: Replacement of Items that Deteriorate with Time (With and Without Change In Money Value), Staff Replacement Problem.

10 HOURS

UNIT-IV Integer and dynamic programming

Integer Programming: Formulation Techniques, Unimodularity, Cutting Plane Method, Branch and Bound Method.

Dynamic programming: Methodology and its Programming Applications.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA424
COURSE TITLE: OPTIMIZATION TECHNIQUES

UNIT-V Non linear programming

Solution of Non-Linear Programming, Convex and Concave Functions, Quadratic and Separable Programming, Cohn Tucker Conditions for Constraint Optimization.

10 HOURS

SUGGESTED READINGS:

1. V K Kapoor, "Operations Research, Techniques for Management", Sultan Chand and Sons, 5th Edition, 2012.
2. H. A. Taha, "Operations Research-An introduction", Pearson, 9th Edition 2010.
3. JK Sharma, "Operations Research, Theory and Applications", LaxmiPublications,6th Edition,2017.
4. S SRao, "Optimization theory and applications", Wiley Eastern ltd.,New Delhi.
5. S. D. Sharma, "Operations research, KedarNath", Ram Nath& co.
6. KantiSwarup, P. K. Gupta and Man Mohan, "Operations Research", Sultan chand and sons, New Delhi.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A

Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B

It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA425
COURSE TITLE: PYTHON

Course Objectives & Learning Outcomes:

- To understand the basic and advanced features of core language built-ins.
- To implement various packages of python library.
- To communicate using sockets, write client and server side scripts.
- To design and implement basic applications with database connectivity.
- Students will gain basic and advanced programming concepts of Python.

UNIT-I Introduction
Installing and working with python, Data Types: Identifiers and keywords, integral types, floating-point types, strings, Sequence types: Tuples, Named tuples, lists, Set Types: Sets, Frozen sets, Mapping types: dictionaries, iterating and copying collections. Control structures: conditional branching, looping, Exception handling: catching and raising exceptions, custom exceptions, custom functions: names and docstring, argument and parameter unpacking.

10 HOURS

UNIT-II Modules and Packages
Modules and packages, Overview of python standard library, Classes in python, inheritance, odds and ends, iterators, generators, generator expression.

10 HOURS

UNIT-III File Handling and Database programming
Writing and Reading Binary Data, Writing and Parsing Text Files, Writing and Parsing XML Files, Random Access Binary Files, DBM data bases, SQL databases.

10 HOURS

UNIT-IV Networking and Web programming
Sockets introduction, Creating a socket, using a socket, disconnecting, non-blocking sockets, CGI, Server client program using CGI, mod_python, FastCGI and SCGI, mod_wsgi, WSGI, MVC, Templates, Data persistence, Frameworks-Django, Turbogears, Zope, etc.

10 HOURS

UNIT-V Python Django Framework
Introduction to Django Web Framework, features of Django, Installing Django, MVC model, HTTP concepts, Views, URL Mapping, Creating Template Objects, Form validation and Error Messages, Form Display, Django Models, Model Fields, Model Inheritance, CRUD on DB, Session and Caching, Dynamic Webpages, Toggle Hidden Content.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA425
COURSE TITLE: PYTHON

SUGGESTED READINGS:

1. Mark Summerfield, "Programming in python 3: A Complete Introduction to Python Programming".
2. Mark Lutz, "Learning Python", O Reily, 4th Edition, 2009.
3. Brian K. Jones, "Python Cookbook".
4. Alex Martelli, "Python in a nutshell".
5. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", 2009.
6. Python online documentation: www. python.org/doc.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA426
COURSE TITLE: BIG DATA ANALYTICS USING R

Course Objectives& Learning Outcomes

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.
- To know about the research that requires the integration of large amounts of data.
- To work with big data tools and its analysis techniques.
- To analyze data by utilizing clustering and classification algorithms.

UNIT-I Introduction to Big Data

Evolution of Big data–Best Practices for Big data Analytics–Big data characteristics–Validating–The Promotion of the Value of Big Data–Big Data Use Cases- Characteristics of Big Data Applications–Perception and Quantification of Value -Understanding Big Data Storage–A General Overview of High-Performance Architecture–HDFS–MapReduce and YARN–Map Reduce Programming Model.

10 HOURS

UNIT-II Clustering and Classification

Advanced Analytical Theory and Methods: Overview of Clustering–K-means–Use Cases–Overview of the Method–Determining the Number of Clusters–Diagnostics–Reasons to Choose and Cautions.-Classification: Decision Trees–Overview of a Decision Tree–The General Algorithm–Decision Tree Algorithms–Evaluating a Decision Tree–Decision Trees in R–Naïve Bayes–Bayes‘ Theorem–Naïve Bayes Classifier.

10 HOURS

UNIT-III Association and Recommendation System

Advanced Analytical Theory and Methods: Association Rules–Overview–Apriori Algorithm–Evaluation of Candidate Rules–Applications of Association Rules–Finding Association& finding similarity–Recommendation System: Collaborative Recommendation- Content Based Recommendation–Knowledge Based Recommendation- Hybrid Recommendation Approaches.

10 HOURS

UNIT-IV Stream Theory

Introduction to Streams Concepts–Stream Data Model and Architecture–Stream Computing, Sampling Data in a Stream–Filtering Streams–Counting Distinct Elements in a Stream–Estimating moments–Counting oneness in a Window–Decaying Window–Real time Analytics Platform(RTAP) applications–Case Studies–Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

10 HOURS

UNIT-V NOSQL Data Management for Big Data and Visualization

NoSQL Databases: Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores-Document Stores–Tabular Stores–Object Data Stores–Graph Databases Hive–Sharding –- Hbase–Analyzing big data with twitter–Big data for E-Commerce Big data for blogs–Review of Basic Data Analytic Methods using R.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA426
COURSE TITLE: BIG DATA ANALYTICS USING R

Tools and Platforms: Hadoop

SUGGESTED READINGS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.
3. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
5. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
6. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers" CRC Press, 2015.
7. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with Map Reduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA427
COURSE TITLE: MACHINE LEARNING

Course Objectives & Learning Outcomes:

- To introduce students to state-of-the-art methods and modern programming tools for data analysis.
- To understand complexity of Machine Learning algorithms and their limitations.
- To understand modern notions in data analysis oriented computing.
- Student will be able of performing experiments in Machine Learning using real-world data.
- Student will be able to identify algorithmic aspects in machine learning and data mining tasks, evaluate correctness and efficiency of the used methods, and their applicability in each current situation.

Unit-I Machine Learning Basics
Introduction to Machine Learning, Types of machine Learning: supervised, unsupervised, semi supervised and reinforcement learning, Steps in the design of learning system, Training and testing, Cross Validation, Performance prediction parameters, Applications of machine learning.

10 HOURS

Unit-II Supervised Learning
Labelled data, Classification and its algorithms: Nearest Neighbour, Naive-Bayes classifier, Decision trees**,** Linear regression, Logistic regression, Support vector machines, Principal component analysis**.**

10 HOURS

Unit-III Unsupervised Learning
Unlabelled data, Clustering and its types, Partition clustering, Hierarchical Clustering, Fuzzy clustering, Density based clustering, Model based clustering, K-means clustering, Applications of Clustering.

10 HOURS

Unit-IV Artificial Neural Networks & Fuzzy Logic
Basic structure of ANNs, Activation functions, Learning Rules, Types of ANN: feed forward and feedback, applications of neural networks.
Fuzzy Logic: Introduction, Membership function, Operations on fuzzy Sets, Applications of fuzzy logic.

10 HOURS

Unit-V Reinforcement and Semi-supervised Learning
Introduction, Q learning, Temporal Difference Learning, Learning from Examples, Reward Hypothesis.
Genetic algorithm: Introduction, Steps involved in genetic algorithm, Applications of genetic algorithm. Introduction to Deep learning concepts.
Tools and Platforms: Introduction to WEKA and PYTHON.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA427
COURSE TITLE: MACHINE LEARNING

SUGGESTED READINGS:

1. Machine Learning, "A Probabilistic Perspective", MIT Press, 2012 by Kevin Murphy.
2. Christopher M. Bishop , "Pattern Recognition and Machine Learning", Springer, 2006.
3. Shai Shalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms".
4. Haykin, S. "Neural Networks and Learning Machines. Prentice Hall." New York (2008).
5. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", John Wiley & Sons, 2010.
6. Montgomery, D. C., and G. C. Runger, "Applied Statistics and Probability for Engineers", John Wiley & Sons, Sixth Edition, 2013.
7. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.
8. NPTEL lectures on Introduction to Machine Learning.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA428
COURSE TITLE: INTERNET OF THINGS

Course Objectives & Learning Outcomes

- To understand the basics of Internet of Things (IoT) and its application sectors.
- Understand M2M and Internet of Things.
- Understand and become proficient in Internet of Things platforms.
- Understand and apply Internet of Things T protocols appropriately.
- Design and develop Internet of Things based applications.

UNIT-I Introduction and Concepts of IOT

Introduction to IOT, definition and characteristics of IOT, Architecture of Internet of Things, Physical and logical design of IOT, IOT enabling technologies, IOT levels and deployment templates, Domain specific IOTs, home automation, cities, environment, Domain specific IOTs, Energy, retail, agriculture, industry, health and lifestyle

10 HOURS

UNIT-II IOT and M2M Communication

M2M, difference between IOT and M2M, ETSI M2M Architecture, system architecture, ETSI M2M SCL resource structure, Security in ETSI M2M framework, SDN and NFV for IOT, IOT system management, need for IOT system management, SNMP, Network operator requirements, NETCONF-YANG, IOT system management with NETCONF-YANG, IoT Design methodology-case study on IOT system for Weather Monitoring.

10 HOURS

UNIT-III IOT Platforms

Introduction to Hardware used for IoT: Microcontrollers, Microprocessors, SoC, Sensors 2 C, I 3 1 8. Introduction to Arduino, Pi, Spark, Intel Galileo etc.

10 HOURS

UNIT-IV IOT Technical Standards and Protocols

RF Protocols: RFID, NFC; IEEE 802. 15. 4: ZigBee, Z-WAVE, THREAD; Bluetooth Low Energy (BLE), IPv6 for Low Power and Lossy Networks (6LoWPAN) and Routing Protocol for Low power and lossy networks (RPL), CoAP, XMPP, Web Socket, AMQP, MQTT, WebRTC, PuSH, Architectural Considerations in Smart Object Networking.

10 HOURS

UNIT-V Developing Internet of Things

IoT platforms design methodology, IoT Physical devices and endpoints, IoT Systems: Logical design using Python, IoT physical servers and cloud offerings (Cloud computing for IoT).

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: May 2020, 2021, 2022

COURSE NO: MCA428
COURSE TITLE: INTERNET OF THINGS

SUGGESTED READINGS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things, A Hands-on Approach", University Press, First Edition 2015.
2. Oliver Hersent, David Boswarthick, Omar Elloumy, "The Internet of Things", First Edition, 2015.
3. Michael Miller, "The Internet of Things, How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are changing the World", Pearson, First edition, 2015.
4. https://thingsee.com/blog/quality-hardware-list-for-your-iot-projects.

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The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

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Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FOURTH SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: MCA490
PRACTICAL

Practical will be based on Numerical & Statistical Methods and Python/R.

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MCA-FIFTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2020, 2021, 2022	

COURSE NO: MCA504
COURSE TITLE: ARTIFICIAL INTELLIGENCE

Course Objectives & Learning Outcomes

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To use different machine learning techniques to design AI machine and enveloping applications for real world problems.

UNIT-I Introduction
Introduction to AI: History of AI, Basic Elements of AI, Introduction to Turing Machine, Turing Test and Rational Agent Approaches; State Space Representation of Problems, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.
Introduction to Expert system, Expert System Life Cycle, Study of existing expert systems like MYCIN and DENDRAL.

10 HOURS

UNIT-II Searching Techniques
Heuristic Search techniques-Hill Climbing, Best first search: OR graph, A* algorithm, Problem Reduction: AND-OR graph,
The AO* Algorithm. Constraint satisfaction: Introduction and algorithm.

10 HOURS

UNIT-III Knowledge Representation
Knowledge Representation Structures: Prepositional Logic, First Order Predicate Logic, CNF, DNF, Prenex Normal Form, Resolution, Unification, Inference Mechanisms Semantic Nets, Frames, Scripts, conceptual dependences, Procedural & Declarative knowledge, Reasoning, Uncertainty.

10 HOURS

UNIT–IV Multi Agent Systems and Genetic Algorithms
Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.
Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA.

10 HOURS

UNIT–V Understanding Natural Languages
Understanding Natural Languages: Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammar; grammar-freeanalyzers, sentence generation.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2020, 2021, 2022

COURSE NO: MCA504
COURSE TITLE: ARTIFICIAL INTELLIGENCE

SUGGESTED READINGS:

1. Kevin Knight, Elaine Rich, B. Nair, "Artificial Intelligence", McGraw Hill Education.
2. Charniak, E., "Introduction of Artificial Intelligence", Narosa Publishing House.
3. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Edition.
4. George F. Luger, "Artificial Intelligence", Pearson Education.
5. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.
6. Barrat, James, "Our final invention: Artificial intelligence and the end of the human era", Macmillan, 2013.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FIFTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2020, 2021, 2022	

COURSE NO: MCA511
COURSE TITLE: PRINCIPLES OF COMPILER DESIGN

Course Objectives & Learning Outcomes:

- To introduce principal structure of compiler, basic theories and methods used for different parts of compiler.
- To impart knowledge of fundamentals of language translator, structure of a typical compiler, parsing methods etc.
- To design various phases of compiler such as Lexical analyzer, parser etc.
- To distinguish different optimization techniques in the design of compiler.
- Students will be able to design and develop a comprehensive Compiler for a given language.

UNIT-I Compiler Structure & Lexical Analysis
Compiler Structure: Compilers and Translators, Analysis- Synthesis Model of Compilation, Various Phases of Compiler, Pass Structure, Bootstrapping & Compiler Construction Tools.
Lexical Analysis: Interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, Error Reporting, Regular definition, Transition diagrams, LEX.
Capabilities of Lexical Analyzer.

10 HOURS

UNIT-II Finite Automata
Finite Automata: Nondeterministic Finite Automata, Deterministic Finite Automata, Subset Construction, Thompson's construction, DFA State Minimization.
The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.

10 HOURS

UNIT-III Parsing
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Non-recursive Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers.
YACC, Syntax Directed Definitions, Type checking.

10 HOURS

UNIT-IV Memory Management & Intermediate Code Generation
Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.
Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.
Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2020, 2021, 2022

COURSE NO: MCA511
COURSE TITLE: PRINCIPLES OF COMPILER DESIGN

UNIT-V Code Optimization & Generation

Sources of optimization, Local optimization, Loop optimization, Peephole optimization
Issues in the design of Code Generator, Basic Blocks and Flow Graphs, Transformations on Basic Blocks, DAG, Code Generation Algorithm, Register Allocation and Assignment.

10 HOURS

SUGGESTED READINGS:

1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Publ. House.
2. A. V. Aho, R. Sethi and J. D Ullman, "Compiler: principle, Techniques and Tools", Addison Wesley.
3. Tremblay and Sorenson: "The theory and Practice of Compiler Writing", McGraw Hill, 1985.
4. Londan: "Compiler Construction", Thomson Learning.
5. H. I. Holub, "Compiler Design in C", Prentice Hall.
6. Appel, Andrew W., "Modern compiler implementation in C", Cambridge university press, 2004.
7. Louden, Kenneth C, "Compiler construction", Cengage Learning, 1997.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A

Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B

It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FIFTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2020, 2021, 2022	

COURSE NO: MCA518
COURSE TITLE: .NET Technology & C#

Course Objectives & Learning Outcomes:

- To develop correct, well-documented programs using the C# programming language; learn to develop object-oriented programs using C# classes and objects; learn to use Windows Forms and WPF to create GUI-based programs.
- To demonstrate how to design, code, compile, and execute business-oriented programs using the C# programming language commands.
- Students will be able to build web applications and validate form data using server-side validation controls
- Students will be able to create dynamic Web applications that interact with a database using server-side programming.

UNIT-I .NET Framework & C#
The. NET Framework: Introduction, Benefits, Components; C# program structure, Creating console application.
C# Language: Introduction, data types, value types, reference types, identifiers, variables, constants, literals, C# operators, expressions, control structures.

10 HOURS

UNIT-II C# Fundamentals and Object Oriented Concepts
Methods, Arrays, Strings, Structures, Enumerations, Generics, Classes and Objects, class and method modifiers, Inheritance, Polymorphism and Interfaces, Properties and Indexers, delegates and Events.

10 HOURS

UNIT-III Assemblies, Exceptions, Multithreading and Windows Applications
Namespaces, assemblies, Microsoft Intermediate Language (MSIL), Metadata, Attributes, Reflection, Exceptions, Multithreading, Building windows Application, working with C# controls, Event Handling, Graphics Device Interface (GDI).

10 HOURS

UNIT-IV File Handling and LINQ
Streams, Types of Stream, Standard I/O Streams − Console, Handling text in files, Dealing with Binary files, Binary Reader and Binary Writer, Serialization / Deserialization, Lambda Expressions, Anonymous Methods, Basic LINQ operations.

10 HOURS

UNIT-V ADO.NET and Database Connectivity
Introduction to ADO. NET, Major Components of ADO. NET, Establishing Database Connections, Connection objects, Command objects, Datasets, Data readers, Querying Databases, Data Grid Views, Data Validation.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2020, 2021, 2022

COURSE NO: MCA518
COURSE TITLE: .NET Technology & C#

SUGGESTED READINGS:

1. E Balagurusamy, "Programming in C#", Tata McGraw Hill, 3rd edition, 2010.
2. Mark Michaelis, "Essential C# 4. 0", Pearson Education, 3rd edition.
3. Ivor Horton, "Beginning Visual C++ 2008", wrox, 2008.
4. Herbert Schildt, "C# 4. 0-The Complete Reference", McGraw Hill Education, 2010.
5. Joseph Albahari& Ben Albahari, "C# 5. 0 in a Nutshell", O'Reilly, 2012.
6. Tim Patrick, "Microsoft ADO. NET 4 step by step", O'Reilly, 2010.
7. Hejlsberg, Anders, Scott Wiltamuth, and Peter Golde, "C# language specification", Addison-Wesley Longman Publishing Co., Inc., 2003.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A
Total of 10 short answer questions (2 from each Unit with internal choice) shall be set and the candidates are required to answer one question from each unit. Each question shall be of 7 marks.

(5x7 = 35 marks)

Section B
It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FIFTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2020, 2021, 2022	

COURSE NO: MCA516
COURSE TITLE: MOBILE TECHNOLOGIES

Course Objectives & Learning Outcomes:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking Infrastructure through a popular GSM protocol
- To understand the ad hoc networks and related concepts.
- Students will be able to develop new mobile application.

UNIT-I Basic of Mobile Technology & Smart Client

Mobile Devices -Definition, m-commerce, m-business, component of wireless environment, wireless communication, mobile device classification, Wireless Network -WPANS, WLAN, WWANS (1 G, 2G, 2. 5G, 3G).

Introduction to Mobile Communications and Computing, Mobile Computing, novel applications, limitations and architecture;

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, security in MANETs.

10 HOURS

UNIT-II Cellular Concept and Its Initial Implementations

The cellular concept, Multiple access technologies for cellular systems, Cellular system operation and planning (General principles, System Architecture, Location updating and call setup), Handoff and power control

Initial implementations of the cellular concept: The AMPS system, TACS system, NMT system, NTT system, Concluding remarks.

10 HOURS

UNIT-III Digital Cellular Mobile Systems

Introduction, GSM: The European TDMA digital cellular standard, GSM standardization and service aspects GSM reference architecture and function partitioning, GSM radio aspects, Security aspects, GSM protocol model, Typical call flow sequences in GSM, Evolutionary directions for GSM, Introduction to GPRS, Architecture and Services.

10 Hours

Unit-IV Mobile Data Communications and Protocols

Introduction, Circuit switched data on analog cellular networks, Circuit switched data on digital cellular networks, high speed Circuit switched data in GSM, Packet switched data services on cellular networks, Packet data in analog cellular networks, CDPD (cellular digital packet data), Packet data in digital cellular, Evolution of cellular mobile data capabilities: The EDGE concept, Data over lower power wireless or cordless telecommunication networks, Data services over DECT (Digital enhanced cordless telecommunications), Data services in PACS (Personal Access communications System).

Protocols and Platforms for Mobile Computing: WAP, Bluetooth. XML. J2ME. JavaCard. PaImOS, Windows CE. SymbianOS. Unux for Mobile Devices. Android.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2020, 2021, 2022

COURSE NO: MCA516
COURSE TITLE: MOBILE TECHNOLOGIES

UNIT-V Android Basic & Its components

Introduction to Android -History of android, The Open Handset Alliance, Android SDK installation, Android SDK & their codenames, Advantages of android, The Android O/S Architecture, Over view of IDE for Android application, AVD, launching and starting AVD (android virtual device) Managing Application Resources -What are resources, resource value types, storing different resource values types (string, string arrays, Boolean, colors, integer, animation, & menus)

Android Application Components- Activities & its life cycle, Services & its life cycle, Broadcast receiver, Content provider, Intents, shutting down component, Android Manifest File in detail, Use of Intent Filter.

10 HOURS

SUGGESTED READINGS:

1. Raj Kamal, "Mobile Computing", Oxford University Press-New Delhi, 2nd Edition.
2. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd Edition, 2004.
3. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002.
4. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML".
5. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional, 2005.
6. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, 2nd Edition, 2003.
7. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.
8. shane conder, Lauren darcey, "Android wireless application development", 2nd Edition, Addison – Welsey.
9. Rick rogers, John Lombardo, "Android Application Development", O'Reilly.
10. Reto Meier, "Professional Android 2 application development", Wrox.

NOTE FOR PAPER SETTERS

The question paper shall be divided into the two sections namely A and B with total weightage of 35 and 45 marks respectively with detail as under:

Section A

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(5x7 = 35 marks)

Section B

It shall contain five long answer questions (one from each Unit). The candidates shall be required to answer any three questions. Each question shall be of 15 marks.

(3x15 = 45 marks)

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MCA-FIFTH SEMESTER

Total Marks = 100	Theory Exam. = 80
No. of Credits = 4	Int. Assessment = 20
Duration of the Examination = 3 Hrs	
Examination to be held: December 2020, 2021, 2022	

COURSE NO: MCA519
COURSE TITLE: PHP

Course Objectives & Learning Outcomes:

- To understand the concepts of PHP and its advantages over other languages.
- To provide students with the skills and knowledge necessary to create dynamic database-driven websites using both PHP.
- To familiarize with PHP built-in functions and creating custom functions.
- To understand how to create sessions, modify and destroy cookies.
- Students will be able to test, debug and develop simple web application using server side PHP programming and Database Connectivity using MySQL.

UNIT-I PHP Basics
Introduction: XAMPP & WAMPP, Configure php. ini, PHP Syntax, data types, variables, Strings, Constants, Operators, Echo / Print, conditional statements, loops, user defined functions
Arrays, Date and Time, include/ include_once, require/require_once;PHP Form ;$_GET, $_POST, $_REQUEST, $_DELETE, File Upload.

10 HOURS

UNIT-II Session and Cookies
Session: introduction, Start a PHP session, session variables, modify and destroy session. Logins and passwords: Create a session, use a login to limit access to one or more pages.
Cookies: Start a PHP Cookies, Cookie variables, modify and destroy Cookie.
Error handling in PHP: -Displaying errors, warnings, types of errors, error levelsin PHP, logging Errors and ignoring errors.

10 HOURS

UNIT-III Working with Files and Directories
File system basics, understanding file permissions, setting file permissions, PHP permissions, accessing files, writing to files, deleting files, moving the file pointer, reading files, examining file details, working with directories, viewing directory content.

10 HOURS

UNIT-IV PHP MVC
Codeigniter: Models, views, controllers, installation, working with Simple Database Pgm file.
Laravel: Introduction, Installation, Directory Structure, URL Routing, Controller View, Passing Data in View, Print Variable, Build Master Layout, Include a File, Form Handling, Connecting Database, Validation Preserving the Data, File Uploading, Simple Crud Operation(CREATE, READ, UPDATE, DELETE, SEARCH).

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 Theory Exam. = 80
No. of Credits = 4 Int. Assessment = 20
Duration of the Examination = 3 Hrs
Examination to be held: December 2020, 2021, 2022

COURSE NO: MCA519
COURSE TITLE: PHP

UNIT-V Patterns and Sending Emails

Strings & Patterns: quoting, matching, extracting, searching, replacing, formatting, PCRE, NOWDOC, encodings.

Configuring PHP for email, Sending email with mail(), using headers, reviewing SMTP, using PHPMailer. Security: sanitizing data to prevent SQL Injection, buffer overflow, etc.

10 HOURS

SUGGESTED READINGS:

1. Ratschiller, Tobias, and Till Gerken, "Web application development with PHP 4. 0", New Riders, 2000.
2. Ware, Brent, " Open source development with LAMP: using Linux, Apache, MySQL and PHP", Addison-Wesley Longman Publishing Co., Inc., 2002.
3. Welling, Luke, and Laura Thomson, "PHP and MySQL Web development", Sams Publishing, 2003.
4. Sklar, David, and Adam Trachtenberg, "PHP cookbook", O'Reilly Media, Inc., 2006.
5. Popel, Dennis, "Learning PHP Data Objects", Packt Publishing Ltd, 2007.
6. Lerdorf, Rasmus, Kevin Tatroe, and Peter MacIntyre., "Programming Php", O'Reilly Media, Inc., 2006.

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(5x7 = 35 marks)

Section B

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(3x15 = 45 marks)

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MCA-FIFTH SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held : December 2020, 2021, 2022	

COURSE NO: MCA590
PRACTICAL

Practical will be based .NET and PHP/Mobile Technologies.

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MCA- SIXTH SEMESTER

COURSE NO: MCA601
PROJECT WORK

No. of Credits = 26
Examination to be held: May 2021, 2022, 2023

The scheme of evaluation regarding Project work shall be as follows:

The project in sixth semester shall carry 650 marks distributed as follows:

Project Component		Marks
Mid-Semester Presentation & Internal Evaluation		250
End-Semester Evaluation	Project Evaluation	250
	Project Viva-voce	150
	Total:	650

The student is required to take up project work of four to six months duration. The student will submit a synopsis at the beginning of the semester for approval from the department. The student will have to present the progress of the work through Mid-Semester Presentation after two months duration. The date of Mid-Semester Presentation will be communicated by the department and will be displayed on the departmental notice board. All the students are required to keep in touch with the respective supervisor allotted by the department. The evaluation of Mid-Semester presentation shall be internal, to be done at the departmental level.

End semester evaluation will be carried out by internal and external examiners. Each student shall carry out the project in the Department/Other Institution/Organization as approved by the Department under the supervision of a teacher assigned by the Department.

In case a student has failed to submit his project report by the date fixed by the department or his work is found unsatisfactory, he may be asked to take more time to work in such manner as may be decided by the Head. The result of such students shall be announced separately by the university.

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