



# Master of Computer Application

## MCA PROGRAMME

**Release Month & Year : June 2017**

# **Course Structure**

**1<sup>st</sup> Year 1<sup>st</sup> Semester:**

<b>A. THEORY</b>							
<b>SERIAL NO</b>	<b>PAPER CODE</b>	<b>PAPER NAME</b>	<b>CONTACTS (PERIODS/WEEK)</b>				<b>CREDITS</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>TOTAL</b>	
1	MCAP1101	Digital Logic Design	3	-	-	3	3
2	MCAP1102	Introduction to Programming	3	1	-	4	4
3	MCAP1103	Numerical and Statistical Techniques	3	1	-	4	4
4	MCAP1104	Discrete Mathematics	3	-	-	3	3
5	MCAP1105	Management Information System	3	-	-	3	3
6	HMTS1102	Business English	3	-	-	3	3
<b>Total of Theory</b>						<b>20</b>	<b>20</b>
<b>B. PRACTICAL</b>							
7	MCAP1111	Digital Logic Lab	-	-	4	4	3
8	MCAP1112	Programming Lab	-	-	4	4	3
9	HMTS1112	Language Practice Lab	-	-	4	4	3
<b>Total of Practical</b>						<b>12</b>	<b>9</b>
<b>Total of Semester</b>						<b>32</b>	<b>29</b>

**1<sup>st</sup> Year 2<sup>nd</sup> Semester:**

<b>A. THEORY</b>							
<b>SERIAL NO</b>	<b>PAPER CODE</b>	<b>PAPER NAME</b>	<b>CONTACTS (PERIODS/WEEK)</b>				<b>CREDITS</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>TOTAL</b>	
1	MCAP1201	Object Oriented Programming with Java	3	1	-	4	4
2	MCAP1202	Data Structures	3	1	-	4	4
3	MCAP1203	Database Management Systems I	3	1	-	4	4
4	MCAP1204	Optimization Techniques	3	-	-	3	3
5	MCAP1205	Computer Organization and Architecture	3	-	-	3	3
6	HMTS1201	Principles of Management and Accounting	3	-	-	3	3
<b>Total of Theory</b>						<b>21</b>	<b>21</b>
<b>B. PRACTICAL</b>							
7	MCAP1211	Object Oriented Programming Lab	-	-	4	4	3
8	MCAP1212	Data Structures Lab	-	-	4	4	3
9	MCAP1213	DBMS I Lab	-	-	4	4	3
<b>Total of Practical</b>						<b>12</b>	<b>9</b>
<b>Total of Semester</b>						<b>33</b>	<b>30</b>

**2<sup>nd</sup> Year 1<sup>st</sup> Semester:**

<b>A. THEORY</b>							
<b>SERIAL NO</b>	<b>PAPER CODE</b>	<b>PAPER NAME</b>	<b>CONTACTS (PERIODS/WEEK)</b>				<b>CREDITS</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>TOTAL</b>	
1	MCAP2101	Design and Analysis of Algorithms	3	1	-	4	4
2	MCAP2102	Data Communication & Computer Networks	3	1	-	4	4
3	MCAP2103	Database Management Systems II	3	1	-	4	4
4	MCAP2104	Operating Systems	3	1	-	4	4
5	CHEM2101	Environment and Ecology	3	-	-	3	3
<b>Total of Theory</b>						<b>19</b>	<b>19</b>
<b>B. PRACTICAL</b>							
6	MCAP2111	Algorithms Lab	-	-	4	4	3
7	MCAP2112	UNIX and Network Programming Lab	-	-	4	4	3
8	MCAP2113	DBMS II Lab	-	-	4	4	3
<b>Total of Practical</b>						<b>12</b>	<b>9</b>
<b>Total of Semester</b>						<b>31</b>	<b>28</b>

## 2<sup>nd</sup> Year 2<sup>nd</sup> Semester:

A. THEORY							
SERIAL NO	PAPER CODE	PAPER NAME	CONTACTS (PERIODS/WEEK)				CREDITS
			L	T	P	TOTAL	
1	MCAP2201	Software Engineering	3	1	-	4	4
2	MCAP2202	Web Technology	3	1	-	4	4
3	MCAP2203	Computer Graphics	3	1	-	4	4
4	MCAP2204	Intelligent Systems	3	1	-	4	4
5	HMTS2201	Professional Ethics	3	-	-	3	3
<b>Total of Theory</b>						<b>19</b>	<b>19</b>
B. PRACTICAL							
6	MCAP2211	Software Engineering Lab	-	-	4	4	3
7	MCAP2212	Web Technology Lab	-	-	4	4	3
8	MCAP2213	Graphics Lab	-	-	4	4	3
<b>Total of Practical</b>						<b>12</b>	<b>9</b>
C. SESSIONAL							
9	HMTS2221	Career Development and Management	-	-	3	3	2
<b>Total of Sessional</b>						<b>3</b>	<b>2</b>
<b>Total of Semester</b>						<b>34</b>	<b>30</b>

### 3<sup>rd</sup> Year 1<sup>st</sup> Semester:

A. THEORY							
SERIAL NO	PAPER CODE	PAPER NAME	CONTACTS (PERIODS/WEEK)				CREDITS
			L	T	P	TOTAL	
1	MCAP3150 to 3152	Elective I	3	1	-	4	4
2	MCAP3160 to 3162	Elective II	3	1	-	4	4
3	MCAP3170 to 3172	Elective III	3	1	-	4	4
4	MCAP3180 to 3183	Elective IV	3	1	-	4	4
<b>Total of Theory</b>						<b>16</b>	<b>16</b>
B. PRACTICAL							
5	MCAP3155 to 3157	Elective I Lab	-	-	4	4	3
<b>Total of Practical</b>						<b>4</b>	<b>3</b>
C. SESSIONAL							
6	MCAP3195	Minor Project and Seminar	-	-	12	12	10
<b>Total of Sessional</b>						<b>12</b>	<b>10</b>
<b>Total of Semester</b>						<b>32</b>	<b>29</b>

### Electives for 3<sup>rd</sup> Year 1<sup>st</sup> Semester:

ELECTIVE NO	COURSE CODE	TOPIC
Elective I	MCAP3150	System Administration using Linux
	MCAP3151	Advanced Java
	MCAP3152	Image Processing
Elective II	MCAP3160	Cryptography and Network Security
	MCAP3161	Theory of Computing
	MCAP3162	Big Data Analysis
Elective III	MCAP3170	Mobile Computing
	MCAP3171	Soft Computing
	MCAP3172	Data Mining and Data Warehousing
Elective IV	MCAP3180	Next Generation Networking
	MCAP3181	Parallel and Distributed Computing
	MCAP3182	Compiler Design
	MCAP3183	Ecommerce and ERP
Elective I Lab	MCAP3155	System Administration Lab
	MCAP3156	Advanced Java Lab
	MCAP3157	Image Processing Lab

### 3<sup>rd</sup> Year 2<sup>nd</sup> Semester:

A. SESSIONAL							
SERIAL NO	PAPER CODE	PAPER NAME	CONTACTS (PERIODS/WEEK)				CREDITS
			L	T	P	TOTAL	
1	MCAP3221	Comprehensive Viva	-	-	-	-	10
2	MCAP3295	Major Project and Seminar	-	-	-	-	20
<b>Total of Sessional</b>						-	<b>30</b>
<b>Total of Semester</b>						-	<b>30</b>

### Summary

Semester No.	Contact hr/wk	Credit
1	32	29
2	33	30
3	31	28
4	34	30
5	32	29
6	-	30
<b>Total</b>		176



# **Course Content**

**1<sup>st</sup> Year 1<sup>st</sup> Semester**

<b>Paper Name: DIGITAL LOGIC DESIGN</b>					
<b>Paper Code: MCAP1101</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [10L]**

#### ***Number System***

Data and number systems; Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBDIC, Gray codes and their conversions; Fixed point representation of fractional number. Signed binary number representation with 1's and 2's complement methods, Binary arithmetic.

### **Module II [10L]**

Logic gates- truth tables and circuits; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, Kmap method, Quine Mc Clusky's Method.

### **Module III [10L]**

#### ***Combinational Circuits and Memory***

Combinational circuits- Adder and Subtractor circuits; Applications and circuits of Encoder, Decoder, Multiplexer, De-Multiplexer and Parity Generator. Overview of Memory Systems. Design of combinational circuits-using ROM. Overview of Programming logic devices and gate arrays (PLAs and PLDs).

### **Module IV [10L]**

#### ***Sequential Circuits***

Sequential Circuits - Basic memory element - S-R, J-K, D and T flip flops; Registers and counters and their design, Irregular counter, State table and state transition diagram; Sequential circuits design methodology.

#### **Text Books:**

1. Digital Logic and Computer Design - M. Morris Mano, Pearson.
2. Digital Logic Design, Mansaf Alam-Bashir Alam, PHI.

#### **Reference Books:**

1. Digital Design: Basic Concepts and Principles - Mohammad A. Karim, CRC Press.
2. Digital Logic Design Principle - Bradley Carlson, Norman Balabanian, Wiley India.

<b>Paper Name: DIGITAL LOGIC LAB</b>					
<b>Paper Code: MCAP1111</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Problems related to

- Basic skills lab in using Personal Computer and common software tools
- Realization of Logic Gates
- Realization of Flip- Flop using logic gates
- Realization of Multiplexer
- Realization of Coder & Decoder
- Realization of Adder and Subtractor using logic gates

<b>Paper Name: INTRODUCTION TO PROGRAMMING</b>					
<b>Paper Code: MCAP1102</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

## **Module I [10L]**

### ***Introduction***

History of Computing, Evolution of Programming Languages, Compilers, Familiarization with UNIX.

### ***Problem Solving Method***

Algorithm, Flowchart, Problem-Solving Methodology- Tools, Pseudocode.

### ***Overview of C language***

C Standards, Structure of a C Program, C Libraries, Steps of Compilation of a C Program.

### ***Expressions***

Basic Data Types, Variables, Type Qualifiers, Storage Class Specifiers, Variable Scopes, Constants, Operators, Operator Precedence, Expression Evaluation, Type Conversion in Expressions, Type Casting.

### ***Console I/O***

Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O.

## **Module II [10L]**

### ***Control Statements***

Selection Statements (if, switch-case), Iteration Statements (for loop, while loop, do-while loop), Jumping Statements (return, goto, break, exit, continue).

### ***Function:***

Functions and Modular Programming, General Form, Function Prototypes, Library Functions, Parameter Passing Mechanisms, Storage Classes, Recursive function.

## **Module III [10L]**

### ***Arrays and Strings***

Single Dimension Arrays, Two Dimension Arrays, Multidimensional Arrays, Strings, Arrays of Strings, String Library Functions.

### ***Pointer***

Pointers and Memory Addressing. Pointer Variables, Pointer Arithmetic, Pointer Expressions, Pointers and Arrays, Functions and Pointers, Dynamic Memory Allocation, Command Line Arguments.

## **Module IV [10L]**

### ***Structures, Unions, Enumerations***

Structures, Arrays of Structures, Structure and Pointers, Unions, Bit Fields, Enumerations, typedef keyword.

### ***File I/O***

Concept of Files, File operations, Text Files and Binary Files.

### ***The Preprocessor***

Preprocessor Directives, Macros, File Inclusion.

#### **Text Books:**

1. Programming with C - Gottfried, TMH.
2. Programming in C - Balagurusamy, Tata McGraw Hill.

#### **Reference Books:**

1. C Programming Made Easy - Raja Ram, SCITECH.
2. The C Programming Language - Kernighan Ritchie, PHI.

<b>Subject Name: PROGRAMMING LAB</b>					
<b>Paper Code: MCAP1112</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Programs related to

- Control Structures
- Array (1-d, 2-d)
- Functions
- Dynamic Memory Allocation
- String Handling
- Structures, Union
- File Handling

<b>Paper Name: NUMERICAL AND STATISTICAL TECHNIQUES</b>					
<b>Paper Code: MCAP1103</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit points</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Probability***

Random Experiment, Sample Space, Random Events, Probability of Events, Probability of Non-disjoint Events (Theorems), Counting Techniques Applied to Probability Problems, Conditional Probability, Independent Events, Bayes' Theorem and Related Problems.

#### ***Random Variable and Probability Distribution***

Probability Mass Function, Probability Density Function and Distribution Function, Distributions: Binomial, Poisson and Normal Expectation and Variance, Moment Generating Function, Reproductive Property of Binomial, Poisson and Normal Distribution (proof not required), Chebychev's Inequality (statement) and Problems.

### **Module II [10L]**

#### ***Sampling and Estimation***

Population, Sample; Statistic, Estimation of Parameters (consistent and unbiased), Sampling Distribution of Sample Mean and Sample Variance (proof not required), Point Estimation. Overview of Testing of Hypothesis, Type I and Type II errors.

### **Module III [10L]**

#### ***Numerical Analysis and Errors***

Introduction, Sources of Errors, Significant Figures: Absolute, Relative and Percentage Errors.

#### ***Interpolation***

Introduction, Lagrange's Interpolation Formula, Divided Differences and Properties, Newton's Forward & Backward Interpolation Formula, Newton's Divided Difference Formula, Error in Difference Table, Problems and Solutions.

#### ***Numerical Differentiation and Integration***

Differentiation based on Newton's Forward and Backward Interpolation Formula. Trapezoidal Rule and Simpson's  $1/3^{\text{rd}}$  Rule, Errors in Numerical Integration Formulae, Problems and Solutions.

### **Module IV [10L]**

#### ***Solution of System of Linear Equations***

Introduction, Gauss Elimination Method and Gauss-Seidel Method, Problems and Solutions.

#### ***Solution of Algebraic and Transcendental Equation***

Introduction, Bisection Method, Regula-Falsi Method, Newton-Raphson Method, Problems and Solutions.

#### ***Solution of Ordinary Differential Equations***

Introduction, Euler's Method, Runge-Kutta Method (2nd and 4th order), Modified Euler's Method, Problems and Solutions.

**Text Books:**

1. Statistical Methods (Volume 1 and 2) – N. G. Das, TMH.
2. Introductory Numerical Analysis – Dutta and Jana, Shreedhar Prakashani.

**Reference Books:**

1. Mathematical Statistics – S.C. Gupta and V. K. Kapoor, S. Chand.
2. Engineering Mathematics: Volume IIIA – B. K. Pal & K. Das, U. N. Dhur & Sons Pvt. Ltd.
3. Numerical Analysis and Computational Procedures - S. Ali Mollah, Books & Allied Ltd.
4. Numerical Mathematical Analysis - James B. Scarborough, Oxford & Ibh.



<b>Paper Name: DISCRETE MATHEMATICS</b>					
<b>Paper Code: MCAP1104</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [10L]**

#### ***Abstract Algebra***

Overview of Discrete Mathematics, Set, Relations, Mappings, Poset, lattice, Hasse diagram, Vector Space.

#### ***Boolean algebra***

Definition of Boolean algebra, Boolean function Simplification.

#### ***Mathematical Logic***

Propositions, Connectives, Conditionals and Biconditionals, Well Formed Formulas (WFF), Tautologies, Equivalence formulas, duality law, Normal Forms, Predicate Calculus, free and bound variables.

### **Module II [10L]**

#### ***Permutation and Combination***

Concepts of Permutations and Combinations, Pigeon-hole principle, Euclidean algorithm for Linear Diophantine Equation, Basic Counting Concepts, problems, solutions.

#### ***Generating- function and Recurrence- relation***

Generating Function, Recurrence relations, Linear recurrence relations with constant Coefficients, Solution by Generating Function.

### **Module III [10L]**

#### ***Graph Theory***

Basic Concepts of Graphs, Trees, Forest, Adjacency and Incidence Matrices, Minimum Spanning Tree (Prim's and Kruskals Algm), Shortest Path (Dijkstra's Algm), Planar Graph. Various applications of Graph Theory in Computer Science.

### **Module IV [10L]**

#### ***Mathematical Computing***

Finite Automata, Finite Automata - Construction, DFA, NFA, State minimization, Mealy M/C, Moore M/C, problem and solution.

Definition Of Grammars – Unrestricted grammar, Context-sensitive grammar, Context-free grammar, Regular grammar.

#### **Text Books:**

1. Discrete Mathematics and Its Applications - K.H. Rosen, TMH.
2. Elements of Discrete Mathematics - C.L. Liu, McGraw-Hill.
3. Discrete Mathematical Structures - Kolman, Busby and Ross, PHI.

#### **Reference Books:**

1. Discrete Mathematics Theory, Problems and Solutions – Dipendra Nath Ghosh, Academic Publishers.
2. Graph Theory with Applications to Engineering and Computer Science - N. Deo, PHI.
3. Theory of Computer Science - K.L.P Mishra and N. Chandrasekaran, PHI.

<b>Paper Name: MANAGEMENT INFORMATION SYSTEM</b>					
<b>Paper Code: MCAP1105</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [10L]**

Introduction to systems and Basic systems concepts, Types of systems, The systems Approach, Information systems-Definition and characteristics, types of Information, role of Information in Decision Making.

Introduction to Information Analysis and Design Tools-Decision Tree, Decision Table, Structured Analysis, Dataflow Analysis, Data dictionary, Structured Flow Chart, HIPO, Warnier/ORR diagram

### **Module II [10L]**

An overview of Management Information System: Definition and Characteristics, Components of MIS, Hierarchy of Management Activity. Information requirements and Levels of Management, Model of decision making, structured Vs un-structured decisions, Formal vs Information systems

### **Module III [10L]**

Storage and retrieval of data -transaction processing, office automation and information processing, Virtual office system, control functions, Decision making process, phases in the decision making process, Intelligence and design phases, concepts of decision making, Behavioral models of the decision maker/decision making

### **Module IV [10L]**

Planning & implementation of Information Systems, Executive information Systems, Decision Support Systems, Expert Systems, Knowledge Based System. Introduction to Computer crime, Security & ethical challenges.

#### **Text Books:**

1. Management Information System - W.S.Jawadekar, TMH.
2. Management Information Systems - Loudon and Loudon, Pearson/Prentice Hall.
3. Analysis & Design of Information System - James A. Senn, McGraw Hill Education.

#### **Reference Books:**

1. Management Information Systems – Conceptual foundations, Structure and Development - Gordon B. Davis, Margrethe H. Olson.
2. Management Information System – Oz, Thomson Learning.
3. Management Information System - James O'Brien, TMH.
4. Information Systems: Foundation of E-Business - Steven Alter, Pearson Education.

<b>Paper Name: BUSINESS ENGLISH</b>					
<b>Paper Code: HMTS1102</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [10L]**

Communication Skill  
Definition, nature & attributes of Communication  
Process of Communication  
Models or Theories of Communication  
Types of Communication  
Levels or Channels of Communication  
Barriers to Communication

### **Module II [10L]**

Business Communication- Scope & Importance  
Writing Formal Business Letters  
Writing Reports  
Organizational Communication: Agenda & minutes of a meeting, notice, memo, circular  
Project Proposal  
Technical Report Writing  
Organizing e-mail messages  
E-mail etiquette  
Tips for e-mail effectiveness

### **Module III [10L]**

Language through Literature  
Modes of literary & non-literary expression  
Introduction to Fiction, (An Astrologer's Day by R.K. Narayan and Monkey's Paw by W.W. Jacobs), Drama (The Two Executioners by Fernando Arrabal) or (Lithuania by Rupert Brooke) & Poetry (Night of the Scorpion by Nissim Ezekiel and Palanquin Bearers by Sarojini Naidu)

### **Module IV [10L]**

Grammar in usage (nouns, verbs, adjectives, adverbs, tense, prepositions, voice change) -to be dealt with the help of the given texts.

#### **Text Books:**

1. Theories of Communication: A Short Introduction - Armand Matterlart and Michele Matterlart, Sage Publications Ltd.
2. Professional Writing Skills - Chan, Janis Fisher and Diane Lutovich. San Anselmo, CA:  
Advanced Communication Designs.
3. Business English - Hauppauge, Geffner, Andrew P., New York: Barron's Educational Series.

#### **Reference Books:**

1. Writing and Speaking at Work: A Practical Guide for Business Communication - Edward P. Bailey, Prentice-Hall.
2. Business and Administrative Communication - Kitty O. Locker, McGraw-Hill/ Irwin.
3. Intercultural Business Communication - Lillian Chaney and Jeanette Martin, Prentice Hall.

<b>Paper Name: LANGUAGE PRACTICE LAB</b>					
<b>Paper Code: HMTS1112</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

### **Module I**

Introduction to Linguistics  
 Phonetics-Vowel and Consonant Sounds (Identification & articulation)  
 Word- stress, Intonation (Falling and rising tone), Voice Modulation, Accent training  
 Conversational Skills

### **Module II**

Writing Skill  
 Writing Dialogue- (formal and informal)  
 Descriptive, narrative and expository writing  
 Writing with a purpose---Convincing skill, argumentative skill/negotiating Skill (These skills will be repeated in oral skills).  
 Writing reports/essays/articles—logical organization of thoughts  
 Job Application Letter  
 CV& Resume  
 Book review

### **Module III**

Major Areas of Formal, Verbal Communication  
 Interpersonal Speaking & Public Speaking  
 Group Discussion  
 Oral Presentation, both technical and general  
 Interview Techniques

## **1<sup>st</sup> Year 2<sup>nd</sup> Semester**

<b>Paper Name: OBJECT ORIENTED PROGRAMMING WITH JAVA</b>					
<b>Paper Code: MCAPI201</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Introduction to Object Oriented Programming***

Genesis of Object Oriented Programming. Problems with Procedural Programming, Object Oriented Concepts – Objects & Classes, Abstraction, Encapsulation, Message Passing, Access Specifier, Relationships, Aggregation, Links & Associations, Generalization & Specialization, Inheritance, Abstract Classes, Meta-Class, Grouping Constructs. Comparison of Procedural & OOP.

#### ***Introduction to Java***

Introduction and Overview, Virtual machines - concept and hierarchy of virtual machines. Basic Language Constructs, Arrays. String Class, String Methods, String Arrays, Command Line Arguments, StringBuffer Class, StringBuffer Methods.

### **Module II [10L]**

#### ***Classes and Objects***

Defining a Class, Creating Objects, Assigning Object Reference Variables, Introducing Methods, Array of Objects, Constructors, Method Overloading, Passing and Returning Objects, “this” Keyword, Static Members, Introducing Access Control, Inner and Nested Classes.

### **Module III [10L]**

#### ***Inheritance***

Inheritance and Code Reusability, Types of Inheritance, Dealing with “super”, Multilevel Inheritance, Method Overriding, “final” Keyword, Object Class, Abstract Classes.

#### ***Interface***

Defining Interfaces, Implementing Interfaces, Extending Interfaces, Interfaces and Multiple Inheritance.

#### ***Package***

Using Packages, Java API, User Defined Packages, Classpath, Access Control.

### **Module IV [10L]**

#### ***Exception Handling***

Exception and Exception Handling, Exception Types, Built-in Exceptions, “throw”, “throws”, “finally”, Creating User Defined Exceptions, Chained and Unchained Exceptions.

#### ***Multithreading***

Multitasking & Multithreading, Java and Multithreading, Creating Threads, Life Cycle of a Thread, Thread Methods, Thread Priorities, Synchronization and Deadlock.

#### ***Excerpts from java.util and java.lang***

Garbage Collection, String Tokenizer, Collections API.

**Text Books:**

1. JAVA: The Complete Reference – Herbert Schildt, TMH.
2. Core Java I and II – Horstmann and Cornell, Oracle Corporation.

**Reference Books:**

1. Object Oriented Modeling & Design -James R. RumBaugh, PHI.
2. The Java Programming Language – James Gosling, Addison Wesley.
3. Java – How to Program – Deitel and Deitel, PHI.
4. A Programmer’s Guide to Java SCJP Certification - Khalid A. Mughal and Rolf W. Rasmussen, Addison Wesley.

<b>Paper Name: OBJECT ORIENTED PROGRAMMING LAB</b>					
<b>Paper Code: MCAP1211</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Programs related to

- Language Features
- Arrays in Java and String Handling
- Classes and Objects
- Inheritance
- Interface and Package
- Exception Handling
- Multithreading
- java.util and java.lang
- Applet



<b>Paper Name: DATA STRUCTURES</b>					
<b>Paper Code: MCAP1202</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [8L]**

#### ***Introduction***

Concepts: Datatype and data structure, Abstract Data Type. Classification.

Algorithms concepts. Analysis: space and time analysis of algorithms – Big O,  $\Theta$ ,  $\Omega$  notations.

#### ***Array***

Different representations – row major, column major. Sparse matrix – its implementation and applications. Array representation of polynomials.

#### ***Linked List***

Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

### **Module II [8L]**

#### ***Stack and Queue***

Stack - implementation using array and linked list. Applications.

Queue, circular queue, deque - implementation using array and linked list. Applications.

#### ***Recursion***

Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi.

### **Module III [12L]**

#### ***Graphs***

Graph representations / storage – using adjacency matrix, adjacency list.

#### ***Trees***

Basic Terminologies, tree representation – using array and linked list. Binary trees: traversal (pre-, in-, post-, level- order). Threaded binary trees. Huffman trees. Heaps – implementation of priority queue. Binary Search trees, AVL tree (insertion, deletion with examples only), B-tree (insertion, deletion with examples only), Trie (insertion, deletion with examples only).

### **Module IV [12L]**

#### ***Searching***

Sequential, Binary. Complexity analysis and comparison.

#### ***Sorting***

Introduction – idea about internal and external sorting, in-place sorting, stability, adaptivity. Sorting algorithms - Bubble, Insertion, Selection, Shell, Quick, Merge, Heap, Radix. Complexity analysis (Average case analysis not required), and comparison.

#### ***Hashing***

Hash Functions. Collision resolution – open and closed hashing.

**Text Books:**

1. Classic Data Structures –Debasis Samanta, PHI Learning.
2. Data Structures and Program Design in C -Robert L Kruse, Bruce P. Leung, Pearson Education.
3. Data Structures using C -Aaron M Tenenbaum, Moshe J Augustein, Pearson Education.

**Reference Books:**

1. Data Structures -Seymour Lipshutz, McGraw Hill.
2. Fundamentals of Data Structures in C -Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed,Universities Press.

<b>Paper Name: DATA STRUCTURES LAB</b>					
<b>Paper Code: MCAP1212</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Programs related to

- 1-D and 2-D array
- Linked List (Singly linked list, Circular Linked List, Doubly Linked List)
- Stack and Queue implementation using array and linked list
- Implementation of different recursive algorithms
- Implementation of Binary Search Tree (insertion, deletion, searching, traversals)
- Different searching and sorting algorithms

<b>Paper Name: DATABASE MANAGEMENT SYSTEMS I</b>					
<b>Paper Code: MCAP1203</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Introduction to DBMS***

Basic Concepts of Operational Data, Data vs Information, Introduction to Database and DBMS, Importance of Database Design, Files and File Systems, Problems with File System Data Management, Database Systems, Views of Data, Three-Level Architecture, Instances and Schemas, Database Administrator, Database Users, Advantages and Disadvantages of DBMS.

#### ***Data Model***

Data Modeling and Data Models, Importance of Data Models, Data Model Basic Building Blocks, The Evolution of Data Models, Degree of Data Abstraction.

#### ***Entity-Relationship Modeling***

Entity and Entity Instances, Attributes, Entity Relationships, Cardinality of Relationships, Strong and Weak Entity, Generalization, Specialization, Aggregation, Developing an ER Diagram, Entity Integrity and Primary Key, Translating ER Model into Relational Model

### **Module II [10L]**

#### ***Relational Model***

A Logical View of Data, Keys, Integrity Rules, Relational Set Operators, Data Dictionary and the System Catalog, Relationships within the Relational Database, Data Redundancy Revisited, Indexes, Codd's Relational Database Rules.

#### ***Relational Database Design***

Functional Dependency (FD) –Definition, Trivial and Non-Trivial FD, Closure of Set of FD, Closure Of Attribute Sets, Irreducible Set of FD, Canonical Cover, Normalization – 1NF, 2NF, 3NF,BCNF, Decomposition using FD, Lossless Decomposition, Dependency Preservation.

### **Module III [10L]**

#### ***Relational Algebra***

Select Operation, Project Operation, Join Operation, Division Operation, Cross Product Operation, Set operations.

#### ***Relational Calculus***

Introduction, Tuple Relational Calculus, Operators used in TRC, Example queries using TRC, Domain Relational Calculus, Operators used in DRC, Example queries using DRC, Comparison of TRC, DRC, RA

#### ***Structured Query Language (SQL)***

Introduction to SQL, DDL, DML, DCL, Basic Structure, Basic Queries, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Assertions, Views, Joining Database Tables, Commit, Rollback.

## **Module IV [10L]**

### ***Advanced SQL***

Subqueries and Correlated Queries, SQL Built in Functions - Numeric, Date, String Functions, Updatable Views.

### ***Storage structure***

Sequential and indexed file organization, B+ tree - creation, insertion & deletion.

### ***Indexing***

Primary, Secondary & Multi Level.

### **Text Books:**

1. Database System Concepts - Korth, Silberschatz, S. Sudarshan, TMH.
2. Fundamentals of Database Systems - Elmsari and Navathe, Addison-Wesley.

### **Reference Books:**

1. An Introduction to Database Systems - Date C. J, Addison-Wesley.
2. SQL-PL/SQL - Ivan Bayross, BPB.

<b>Paper Name : DBMS I LAB</b>					
<b>Paper Code: MCAP1213</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Problems related to

1. Database Creation
  - Creating a Database
  - Creating a Table
  - Specifying Relational Data Types
  - Specifying Constraints
  - Creating Indexes
2. Table and Record Handling
  - INSERT statement
  - Using SELECT and INSERT together
  - DELETE, UPDATE, TRUNCATE statements
  - DROP, ALTER statements
3. Retrieving Data from a Database
  - The SELECT statement
  - Using the WHERE clause
  - Using Logical Operators in the WHERE clause
  - Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING
4. Clause
  - Using Aggregate Functions
  - Combining Tables Using JOINS
  - Subqueries
5. Database Management
  - Creating Views
  - Creating Column Aliases
  - Creating Database Users
  - Using GRANT and REVOKE

<b>Paper Name: OPTIMIZATION TECHNIQUES</b>					
<b>Paper Code: MCAP1204</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [10L]**

#### ***Introduction***

The nature of Optimization Techniques, History, Meaning, Models, Principles Problem solving with mathematical models, optimization process.

#### ***Linear Programming***

Basic LPP and applications, various components of LP problem formulation, Graphical Method, Simplex Method, Big-M method, Duality in linear programming.

#### ***Integer programming***

Concepts, Formulation, Solution and Applications (Branch & Bound method).

### **Module II [10L]**

#### ***Transportation Problem***

Formulation, Initial solution - North-West corner method, Least cost method, Vogel's approximation method (VAM). Optimal solution – Economic interpretation of  $u_i$ 's and  $v_j$ 's, MODI method, Properties of closed-loop. Unbalanced transportation problems, Degeneracy and its resolution, Alternate optimal solution, Prohibited transportation route. Maximization transportation problems.

#### ***Assignment Problem***

Formulation, Optimal solution - Hungarian method. Multiple optimal solution, Maximization problem, Unbalanced assignment problem, Restriction on assignment problem. Travelling salesman problem.

### **Module III [10L]**

#### ***Game theory***

Introduction, Decision making under risk, Decision making under uncertainty. Two person Zero Sum game (Pure Strategy and Mixed Strategy), Properties of a game, Maximin and Minimax principles, Method of solving game - Saddle point, Principle of dominance, Algebraic method, Graphical method, Linear Programming method.

#### ***Network Optimizations***

*PERT/ CPM* – Introduction, Significance of use, Network components and precedence relationship (AOA and AON diagram), Critical path analysis- Forward pass, Backward pass, Float(slack) of Activity and Event.

### **Module IV [10L]**

#### ***Queuing Theory***

Introduction, Basic definitions and notations, Structure of a Queuing system, Axiomatic derivation of the arrival & departure distributions for Poisson Queue, M/M/1 Queuing Model.

#### ***Sequencing Model***

Introduction, Notation, Terminology and Assumption. Processing of n jobs through two machines, Processing of n jobs through three machines, Processing of n jobs through m machines, Processing of two jobs through m machines.

**Text Books:**

1. Operations Research: Theory and Applications - J K Sharma, MacMillan.
2. Operation Research – Kanti Swarup, Gupta P K, Man Mohan, Sultan Chand & Sons.

**Reference Books:**

1. Operations Research: An Introduction - H. Taha, Prentice' Hall.
2. Operations Research - Hillier & Lieberman, TMH.



<b>Paper Name: COMPUTER ORGANIZATION AND ARCHITECTURE</b>					
<b>Paper Code: MCAPI205</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [12L]**

Introduction to basic structures and operational concepts, Instruction formats, Instruction execution, sequencing, Addressing modes Control unit – Concepts, Fetching and storing word from/in main memory, Register transfers, Operations, execution of a complete instruction, Hardwired control, Microprogrammed control.

### **Module II [8L]**

Fixed point Arithmetic - Arithmetic and logical operations of signed numbers and their implementation, Hardware Multiplier, Booths' multiplier, Booth pair multiplier, Binary Division restoring and non-restoring. IEEE-754 representation of floating point numbers, overflow and underflow.

### **Module III [10L]**

Memory – Basic concepts, RAM, ROM – different types, Characteristics, Memory design (Linear addressing, interleaved memory) Cache memories, Performance (memory interleaving, hit rate etc.), Memory hierarchy - virtual memory – address translation, Secondary memories Data transfer through programmed I/O, interrupt and DMA, I/O processors.

### **Module IV [10L]**

Input/output organization: memory mapped, standard (isolated) and linear selection techniques of I/O addressing.

Pipelining - arithmetic & instruction, speedup, vector processing, array processor, Introduction to RISC processor and parallel processing, Bit-Slice processors.

### **Text Books:**

1. Computer Organization – C. Hamacher, Z. Vranesik, S. Zaky, McGraw Hill.
2. Computer Architecture and Organization – John P. Hayes, McGraw Hill.

### **Reference Books:**

1. Computer System Architecture-Morris Mano, PHI.
2. Computer Organization and Architecture-Williams Stallings.

<b>Paper Name: PRINCIPLES OF MANAGEMENT AND ACCOUNTING</b>					
<b>Paper Code: HMTS1201</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [4L]**

#### ***Introduction to Business Management***

Basic concepts, Management Functions, Planning and decision making, scheduling, organizing, staffing, directing, controlling. Manager as Leader. Human Resource Planning, Human resource development and Organizational Development, Organizational Communication.

### **Module II [4L]**

#### ***Management for Organization***

Management control systems: goals, strategies, Managerial economics and financial management, productivity management. Strategic planning. Strategy: firm and its environment, strategies and resources, industry structure and analysis, corporate strategies and its evaluation, strategies for growth and diversification.

### **Module III [17L]**

#### ***Accounting Principles & Financial Accounting***

Meaning and Scope of accounting, Accounting Concepts, Principles and Conventions, Accounting Standards – concepts, objectives, benefits, Accounting Policies, basic accounting equation, Accounting as a measurement discipline – valuation principles, accounting estimates. Financial accounting, rules of debit and credit, financial statements and analysis, seven basic steps of the accounting cycle for a sole proprietorship and a merchandising business using subsidiary ledgers and special journals. Books of Accounts leading to the preparation of Trial Balance, Journalize entries for uncollectible receivables including the direct write-off method and the allowance method.

### **Module IV [15L]**

#### ***Overview of Management and Cost Accounting***

Conceptual framework of Management Accounting, Meaning, Scope, Objectives and limitation. Cost–Volume profit analysis: Concept of break-even point, Profit volume relation, Margin of safety, Angle of incidence, Break-even point chart, Break even analysis. Introduction to cost accounting, meaning, objectives and advantages of cost accounting.

#### **Text Books:**

1. Management: A Systems Approach - Koontz and O'Donnel, TMH.
2. Management: A Global Perspective - Wehrich and Koontz, TMH.
3. Financial Accounting - PC Tulsian, Pearson Education.
4. Management Accounting - I.M. Pande, VIKAS.

#### **Reference Books:**

1. Management Techniques: A Practical Guide - John Argenti.
2. Management Accounting - Khan & Jain, TMH.

## **2<sup>nd</sup> Year 1<sup>st</sup> Semester**

<b>Paper Name: DESIGN AND ANALYSIS OF ALGORITHMS</b>					
<b>Paper Code: MCAP2101</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Introduction***

Algorithm specification, performance analysis - time and space complexity, asymptotic notations, Master theorem, Correctness of algorithms.

#### ***Divide and Conquer***

General method, binary search, quick sort, merge sort, performance analysis; Strassen's matrix multiplication.

#### ***Lower Bound Theory***

Comparison tree, lower bound on comparison-based sorting, sorting in linear time, counting sort.

### **Module II [12L]**

#### ***The Greedy Method***

General method, fractional knapsack problem, job sequencing with deadlines, minimum cost spanning trees – Prim's and Kruskal's algorithms.

#### ***Dynamic Programming***

General method, Shortest path algorithms – Bellman Ford, Floyd Warshall, 0/1 knapsack problem, traveling salesman problem.

### **Module III [8L]**

#### ***Traversal and Search Techniques***

Breadth first search and traversal, depth first search and traversal, bidirectional search.

#### ***Pattern Matching***

Brute-force algorithm, Knuth-Morris-Pratt algorithm.

#### ***Backtracking***

General method, 8 queens problem, graph colouring.

### **Module IV [10L]**

#### ***Branch and Bound***

General method, least cost search, 15-puzzles problem.

#### ***Introduction to NP-completeness***

Basic concepts, the classes P, NP, NP-hard and NP-complete, Relative hardness of problems and polynomial time reductions. Satisfiability problem, Clique Decision Problem, Vertex Cover Problem.

#### ***Approximation Algorithms***

Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes, approximation algorithms for vertex cover, travelling salesman problem.

**Text Books:**

1. Introduction to Algorithms - Cormen et al, PHI Learning.
2. Fundamentals of Computer Algorithms - Horowitz, Sahni, Orient Longman.

**Reference Books:**

1. The Design and Analysis of Computer Algorithms - Aho, Hopcroft, Ullman, Pearson.
2. Algorithm Design - Kleinberg, Tardos, Pearson.
3. The Art of Computer Programming - Knuth, Pearson.

<b>Paper Name: ALGORITHMS LAB</b>					
<b>Paper Code: MCAP2111</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Programs related to

- (Divide and Conquer) Binary Search, Merge Sort, Quick Sort, finding maximum and minimum element from an array of integers
- (Greedy method) Minimum cost spanning trees by Prim's and Kruskal's algorithm, job sequencing with deadlines
- (Dynamic programming) single source shortest path – Bellman Ford, all pair shortest path – Floyd Warshall, traveling salesman problem
- (Graph traversal) BFS, DFS
- (Pattern matching) brute-force, KMP
- (Backtracking) 8 queens problem
- (Branch and Bound) 15 puzzles problem

<b>Paper Name: DATA COMMUNICATION &amp; COMPUTER NETWORKS</b>					
<b>Paper Code: MCAP2102</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I – Data Communication Fundamentals and Physical Layer [10L]**

#### ***Overview of Data Communication & Networking***

*Introduction:* Data Communication Systems, Networks, Protocols & Standards, The Internet

*Layered Tasks:* Utility of Layering, ISO/OSI Reference Model, TCP/IP Reference Model, Comparison between OSI and TCP/IP

*Connecting Devices:* Repeater, Hub, Bridge, Switch, Router, Gateway

*Switching:* Overview of – Circuit Switching, Message Switching, Packet Switching, Virtual Circuit Switching

#### ***Physical Layer***

*Signals:* Data & Signals, Data Rate Limits, Transmission Impairments

*Digital Transmission:* Line Coding, Sampling, Transmission Mode

*Analog Transmission:* Modulation of Digital Data, Modulation of Analog Signals

*Multiplexing:* FDM, TDM, WDM

*Transmission Media:* Guided Media, Unguided Media

### **Module II – Data Link Layer and MAC Sublayer [10L]**

#### ***Data Link Layer***

*Framing:* Character Stuffing, Bit Stuffing

*Error Detection & Correction:* Types of Error – Single Bit Error, Error Detection, Error Correction

*Flow Control:* Stop – And – Wait ARQ, Sliding Window Protocols

*Data Link Layer Protocols:* HDLC, PPP

#### ***Medium Access Sub layer***

*Random Access:* ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA

*Controlled Access:* Reservation, Polling, Token Passing

*LAN:* Ethernet (Traditional, Fast and Gigabit), FDDI, DQDB

### **Module III – Network and Transport Layer [10L]**

#### ***Network Layer***

*Internetworking, Addressing and Routing:* Internetworking, Addressing (Internet Address, Classful Addressing, Subnetting), Routing (Static and Dynamic Routing, Distance Vector Routing, Link State Routing)

*Network Layer Protocols:* ARP, RARP, IP, ICMP and IGMP, IPv6

*Network Monitoring and Management:* Concepts of Wireshark and SNMP

### **Module IV – Application Layer and Miscellaneous Topics [10L]**

#### ***Transport Layer***

*Process-to-Process Delivery, UDP, TCP:* Process to Process Delivery, User Datagram Protocol and Transmission Control Protocol

*Congestion Control & Quality of Service: Data Traffic, Congestion and Congestion Control, Quality of Service (QOS), Techniques to improve QOS – Leaky Bucket and Token Bucket Algorithms*

***Application Layer***

*Application layer protocols: DNS, Telnet, FTP, SMTP, HTTP, WWW*

*Introduction to Network Security*

**Text Books:**

1. Data Communications & Networking – B.A. Forouzan, TMH.
2. Computer Networks - Andrew S. Tanenbaum, Pearson Education.
3. Data and Computer Communication - William Stallings, PHI.

**Reference Books:**

1. High speed Networks and Internets - William Stallings, Pearson Education.
2. Cryptography and Network Security - William Stallings, PHI.
3. Computer Networking: A Top Down Approach - Kurose & Ross, Pearson Education.



<b>Paper Name: UNIX AND NETWORK PROGRAMMING LAB</b>					
<b>Paper Code: MCAP2112</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

***UNIX Fundamentals***

1. Basic UNIX Commands
2. Writing Shell Scripts

***Network Programming on the following (To be implemented in Java/C/C++)***

1. IPC: a) Pipes b) FIFO
2. File transfer using message queue form of IPC
3. TCP sockets (like date and time server & client, echo server & client, etc.)
4. UDP sockets (like simple DNS)
5. Raw sockets (like packet capturing and filtering)
6. Sliding window protocol and cyclic redundancy check
7. Routing protocols
8. Study of TCP/UDP performance
9. TCP client and server application to transfer file
10. UDP client and server application to transfer a file
11. RPC

***Testbed Development and Simulators***

1. Creating a LAN
2. Use of Network Simulators for Network Modeling (basic ideas/ demonstration only)

**Reference Books:**

1. Advance UNIX Programming - Richard Stevens, Pearson Education.
2. Advance UNIX Programming - N.B. Venkateswarlu, BS Publication.

<b>Paper Name: DATABASE MANAGEMENT SYSTEMS II</b>					
<b>Paper Code: MCAP2103</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Higher Normal Forms***

Overview of Lossless Join Decomposition and Dependency Preservation, Multi-valued Dependency and 4NF, Project-Join Decomposition and 5NF, domain-key and DKNF.

#### ***Transaction Processing***

Transaction Concept and State, Implementation of Atomicity and Durability.

#### ***Concurrency Control***

Executions, Serializability, Recoverability, Implementation of Isolation.

Concurrency Control Techniques: Lock based Protocols, Timestamp based Protocols, Validation based Protocols.

Multiple Granularity, Multiversion Schemes, Deadlock Handling.

### **Module II [10L]**

#### ***Recovery Management***

Failure Classification, Storage Structure, Recovery and Atomicity, Log-based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques.

#### ***Case Study: RDBMS Architecture***

Memory Structures, background processes, disk utilization structures, Starting and stopping the database instance, Creating a Database.

### **Module III [10L]**

#### ***Introduction to Procedural Language/Structured Query Language (PL/SQL)***

PL/SQL block structure, Variables, Control Structure and iteration, Implicit and Explicit Cursors, Stored procedures and functions, PL/SQL packages, Triggers, Locks.

### **Module IV [10L]**

#### ***Introduction to Embedded SQL***

Pro\*C syntax, Host variables, Static Vs. Dynamic SQL.

#### ***Introduction to Distributed Database Management System***

Distributed DBMS Architecture, Distributed Query Processing, Distributed Concurrency Control, Distributed DBMS Reliability, Parallel Database Systems.

#### ***Introduction to Temporal Database Management System***

Valid time and transaction time, Discrete bounded linear flow of time and the temporal structure, System-maintained transaction time, Temporal primary keys, Temporal queries at current time, Time points in the past or future or over durations.

### ***Introduction to Object-Oriented Database Management System***

Data types and Object, Evolution of Object Oriented Concepts, Characteristics of Object Oriented Data Model.

Object Hierarchies – Generalization, Specialization, Aggregation.

Object Schema. Inter-object Relationships, Similarities and difference between Object Oriented Database model and Other Data models.

### ***Concept of Grid, Cloud and Graph database.***

#### **Text Books:**

1. Database System Concepts – A.Silberschatz, Henry F. Korth, S. Sudarshan, TMH.
2. An Introduction to Database Systems - C.J. Date, Pearson.

#### **Reference Books:**

1. Fundamentals of Database Systems – Ramez Elmasri, Shamkant B. Navathe, Pearson.
2. Database Systems: The Complete Book - Jeffrey D. Ullman, Jennifer Widom, PHI.
3. Distributed Databases Principles and Systems - Ceri, Pelagatti, TMH.

<b>Paper Name: DBMS II LAB</b>					
<b>Paper Code: MCAP2113</b>					
<b>Contact hrs per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Problems on -

- **SQL**
  - Creation of a database objects with constraints. Deletion and modification of database objects.
  - Performing Insertion, Deletion, Modification, Alteration and Viewing records based on conditions.
  - Creation of Views, Synonyms, Sequence, Indexes, Save points.
- **PL/SQL overview**
  - Structure of PL/SQL block.
  - Using PL/SQL variables, taking user input and displaying the output.
  - PL/SQL Control structures(Conditional control, Iterative control, Sequential control)
  - Built-in PL/SQL functions
  - PL/SQL composite datatype (Tables, ROWTYPE)
  - Subprograms
    - Procedures
    - Functions
  - Cursor Management
    - Implicit Cursor
    - Explicit Cursor
    - Cursor for-loop
  - Database Triggers
  - Error Handling
  - Packages

**Reference Books:**

1. SQL, PL/SQL The Programming Language of Oracle – Ivan Bayross, BPB.

<b>Paper Name: OPERATING SYSTEMS</b>					
<b>Paper Code: MCAP2104</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [8L]**

#### ***Introduction***

Introduction to Operating Systems, Concept of batch-processing, single and multi-programming, single and multi-processing, multi-tasking, real time, distributed and parallel processing.

#### ***Process and Scheduling***

Concept of process, state diagram, process control block, Scheduling-short, medium and long term scheduling.

CPU Scheduling – criteria, types of scheduling, non-preemptive and preemptive scheduling algorithms like: First Come First Serve (FCFS), Shortest Job First/Next (SJF/N), Shortest Remaining Time Next (SRTN), Round Robin (RR), Highest Response Ratio Next (HRRN), Priority based scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

#### ***Threads***

Concept, process vs thread, kernel and user threads, multi-threading models.

### **Module II [12L]**

#### ***Inter-process Communication***

Shared memory approach, message passing, FIFO, concept of semaphore, critical region, monitor.

#### ***Process Synchronization***

Concepts, race condition, mutual exclusion, critical section problem and its solutions; synchronization tools - semaphore, semaphore with queue, monitor; discussion of synchronization problems like producer-consumer, readers-writers, dining philosophers, sleeping-barber.

### **Module III [10L]**

#### ***Deadlock***

Characterization, Prevention, avoidance, detection, recovery.

#### ***Memory Management***

Address space and address translation; memory partitioning - static and dynamic, different types of fragmentation, swapping, paging, segmentation, virtual memory concepts, demand paging, performance, page replacement algorithms – FIFO, LRU, Optimal page replacement, variants of LRU; frame allocation, thrashing, working set strategy.

### **Module IV [10L]**

#### ***Disk Management***

Disk structure, disk scheduling algorithms – FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK; disk formatting, boot block, bad blocks.

### ***File Systems***

File and operations on it, file organization and access; file allocation; directory structures, file allocation methods – contiguous, linked, indexed; free space management – bit vector, linked list, grouping.

### ***I/O Management***

I/O hardware, polling, interrupts, DMA, application I/O interface – block and character devices, network devices, clocks and timers, blocking and non-blocking I/O; kernel I/O subsystem – scheduling, buffering, caching, spooling, error handling.

### ***Protection and Security***

Concepts of domain, Access matrix and its implementation, access control. Security concepts, program threats, system threats, threat monitoring, cryptography as security tool, user authentication.

### **Text Books:**

1. Operating System Concepts - Silberschatz, Galvin, Gagne, Wiley.
2. Operating Systems Design and Implementation - Andrew S. Tanenbaum, Prentice Hall.

### **Reference Books:**

1. Operating Systems -Dietel, Dietel, Choffnes, Prentice Hall.
2. Operating Systems Internals and Design Principles - Stallings, Pearson.

<b>Paper Name: ENVIRONMENT &amp; ECOLOGY</b>					
<b>Paper Code: CHEM2101</b>					
<b>Contact hrs. per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

### **Module I [9L]**

#### ***Basic components of Environment & Ecology***

Basic ideas of environment and its component.

Mathematics of population growth: exponential and logistic and associated problems, definition of resource, types of resource, renewable, non-renewable, potentially renewable, Population pyramid and Sustainable Development.

General idea of ecology, ecosystem – components, types and function

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundarban); Food chain [definition and one example of each food chain], Food web.

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphorus, Sulphur.

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

### **Module II [9L]**

#### ***Air pollution and control***

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Acid rain: causes, effects and control. Earth's heat budget, carbon capture, carbon footprint

Lapse rate: Ambient lapse rate, adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Atmospheric dispersion, Maximum mixing depth

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN.

Smog: Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

### **Module III [9L]**

#### ***Water Pollution and Control***

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides

River/Lake/ground water pollution: River: DO, 5 day BOD test, Unseeded and Seeded BOD test, BOD reaction rate constants, COD.

Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds]

Water pollution due to the toxic chemicals effects: Lead, Mercury, Cadmium, Arsenic

### ***Noise Pollution***

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]. Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,  $L_{10}$  (18hr Index), effective perceived noise level.

Noise pollution control.

## **Module IV [9L]**

### ***Land Pollution***

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes, electronic waste

Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

### ***Social Issues, Health and Environment***

Environmental disasters: Bhopal gas tragedy, Chernobyl disaster, Three Mile Island disaster, cancer and environment: carcinogens, teratogens and mutagens (general aspect)

Environmental impact assessment, Environmental audit, Environmental laws and protection act of India.

Energy audit, Green building, Green sources of energy, Concept of Green Chemistry, Green catalyst, Green solvents (replacement of VOC)

### **Text Books:**

1. Introduction to Environmental Engineering and Science – G.M. Masters, Prentice-Hall of India Pvt. Ltd.
2. Environmental Chemistry – A.K. De, New Age International.
3. Environmental Chemistry with Green Chemistry - Asim K. Das, Books and Allied P. Ltd.

### **Reference Books:**

1. Environmental Science - S. C. Santra, New Central Book Agency P. Ltd.
2. Basic Environmental Engineering and Elementary Biology - GourKrishna Das Mahapatra, Vikas Publishing House P. Ltd.



## **2<sup>nd</sup> Year 2<sup>nd</sup> Semester**

<b>Paper Name: SOFTWARE ENGINEERING</b>					
<b>Paper Code: MCAP2201</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Introduction***

Introduction to software engineering, importance of software, the software evolution, software characteristics, software applications, software crisis: problem and causes.

#### ***Software Development Life Cycle***

Waterfall model, incremental and evolutionary process models, specialized Model – The Unified Process, agile process, and agile models.

#### ***Software Requirement Specification***

Problem analysis, requirement elicitation and validation, requirements modeling: scenarios, information and analysis classes, flow and behavioral modeling, documenting Software Requirement Specification (SRS).

### **Module II [8L]**

#### ***Software Cost Estimation***

Overview of software estimation – size, effort, duration and cost. Size estimation methods – Lines of Code (LOC) and Function Points (FP). Estimation of effort and duration based on size and productivity. Constructive Cost Model (COCOMO) – Basic, Intermediate, Detailed. COCOMO II.

#### ***System Design***

Design concepts, design models for architecture, component, data and user interfaces; Problem partitioning, abstraction, cohesiveness, coupling, top down and bottom up design approaches.

### **Module III [12L]**

#### ***Structured Analysis and Design***

Process model using Data Flow Diagram (DFD) with examples. Data dictionary, decision tree, decision table with examples. Data model using Entity Relationship Diagram (ERD) with examples.

#### ***Object Oriented Analysis and Design***

OOAD basic concepts, Unified Modeling Language (UML) – different types of diagrams for different views of system, User view – Use case diagram with examples, Structural views – Class diagram with examples, Behavioral View – sequence, collaboration, Activity and State Chart Diagrams with examples. Implementation view-Component diagram, Environmental view- Deployment diagram, Functional versus Object Oriented Approach.

#### ***Coding***

TOP-DOWN and BOTTOM-UP structure programming, information hiding, programming style, internal documentation, verification.

## **Module IV [10L]**

### ***Software Testing***

Levels of testing, functional testing, structural testing, test plan, test case specification, software testing strategies, verification & validation, unit and integration testing, Top Down and Bottom Up integration testing, Alpha & Beta Testing, White box and black box testing techniques, system testing and debugging.

### ***Software Maintenance***

Types of maintenance – Corrective, Preventive, Adaptive. Change management and maintenance process.

### ***Software Quality Assurance***

Software Configuration Management, overview of software quality control and quality assurance, ISO 9000 certification for software industry, SEI Capability Maturity Model (CMM) and comparison between ISO & SEI CMM.

Overview of technical metrics for software and CASE tool.

### **Text Books:**

1. Software Engineering: A Practitioner's Approach - Roger S. Pressman, TMH.
2. Fundamentals of Software Engineering – Rajib Mall, PHI.

### **Reference Books:**

1. Software Engineering - P. Fleeger, Prentice Hall.
2. Analysis and Design of Information System - J. A. Senn, Mc Graw Hill College.
3. Software Engineering - Sommerville, Addison Wesley.
4. Software Testing Tools - K. V. K. K Prasad, Dreamtech Press.

<b>Paper Name: SOFTWARE ENGINEERING LAB</b>					
<b>Paper Code: MCAP2211</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

Problems related to

1. Identifying requirements from problem statements
2. Estimation of project metrics
3. Modeling UML Use Case Diagrams and capturing Use Case scenarios
4. E-R modeling from the problem statements
5. Modeling Data Flow Diagrams
6. Identifying domain classes from the problem statements
7. Statechart and Activity Modeling
8. Modeling UML Class Diagrams and Sequence Diagrams
9. Estimation of Test Coverage Metrics and Structural Complexity
10. Designing test suites using tools

<b>Paper Name: WEB TECHNOLOGY</b>					
<b>Paper Code: MCAP2202</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

## **Module I [10L]**

### ***Introduction***

Internet Principles, concept of WWW, internet protocols and applications, web browser and web servers, features of Web 2.0

### ***Web Design***

Basic web concepts, Client/Server model, concepts of effective web design, web design issues including browser, display resolution, page layout and linking, user centric design, sitemap.

### ***Dynamic Web Pages***

The need of dynamic web pages; Comparative studies of different technologies of dynamic page creation.

### ***HTML***

Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, meta tags, character entities, frames and frame sets, browser architecture and web site structure. Overview and features of HTML5.

## **Module II [10L]**

### ***Style sheets***

Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

### ***Extensible Markup Language (XML)***

Introduction, tree, syntax, elements, attributes, validation, viewing. XHTML in brief.

### ***HTTP***

Message, request, response, methods, status codes.

## **Module III [10L]**

### ***JavaScript***

CGI concepts, data types, variables, operators, conditional statements, array object, date object, string object.

### ***PHP***

Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string processing and regular expressions, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP.

## **Module IV [10L]**

### ***PHP and MySQL***

Open Source Web server, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, updating and deleting data and tables, PHP myadmin and database bugs.

### ***Network security threats and techniques***

Threats: Malicious code, eavesdropping, spoofing, denial of service attacks. Techniques: VPN, password and authentication, firewall, proxies.

### **Text Books:**

1. Web Technologies – Uttam Roy, Oxford.
2. Learning PHP, MySQL & JavaScript: With JQuery, CSS & HTML5 – Robin Nixon, Shroff Publishers.

### **Reference Books:**

1. HTML & CSS: Design and Build Web Sites - Jon Duckett, John Wiley & Sons.
2. PHP 6 and MySQL 5 for Dynamic Web Sites - Larry Ullman, Peachpit Press.
3. Web Technologies (Black Book) -Kogent Learning Solutions Inc, Dreamtech Press.
4. Internet Technology & Web Design – Satish Jain, BPB Publications

<b>Paper Name: WEB TECHNOLOGY LAB</b>					
<b>Paper Code: MCAP2212</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

### **HTML**

1. Web page design using tables, frames, header, footer and menu.
2. Creating a form with support for redirection to other page(s).
3. Designing CSS with Bootstrap features to allow for responsive web content.

### **JAVASCRIPT**

1. Create dynamic web pages by modifying features of HTML tags.
2. Validate the fields of a form.
3. Create simple animations.

### **XML**

1. How to write a XML document.
2. How to validate XML document.

### **PHP**

1. Writing methods to implement GET and POST requests.
2. Implementing cookies and sessions.
3. Writing PHP and HTML in open source environment.

### **DATABASE CONNECTIVITY**

1. Connecting to database in web server.
2. Query processing to retrieve data from database and update tables.

<b>Paper Name: COMPUTER GRAPHICS</b>					
<b>Paper Code: MCAP2203</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

## **Module I [10L]**

### ***Introduction***

Basics of computer graphics, real world usage of computer graphics, classification of applications, display technologies, raster-scan systems, video controller, random-scan display processor, graphics input devices, graphics software and standard.

### ***Graphics Primitives***

Scan converting points.

Scan converting lines – DDA algorithm, Bresenham’s algorithm, Midpoint algorithm.

Scan converting circles – Midpoint algorithm.

Scan converting ellipse – Midpoint algorithm.

Fill area primitives–boundary-fill and flood-fill, scan-line polygon fill.

## **Module II [10L]**

### ***Affine Transformation (2D)***

2D translation, rotation and scaling, homogeneous coordinates and matrix representation, composite transformations, reflection and shearing.

### ***Viewing and Clipping***

Viewing pipeline and coordinates system, window-to-viewport transformation, point clipping.

Line clipping algorithms - Cohen-Sutherland, Midpoint subdivision, Cyrus-Beck algorithms.

Polygon clipping – Sutherland Hodgeman algorithm, Weiler Atherton algorithm.

## **Module III [10L]**

### ***3D Transformation and Viewing***

3D translation, rotation and scaling, composite transformations.

Projections - perspective and parallel projections, specifying an arbitrary 3D view.

### ***Curves and Surfaces***

Polygon surfaces, curved lines and surfaces, parametric cubic curves – Hermite curves, Bezier curves, Uniform Nonrational B-Splines, Nonuniform Nonrational B-Splines, comparisons of cubic curves, introduction to parametric bicubic surfaces.

## **Module IV [10L]**

### ***Visible Surface Detection***

Classification of visible surface detection algorithms, back face detection, z-Buffer algorithm, scan-line algorithms, area subdivision algorithm, octree algorithms, visible-surface ray tracing.

### ***Illumination and Shading***

Illumination methods (ambient, diffused and specular reflection), constant and interpolated shading methods (Gouraud, Phong).



**Text Books:**

1. Computer Graphics C Version - D. Hearn and P. Baker, Pearson Education.
2. Computer Graphics - Xiang and Plastock, Schaum Outline Series.

**Reference Books:**

1. Procedural Elements of Computer Graphics - Rogers, TMH.
2. Mathematical Elements for Computer Graphics - Rogers, TMH.
3. Computer Graphics - Andries van Dam, James D. Foley, John F. Hughes, Steven K. Feiner, Pearson Education.
4. Introduction to Computer Graphics & Multimedia – Mukhopadhyay and Chattopadhyay, Vikas Publishing House.

<b>Paper Name: GRAPHICS LAB</b>					
<b>Paper Code: MCAP2213</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>

The following set of experiments in this Lab will be conducted using C / OPENGL / JAVA in Windows / Linux Environment.

1. Implementation of algorithms for drawing 2D primitives –
  - Line (DDA, Bresenham, Midpoint)
  - Circle (Midpoint)
  - Ellipse (Midpoint).
2. Implementation of region filling algorithms – Boundary fill, flood fill.
3. 2D Geometric transformations –
  - Translation
  - Rotation
  - Scaling
  - Reflection
  - Shear
  - Composite 2D Transformations
4. Implementation of algorithms for line clipping –
  - Cohen-Sutherland
  - Midpoint subdivision
  - Cyrus-Beck
5. Drawing of curves – Cubic Bezier, B-Spline
6. Mini Project with animation

<b>Paper Name: INTELLIGENT SYSTEMS</b>					
<b>Paper Code: MCAP2204</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### **Module I [10L]**

#### ***Introduction***

Introduction to Intelligent Systems: concept, typical problems, practical impact, approaches and limits.

#### ***Intelligent Agents***

Definitions of a rational agent, reflex, model-based, goal-based, and utility-based agents, agent environment.

#### ***Problem Solving using Search -(Single agent)***

State space search, explicit & implicit state space; Uninformed Search- search strategies, search tree, Breadth First Search, Uniform-cost search, Depth First Search; Informed search strategies – introduction, Hill Climbing search, Best First Search, Simulated Annealing, Genetic Algorithm Search, A\* Search.

### **Module II [10L]**

#### ***Problem Solving using Search-(Two agents)***

Adversarial Search- and-or graph, AO\* search, two agent games – minmax & game trees, refining minmax, Alpha-Beta pruning.

#### ***Constraint satisfaction problems (CSP)***

Representation of CSP, solution of CSP, variable and value ordering, heuristic search in CSP.

#### ***Knowledge Representation and Logic (Propositional Logic)***

Knowledge representation and reasoning, inference, rules of inference, using inference rules to prove a Query/Goal/Theorem, soundness and completeness.

### **Module III [10L]**

#### ***Knowledge Representation and Logic (First Order Logic)***

First Order Logic, unification, semantics, soundness, completeness, consistency, satisfiability; Inference in First Order Logic – resolution, proof as search, proof strategies, non-monotonic reasoning.

#### ***Knowledge Representation and Logic (Rule based Systems)***

Rule Based Systems, Horn Clause Logic, Backward Chaining, Forward chaining, expert systems.

#### ***Other Representation Formalisms***

Knowledge representation formalisms, semantic networks, inference in semantic networks; frame, inference in frame; script, inference in script.

## Module IV [10L]

### ***Planning***

Introduction to planning, logic based planning, planning systems - representation of states and goals, representation of action; Planning algorithm - planning as search, Partial-Order planning, Plan-Space planning algorithms.

### ***Reasoning with Uncertainty (Probabilistic reasoning)***

Reasoning with uncertain information- Probabilistic reasoning, review of probability theory; Probabilistic inference rules; Bayesian Networks - semantics of Bayesian networks, learning of Bayesian Network parameters, inferencing in Bayesian Networks, approximate inferencing in Bayesian Networks.

### ***Reasoning with Uncertainty (Fuzzy Reasoning)***

Reasoning with uncertainty, the problem: Real-World Vagueness, Historic Fuzziness; Fuzzy Sets: Basic Concepts, operations on Fuzzy sets; Fuzzy reasoning - Fuzzy inferencing; applications.

### **Text Books:**

1. Introduction to Artificial Intelligence and Expert Systems - Dan W. Patterson, PHI.
2. Artificial Intelligence - A Modern Approach, S. Russell and P. Norvig, Pearson Education.

### **Reference Books:**

1. Artificial Intelligence - Elaine Rich and Kelvin Knight, TMH.
2. Artificial Intelligence and Soft Computing Behavioral and Cognitive Modeling of the Human Brain - Amit Konar, CRC Press.
3. Artificial Intelligence: A New Synthesis – N.J. Nilsson, Morgan Kaufmann.
4. Fundamentals of Artificial Intelligence and Expert Systems – V.S. Janakiraman, Macmillan.

<b>Paper Name: PROFESSIONAL ETHICS</b>					
<b>Paper Code: HMTS2201</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>

## **Module I**

### ***Human society and the Value System***

Values: definition, importance and application.

Formation of Values: The process of Socialization  
 Self and the integrated personality  
 Morality, courage, integrity

### ***Types of Values***

Social Values: Justice, Rule of Law, Democracy, Indian Constitution, Secularism

Aesthetic Values: Perception and appreciation of beauty

Organizational Values: Employee: Employer--- rights, relationships, obligations

Psychological Values: Integrated personality and mental health

Spiritual Values & their role in our everyday life

Value Spectrum for a Good Life, meaning of Good Life

### ***Value Crisis in Contemporary Society***

Value crisis at---

Individual Level

Societal Level

Cultural Level

Value Crisis management --- Strategies and Case Studies

## **Module II**

Ethics and Ethical Values

Principles and theories of ethics

Consequential and non-consequential ethics

Egotism, Utilitarianism, Kant's theory and other non-consequential perspectives

Ethics of care, justice and fairness, rights and duties

### ***Ethics***

Standardization

Codification

Acceptance

Application

### ***Types of Ethics***

Ethics of rights and Duties

Ethics of Responsibility

Ethics and Moral judgment

Ethics of care

Ethics of justice and fairness

Work ethics and quality of life at work

### ***Professional Ethics***

Ethics in Profession; moral issues and dilemmas, moral autonomy (types of inquiry)

Kohlberg's theory, Giligan's theory (consensus and controversy)

Code of Professional Ethics Sample Code of ethics  
Violation of Code of Ethics---conflict, causes and consequences  
Professionals as responsible social experimenters (computer ethics, weapons development)  
Professionals as managers, professionals as experts, witnesses and advisors, moral leadership  
Conflict between business demands and professional ideals  
Social and ethical responsibilities of technologies

### ***Whistle Blowing***

Facts, contexts, justifications and case studies

### ***Ethics and Industrial Law***

Institutionalizing Ethics: Relevance, Application, Digression and Consequences

## **Module III**

### ***Science and Technology***

Science, Technology as knowledge and profession  
---Definition, Nature, Social Function and Practical application of science  
Rapid Industrial Growth and its Consequences  
Renewable and Non- renewable Resources: Definition and varieties  
Energy Crisis  
Industry and Industrialization  
Man and Machine interaction  
Impact of assembly line and automation  
Technology assessment and Impact analysis  
Industrial hazards and safety  
Safety regulations and Safety responsibilities and rights  
Safety and risk, risk benefit analysis and reducing risk  
Technology Transfer: Definition and Types  
The Indian Context

## **Module IV**

### ***Environment and Eco- friendly Technology***

Human Development and Environment  
Ecological Ethics/Environment ethics  
Depletion of Natural Resources: Environmental degradation  
Pollution and Pollution Control  
Eco-friendly Technology: Implementation, impact and assessment  
Sustainable Development: Definition and Concept  
Strategies for sustainable development  
Sustainable Development--- The Modern Trends

Appropriate technology movement by Schumacher and later development Reports of Club of Rome.

### **Suggested Readings:**

1. Human Values – A.N. Tripathi, New Age International, New Delhi.
2. Classical Sociological Theory – G. Ritzer, The McGraw Hill Companies, New York.
3. Postmodern Perspectives on Indian Society - S. L. Doshi, Rawat Publications, New Delhi.
4. Sustainable Development – D.K. Bhatnagar, Cyber Tech Publications, New Delhi.
5. The age of Spiritual Machines – R. Kurzwell, Penguin Books, New Delhi.
6. Social Problems in Modern Urban Society – S.K. Weinberg, Prentice Hall Inc.,USA.
7. Sociology - Giddens, Anthony, London: Polity Press.

<b>Paper Name: CAREER DEVELOPMENT AND MANAGEMENT</b>					
<b>Paper Code: HMTS2221</b>					
<b>Contact hrs. per week:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Point</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>2</b>

### **Module I - Professional Growth**

- Self Growth: Anger, stress and time management - Theories and application, SWOT analysis.
- Growth and Environment: Impression management, Cross-cultural communication, Employability quotient
- Skill identification and Skill up gradation- (generic and specific), Local and global skills, Knowledge sources such as MOOC, NPTEL
- Career Planning- Skill mapping to job profile, Basic and add-on qualifications, Career growth, Self-appraisal, Lifelong learning

Assessment - Activity (20 marks)

### **Module II - Entrepreneurship**

- The start-up ecosystem in India- Why entrepreneurship? Indian tech start-up landscape, Stand-up India policies, funding agencies, market development, trends and best practices
- E-Commerce- India as a growing E-commerce market, Possibilities of growth, funding, niche retailers
- Make in India- New processes, Investments, Focus sectors, Makers of Make In India, Opportunities, Policies

Assessment- Project (30 marks)

### **Module III - Industry specific opportunities**

- Industry prospects in India and Beyond
- Industry-specific job opportunities
- Research & Development
- Other opportunities

Assessment---Presentation (30 marks)

### **Module IV - Working and living happily**

- Managing crisis- Organisational and personal crisis, Analysing crisis, Turnaround strategies, Learning from crisis as opportunity
- Work-life balance- Performance-expectation management, Personal and professional goal- mapping
- Understanding happiness- Components, Conflicts, Happiness Index

Assessment: Activity/case (20 marks)

**Suggested Readings:**

1. Basic Managerial Skill for All - E. H. McGrath.SJ, PHI, New Delhi.
2. The Start-up Equation by Steven Fisher and Jae - Nae Duane, Mc Graw Hill Education (India) Pvt. Ltd. New Delhi.
3. Live Happily, Work Happily - Siddhartha Ganguli, Allied Publishers Pvt. Ltd. New Delhi.
4. Crisis Management: Planning for the Inevitable - Steven Fink, iUniverse Inc.USA.
5. Influencer: The New Science of Leading Change - Joseph Grenny & Kerey Patterson, McGraw Hill Education , USA.