

DEPARTMENT OF COMPUTER APPLICATIONS



**Scheme and Syllabus
MCA
(Semester I – IV)**

Session w.e.f. 2020-2021

FACULTY OF INFORMATICS AND COMPUTING

**J.C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY,
YMCA, FARIDABAD**

VISION

“YMCA University of Science and Technology aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building.

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

DEPARTMENT OF COMPUTER APPLICATIONS

VISION

The department aims to make a place at both national and international level by producing high quality ethically rich computer engineers and IT professionals conversant with the state-of-the-art technology with the ability to adapt the upcoming challenges in information technology and their Applications to cater to the ever changing industrial and societal needs. It endeavours to establish itself as a centre of excellence in teaching and research to produce skilled human resources for sustainable nation's growth and having technological impact on the people's life.

MISSION

- To provide the future leaders in the area of computer Applications and information technology through the development of human intellectual potential to its fullest extent.
- To enable the students to acquire globally competence through problem solving skills and exposure to latest developments in area of computer Applications and information technologies.
- To educate the students about their professional and ethical responsibilities.

ABOUT THE PROGRAM

The Master of Computer Applications (MCA) program has a strong flavour on design and hands-on experience. The program aims at imparting computer science background to students by developing a strong base and depth of knowledge in various subjects. The scheme, number of courses, contents of courses is all designed to cater the requirement of industry and research. The curriculum includes various core computer science courses, skilled enhancements courses and advanced computer courses. Besides the theoretical and laboratory based computer specific curriculum, students are also introduced to audit courses that include personality development courses, language specific enhancement courses, yoga and physical education courses etc. for their all-round development. In order to give exposure of real world projects, one complete semester is dedicated to industrial training and project.

This degree provides a solid foundation in core Computer Applications disciplines, critical thinking and problem-solving skills. Through the academic program, students also develop excellent written and oral communication skills, learn to work as a team which is necessary for good project management.

DEPARTMENT OF COMPUTER APPLICATIONS

MCA PROGRAMME

PROGRAMME EDUCATION OBJECTIVES

PEO1	To solidify foundation of computer science and problem solving methodology for effective implementation in the area of software development.
PEO2	To impart advance knowledge about various sub-domains related to the field of computer science and Applications
PEO3	To acquaint students about principles of system analysis, design, development and project management.
PEO4	To inculcate effective communication skills combined with professional & ethical attitude.

PROGRAMME OUTCOMES

PO1	Apply the knowledge of Computer science and engineering fundamentals and specialization to give the solution of complex engineering problems.
PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need

	for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PO13	To develop industrial strength with skills to utilize modern computer technologies and models for developing customized solutions for small to big size Enterprises.
PO14	To prepare computer professionals who can identify and give cost effective software solutions which will not only contribute in the sustainable growth of the nation but also impact the lives of downtrodden and economically less developed citizens.

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA FARIDABAD
CHOICE BASED CREDIT SYSTEM SCHEME
FOR MCA 2 YEARS PROGRAMME
SEMESTER I-IV (2020-2021)

SYNOPSIS OF SCHEME OF STUDIES & EXAMINATIONS

Total Credits: 103 + 4 credits(MOOC)

Total Theory Subjects: 15

Total Labsexcluding Seminars, Projects and MOOC course:11

Minor Project : 01

Industrial Training : 01 (one complete semester)

Total Teaching Load (in Hours) semester-wise:

Semester	Lectures	Tutorials	Practical	Seminar	Project	Total
I	22	0	16	2	-	40
II	225	0	16	-	-	41
III	20	0	12	2	2	36
IV	-	-	-	-	24	

Total Marks:

Sessional	End Term	Total
955+50(Audit Course)+ Marks of OEC	1745+150(Audit Course)+ Marks of OEC	2700+200 (Audit Course)+ Marks of OEC

Itemized Break-up:

	No.	Hours in week	Marks	Credits	Total credits of Theory and labs etc
Theory Subjects	15	4	1500	60	63
Open Elective Corse (OEC)	1	3	*	3	
Labs	11	4	550	22	44
Seminar	2	2	100	4	
Projects	1	2	50	2	
Industrial Training	1	24	500	12	
MOOC	1	4		4	
Audit Course	2	4	200	-	
Total			2700+ Marksof MOOC and OEC	103 + 4	

* Paper code, Internal, External and Total Marks will be as per the scheme of course from where Open Elective is opted.

CHOICE BASED CREDIT SYSTEM SCHEME

Program Core Courses (PCC): Theory			
Sr. N.	Name the Subject	No. of Lectures / Tutorial	No. of Credits
1	Data Structures	4	4
2	Computer Networks	4	4
3	Data Base Management Systems	4	4
4	Object Oriented Programming using C++	4	4
5	Operating System	4	4
6	Analysis & Design of Algorithms	4	4
7	Artificial Intelligence and Machine Learning	4	4
8	Software Engineering	4	4
9	JAVA Programming	4	4
10	Cloud Computing	4	4
11	Big Data	4	4
12	.Net Technology	4	4
13	Soft Computing	4	4
14	Elective 1	4	4
15	Elective 2	4	4
Total Credits			60

Skill Enhancement Courses(SEC) :Labs			
Sr. No.	Name the Lab	No. of contact hours	No. of Credits
1	Data Structures lab using C/C++	4	2
2	DBMS Lab	4	2
3	OOPS Lab	4	2
4	Operating System & Unix Lab	4	2
5	ADA Lab	4	2
6	Artificial intelligence and Machine Learning LAB using Python	4	2
7	Software Engineering LAB	4	2
8	JAVA LAB	4	2
9	Hadoop LAB	4	2
10	.Net Lab	4	2
11	Soft Computing LAB	4	2
Total credits			22

Skill Enhancement Course (SEC) :Seminars and Projects			
Sr. No.	Name the Lab	No. of contact hours	No. of Credits
1	Seminar (Semester I)	2	2
	Seminar (Semester III)	2	2
1	Minor Project (Semester III)	2	2
2	Major Project (Industrial training)	24	12

Discipline Specific Elective (DSE)			
Sr. No.	Name the Subject	No. of contact hours	No. of Credits
DSE Group I	Theory of Computation	4	4
	Natural Language Processing	4	4
	Distributed Operating Systems	4	4
	Data warehousing & Data Mining	4	4
	Software Project Management.	4	4
	Web Technology And Information Retrieval	4	4
DSE Group II	Advanced Wireless and Mobile Networks	4	4
	Network Security.	4	4
	Mobile Computing.	4	4
	Digital Image Processing.	4	4
	Open Source Technology	4	4
	High Speed Networks	4	4

MOOC Course: One MOOC Subject to be qualified in any semester of MCA programme.

Paper Code	Course	Course Requirements (Hrs)	Credits	University Exams	Internal Assessments	Total	Course Type
-----	MOOC*	4	4				

* The MOOC subject can be qualified at any time during the duration of the Programme (that is from semester first to four) through Swayam platform (UGC) and the duration of the course should be equal or more than 12 weeks.

Open Elective Course(Courses offered Department of Computer Applications)

Sr. No	Code	Name the Subject
1	MCA-107-V	Object Oriented Programming using C++
2	MCA-104-V	Artificial Intelligence and Machine Learning
3	MCA-201-V	Big Data
4	MCA-205-V	Soft Computing

Note: 1. These courses are offered by Department running Master of Computer Applications programme for the students of other disciplines/department. Similarly the students of Master of Computer Applications (MCA) may, generally, take any Open Elective courses (as per the MCA scheme) offered by other disciplines/department.

2. In case non-availability of the discipline/department who can offer open elective, the Department or Institution may teach a suitable course (from courses offered by UTDs) to the students provided the course taught under open elective should not be covered by Core and Elective subjects of the programme under consideration.

Mandatory Audit Course(MAC) (Mandatory to Qualify)

Sr. No	Code	Name the Subject	No. of contact hours
1.	AEC-307-V	German-1	2
2.	AEC-308-V	German-2 (With German-1 as prerequisite)	2
3.	AEC-309-V	French-1	2
4	AEC-310-V	French-2(With French-1 as prerequisite)	2
5	AEC-104-V	Sanskrit-1	2
6	AEC-312-V	Sanskrit-2(With Sanskrit-1 as prerequisite)	2
7	AEC-303-V	Personality Development	2
8	AEC-313-V	Interview and Group discussion skills	2
9	AEC-117-V	Yoga and Meditation	2
10	AEC-314-V	Art of living/Life Skills	2

11	VAC-307-V	Contribution of NSS towards nation/ Role of NSS	2
12	AEC-316-V	Physical Education	2

Note: For MOOC and Audit courses the central policy of the University will be followed and accordingly the credit will be transferred for MOOC course

Grading Scheme and Percentage calculation: Grading scheme will be as per the current University grading scheme and Percentage calculation= CGPA * 9.5

Bridge Course:

As per AICTE guidelines the university has to conduct bridge course for non-computer background students having qualifications like B.A, B.com etc. The duration of the bridge course will be of 3 weeks and the following subjects will be taught:

Bridge Course Subjects (Mandatory to Qualify)				
Sr. No	Code	Name the Subject	No. of contact hours/week	Total Marks (Internal Only)
				30(Exam)+20(Viva)
1.	BRI- 01	Mathematical Foundation of Computer Science.	4	50
2.	BRI- 02	Introduction to Programming Languages	4	50
3.	BRI- 03	Fundamentals of Computer System, Internet & Web	4	50
4	BRI- 04	Introduction to Web Technologies	4	50
5	BRI- 05	Programming LAB	2	50
6	BRI- 06	Web technologies LAB	2	50

Note: All the subjects mentioned above for bridge course will be of qualifying nature and there will be no credits for the same.

MCA First Year (Semester I)

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lecture/P practical	Tutorial					
MCA-101-V	Data Structures	4		4	75	25	100	PCC
MCA-103-V	Computer Networks	4		4	75	25	100	
MCA-105-V	Data Base Management Systems	4		4	75	25	100	
MCA-107-V	Object Oriented Programming using C++	4		4	75	25	100	
MCA-109-V	Operating System	4		4	75	25	100	
MCA-111-V	Data Structures lab using C/C++	4		2	35	15	50	SEC
MCA-113-V	DBMS Lab	4		2	35	15	50	
MCA-115-V	OOPS Lab	4		2	35	15	50	
MCA-117-V	Operating System Lab	4		2	35	15	50	
MCA-119-V	Seminar	2		2		50	50	
Mentioned above	Audit Course	2		-	75	25	100	MAC
	Total	40		30	590	235	850	

MCA First Year (Semester II)

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lecture	Tutorial /Practica 1					
MCA-102-V	Analysis & Design Of Algorithms	4		4	75	25	100	PCC
MCA-104-V	Artificial Intelligence and Machine Learning	4		4	75	25	100	
MCA-106-V	Software Engineering	4		4	75	25	100	
MCA-108-V	JAVA Programming	4		4	75	25	100	
MCA-110-V	Cloud Computing	4		4	75	25	100	
MCA-112-V	ADA LAB	4		2	35	15	50	SEC
MCA-114-V	AI andML Lab Using Python	4		2	35	15	50	
MCA-116-V	Software Engineering LAB	4		2	35	15	50	
MCA-118-V	JAVA LAB	4		2	35	15	50	
Mentioned above	Audit Course	2		-	75	25	100	MAC
*	Open Elective	3		3	*	*	*	OEC
	Total	41		31	590 + Marks of OEC	210+ Marks of OEC	800 + Marks of OEC	

* Paper code, Internal, External and Total Marks will be as per the scheme of course from where Open Elective is opted.

MCA Second Year (Semester – III)

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lecture /Practical	Tutorial					
MCA-201-V	Big Data	4		4	75	25	100	PCC
MCA-203-V	.Net Technology	4		4	75	25	100	
MCA-205-V	Soft Computing	4		4	75	25	100	
	Elective1(Chosen from list of electives)	4		4	75	25	100	
	Elective 2 (Chosen from list of electives)	4		4	75	25	100	
MCA-207-V	Hadoop LAB	4		2	35	15	50	SEC
MCA-209-V	Dot Net programming using C# and / or VB. Net	4		2	35	15	50	
MCA-211-V	Soft Computing LAB	4		2	35	15	50	
MCA-213-V	Minor Project	2		2	35	15	50	
MCA-215-V	Seminar	2		2		50	50	
	Total	36		30	515	235	750	

ELECTIVE I

1. **MCA-221-V : Theory of Computation**
2. **MCA-222-V : Natural Language Processing**
3. **MCA-223-V : Distributed Operating Systems**
4. **MCA-224-V : Data Warehousing & Data Mining**
5. **MCA-225-V : Software Project Management**
6. **MCA-226-V : Web Technology And Information Retrieval**

ELECTIVE II

1. **MCA-231-V : Advanced Wireless and Mobile Networks**
2. **MCA-232-V : Network Security**

3. MCA-233-V : Mobile Computing.
4. MCA-234-V : Digital Image Processing.
5. MCA-235-V : Open Source Technology
6. MCA-236-V : High Speed Networks

MCA Second Year (Semester – IV)

Paper Code	Course	Course Requirements (Hrs)	Credits	University Exams	Internal Assessments	Total	Course Type
MCA-202-V	Major Project	24	12	200	300	500	SEC

Procedure for Annual Examination and continuous Assessment of:

(A) Annual Exams Marks

1. Project Evaluation	50 Marks
2. Project Seminar	50 Marks
3. Project Viva	100 Marks

(B) Continuous Assessment Marks

1. Assessment by Institute Faculty	100 Marks
2. Assessment by Industrial Guide	150 Marks
3. Conduct Marks	50 Marks

TOTAL	500 Marks
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MASTER OF COMPUTER APPLICATIONS

CODE: MCA-101-V

SUBJECT NAME: DATA STRUCTURES

MCA SEMESTER I

NO OF CREDITS: 4

SESSIONAL: 25

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4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Computer Fundamentals

Successive: ADA

Course Objectives:

1. To demonstrate major algorithms and data structures and analyze the performance of algorithms.
2. Learn abstract properties of various data structures such as stacks, queues, lists, trees and graphs and use them effectively in Applications programs.
3. To understand of various sorting algorithms, including bubble sort, insertion sort, selection sort, merge sort, quick sort and heap sort.
4. To solve problems using Tree traversals, Graph traversals, and shortest paths.
5. To understand and use advanced data structures like file system, dictionaries, skip lists etc.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Understand and apply various operations on basic data structures like array, stack, queue, and linked list.
- b. Analyze algorithm and determine their complexity.
- c. Understand and apply the various operations on data structures like tree and graphs.
- d. Solve the complex problems like implanting file system, sets, skip lists and dictionaries.

Syllabus:

Unit-I **OVERVIEW OF ‘C’:** Introduction, Flow of Control, Input output functions, Arrays and Structures, Functions

Data structures and Algorithms: An overview: Need of data structures, choice of right data structures, types of data structures, how to design and develop an algorithm: algorithm analysis, complexity of algorithms Big-oh notation.

Linear Data Structure-Arrays: One Dimensional and Multi-dimensional array Arrays, Various Sorting (Linear, Binary) and searching operations on arrays (Selection, insertion, bubble, Shell, Quick, Merge), sparse matrix, sparse matrix representation.

Operations Defined: traversal, selection, searching, insertion, deletion, and sorting. Multidimensional arrays, address calculation of a location in arrays, sparse matrix, sparse matrix representation.

Stacks and queues: Stacks, array representation of stack, Applications of stacks. Queues, Circular queues, array representation of Queues, Deque, priority queues, Applications of Queues.

Unit-II **POINTERS:** Pointer variables, Pointer and arrays, array of pointers, pointers and structures, Dynamic allocation.

Linked Lists: Concept of a linked list, Circular linked list, doubly linked list, operations on linked lists. Concepts of header linked lists. Applications of linked lists, linked stacks linked Queues.

Unit-III **TREES:** Introduction to trees, binary trees, representation and traversal of trees, operations on binary trees, types of binary trees, threaded binary trees, AVL trees, M-way tree, B and B+ Trees, Red Black Trees, Splay Trees, Applications of trees like The Huffman Coding Algorithm.

Graphs: Introduction of graph and associated terminology, 'set, linked and matrix' representation, Graph traversal techniques: BFS, DFS, Operations on graphs (Path Matrix and shortest Path), Minimum spanning trees, Applications of graphs.

Unit-IV **ADVANCED DATA STRUCTURES:** Introduction to file system, Dictionary Abstract Data Type, Implementation of Dictionaries, Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Sets, list representation of sets, Applications of sets, Skip lists: Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Text/ Reference Books:

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.

2. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition. Fundamentals of Data structures by Ellis Horowitz &SartajSahni, Pub, 1983,AW
3. Fundamentals of computer algorithms by Horowitz Sahni and Rajasekaran.
4. Data Structures and Program Design in C By Robert Kruse, PHI,
5. Theory & Problems of Data Structures by Jr. SymourLipschetz, Schaum's outline by TMH
6. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004
7. M T Goodrich Roberto Tamassia

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-103-V

SUBJECT NAME: COMPUTER NETWORKS

MCA SEMESTER I

NO OF CREDITS: 4

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4 0 0

SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite: None

Successive: JAVA, .Net

Course Objectives

1. To understand basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
2. To understand the layers of the OSI model and TCP/IP, function(s) of each layer and to identify the different types of network devices and their functions within a network.
3. To know basic protocols of data link layer, how they can be used to assist in network design and implementation, IEEE standards for LAN and MAN.
4. To analyze the features and operations of network layer, Applications layer protocols including various switching mechanism

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Acquire knowledge about basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
- b. Understand the layers of the OSI model and TCP/IP, function(s) of each layer and identify the different types of network devices and their functions within a network.
- c. Apply protocols of data link layer in network design and implementation, IEEE standards for LAN and MAN.
- d. Analyze the features and operations of various network layers, Applications layer protocols including various switching mechanism.

Syllabus:

Unit-I DATA COMMUNICATION: Theoretical basis of data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation, techniques, broadband and base band transmission; pulse code

modulation, bandwidth, channel, baud rate of transmission; multiplexing; transmission medium; transmission errors, error detection and correction.

Unit-II: NETWORK CLASSIFICATION AND DATA COMMUNICATION SERVICES:

Local area networks, metropolitan area network, wide area network, wireless network, internetworking; switched multi-megabit data services, X.25, frame relay, narrow band and broad ISDN asynchronous transfer modes. Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO-OSI reference model, TCP/ IP reference model; internet protocol stacks.

Unit-III: DATA LINK LAYER FUNCTIONS AND PROTOCOLS:

Framing, error control, flow-control; sliding window protocol; Data link layer of Internet and ATM. Medium Access Control Sub-layer: CSMA/CD protocol switched and fast Ethernet, token ring, IEEE standards for LAN and MAN; satellite networks.

Unit-IV: NETWORK FUNCTIONS AND PROTOCOLS:

Switching mechanism: Circuit switching, message switching, packet switching, cell switching, routing and congestion control, TCP/IP protocol architecture, introduction of tunnelling and Virtual Private Networks (VPN). Network Applications: File transfer protocol, electronic mail, World Wide Web.

Text / Reference Books:

1. A.S. Tanenbaum : Computer Networks (4th ed.), Prentice-Hall of India.
2. W. Tomasi : Introduction to Data Communications and Networking, Pearson, Education.
3. P.C. Gupta : Data Communications and Computer Networks, Prentice-Hall of India.
4. BehrouzForouzan and S.C., Fegan : Data Communications and Networking, McGraw Hill.
5. L.L. Peterson and B.S. Davie : Computer Networks : A system Approach, Morgan Kaufmann.
6. William Stalilngs : Data and Computer Communications, Pearson Education.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-105-V

SUBJECT NAME: DATA BASE MANAGEMENT SYSTEMS

MCA SEMESTER I

NO OF CREDITS: 4

SESSIONAL: 25

L PT

THEORY EXAM: 75

4 0 0

TOTAL: 100

Pre- Requisite: None

Successive: Big Data

Course Objectives:

1. To study about the basics of DBMS, client server architecture and database models.
2. To understand relational model and relational algebra calculus.
3. To study about the various normalization forms.
4. To study about the transaction management and concurrency control mechanisms

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Understand the basics of DBMS, client server architecture and database models.
- b. Apply the concept of relational model and relational algebra calculus to create database.
- c. Apply the concept normalization on database.
- d. Implement transaction management and concurrency control mechanisms

Syllabus:

Unit-I **OVERVIEW OF DATABASE MANAGEMENT SYSTEM:** Database, Database Management system, Advantages of DBMS over file processing systems, Database Languages, Database Users and Administrator, Database system Structure, Storage Manager, Query Processor. Introduction to Client/Server architecture, Various views of data, three levels architecture of Database Systems, database Models, Attributes and Entity sets, Relationship and Relationship sets, mapping Constraints, Keys, Entity Relationship Diagram, Reduction of E-R diagram into tables.

Unit-II **RELATIONAL MODEL:** Introduction to the Relational Model, Integrity Constraints Over relations, Enforcing Integrity constraints.

Relational Algebra and Calculus: Relational Algebra, Selection and projection set operations, renaming, Joins, Division, aggregate operations, Relational calculus-

Tuple relational Calculus, Domain relational calculus, Query processing and Optimization.

NORMALIZATION: Problems Caused by redundancy, Decompositions, Problem related to decomposition, Functional dependencies, Minimal Cover, Attribute Closure, FIRST, SECOND, THIRD Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies, Fourth and Fifth Normal Form.

Unit-III **OVERVIEW OF TRANSACTION MANAGEMENT:** ACID Properties, Transaction States, Transactions and Schedules, Concurrent Execution of transaction. **Concurrency Control:** Serializability and recoverability, Introduction to Lock Management, Lock Conversions, Specialized Locking Techniques, Time stamp based concurrency control, dealing with Dead Locks, Introduction to crash recovery, Log based recovery, Check points.

Unit-IV **PARALLEL AND DISTRIBUTED DATABASES:** Basic concepts, architectures, parallelization of operations, Methods for data distribution: fragmentation and replication, catalog management, Distributed query processing: semi-joins and bloom-joins, Distributed transaction processing.

Text/Reference Books

1. ElmasriNavate: Data base Management System, Pearson Education
2. Raghurama Krishnan: Data base Management Systems, Johannes Gehrke, Tata McGraw Hill Latest Edition.
3. Siberschatz, Korth: Data base System Concepts, McGraw Hill, and latest edition.
4. P. Radha Krishna: Database Management Systems, HI-TECH Publications.
5. C.J. Date: Introduction to Database Systems, Pearson, Education.
6. Rob & Coronel: Data base Systems design, Implementation, and Management, latest Edition, Thomson.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-107-V

SUBJECT NAME: OBJECT ORIENTED PROGRAMMING USING C++

MCA SEMESTER I

NO OF CREDITS: 4

SESSIONAL: 25

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4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Programming using C

Successive: JAVA, .Net

Course Objectives:

1. To learn nature of object oriented programming and its basic concepts and syntax.
2. To implement program using more advanced C++ features such as composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, To implement C++ classes using encapsulation and design principles.
3. To learn file I/O and exception handling, and use of templates etc.
4. Be able to apply object oriented or non-object oriented techniques to solve bigger Real World Computing problems.
5. To review of the concepts of Object Oriented Programming, study the importance of object-oriented analysis and design and understand the importance of modeling.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Understand and apply the basic concept of the C++ and implement the classes using proper syntax and applying the various features of the language.
- b. Apply the OOPs concepts like inheritance, Data Abstraction and polymorphism.
- c. Able to handle I/O and exceptions necessary while solving the real life problems
- d. Apply the concepts of Structural Modeling & Behavioral Modeling while designing the solution to a bigger problem.

Syllabus:

Unit-I INTRODUCTION TO C++: Review of C Programming, Fundamentals of OOPS Basic data types, identifiers, keywords, constants, variables, Operators, control statements, iterative statements in C++, Pointers and Arrays,

Unit-II CLASSES, INHERITANCE AND POLYMORPHISM: classes, objects; array of objects; objects as function arguments, scope resolution operator, static data members, friend function, inheritances, types of inheritance, containership, constructors and their types, destructors, virtual functions and polymorphism, abstract class, , virtual base class, overloading of unary and binary operators

Unit-III WORKING WITH FILES, TEMPLATES AND HANDLING OF EXCEPTION: Template:Introduction to code sharing; templates; generic classes; templates with more than one generic parameter, File handling: files and streams; opening and closing and opening, reading and writing of block and object, Exception handling:exception handling in C++ ‘try, throw, and catch blocks’, multiple throw and catch blocks, throwing objects

Unit-IV STRUCTURAL MODELING & BEHAVIORAL MODELING: Objects, classes: Names, attributes, operations, responsibilities; Stereotypes and Classes Relationships: Dependencies, Generalization, Association, Structural Diagrams: Class diagram, object diagrams, Interaction diagrams, types of Interaction diagrams,Activity Diagrams Activities, Transitions, Decision Points, SwimlanesActors & Use cases, use case diagram, Use Case Relationships, Types of Relationships

Text/ Reference Books:

1. C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall
2. Object Oriented Programming in Turbo C++ by Robert Lafore ,1994, The WAITE Group Press.
3. Programming with C++ By D Ravichandran, 2003, T.M.H
4. Computing Concepts with C++ Essentials by Horstmann, 2003, John Wiley,
5. “UML User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 2000, Addison Wesley
6. Visual Modelling with Rational Rose 2000 and UMLBy Terry Quatrani Foreword by Grady Booch, 2000.
7. Object oriented analysis and design with Applications by Grady booch, Robert A Maksimchuk, Michael W. Engle, Bobbi J. Young, Pearson education India

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-109-V

SUBJECT NAME: OPERATING SYSTEM

MCA SEMESTER I

NO OF CREDITS: 4

SESSIONAL: 25

L P T

4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: None

Successive: Distributed Operating System, Cloud Computing

Course Objectives:

1. To understand evolution, types and functions of OS
2. To learn about Processes, threads and various Scheduling policies.
3. To understand process concurrency, synchronization and Deadlocks
4. To understand various memory management schemes & Disk management.
5. To understand the process, memory and I/O management of Unix Operating system

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Understand the operating system, shares hardware resources between processes, tasks, threads, and users.
- b. Apply the various algorithms to manage the process, communication between the processes its storage in memory.
- c. Implement various memory and Disk management schemes.
- d. Understand the management of process, memory and I/O of the Unix Operating system.

Syllabus:

Unit-I **OPERATING SYSTEM INTRODUCTION:** Need of OS, Evolution of OS, Functions, Types of OS - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Mobile OS.

Unit-II **PROCESS MANAGEMENT AND COMMUNICATIONS:** Process concepts, Process Lifecycle, Operation on processes, Cooperating Processes, Scheduling Criteria, process Scheduling Algorithms, Introduction to threads, Process synchronization: The Critical Section Problem, Synchronization Hardware,

Semaphores, and Classical Problem of Synchronization, Monitors. : **Deadlocks:** System Model, Dead locks Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

Unit-III **MEMORY AND DISK MANAGEMENT:** Logical versus Physical Address Space, Swapping, Relocation, fixed & variable partitioning, Contiguous Allocation, Paging, and Segmentation with Paging. **Virtual Memory Management:** principal of locality, Demand Paging, Performance of Demanding Paging, Page Replacement Algorithm, Allocation of Frames, Thrashing. Disk management: need of disk scheduling, disk scheduling criteria, disk scheduling algorithm.

Unit -IV **CASE STUDY OF UNIX OS:** Types of files, File system layout, internal representation of files: inodes, accessing and releasing inodes, structure of regular files and directories, superblocks, inode and disk block assignment to a new file. Concept of a process, state transitions, process scheduler, scheduling parameters, Fair share scheduler. Swapping: swapping processes in and swapping out; Demand Paging: page stealer process, fault handler, I/O Management, introduction to Shell programming.

Text/ Reference Books:

1. Silberschatz&Galvin : Operating System Concept, Wiley, Latest Edition.
2. Milan Milenovic : Operating Systems, Tata McGraw – Hill Latest, Edition.
3. Principles of operating system: Dr.NareshChauhan, Oxford University press.
4. William Stallings: Operating Systems, PHI, Latest Edition.
5. A.S. Tanenbaum: Modern Operating Systems, Latest edition Pearson/PHI.
6. Maurice J Bach: The Design of the Unix Operating system, Pearson Pub.
7. Unix Shell Programming byYashavantKanetkar , BPB Publications

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-102-V

SUBJECT NAME: ANALYSIS & DESIGN OF ALGORITHMS

MCA SEMESTER II

NO OF CREDITS: 4

SESSIONAL: 25

L P T

4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Data structures

Successive: None

Course Objectives:

1. To study mathematical preliminaries required to analyze and design computer algorithms and understand advanced data structures required to design efficient computer algorithms.
2. To make understand students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc.
3. Use various techniques for efficient algorithm design (divide-and-conquer, greedy, dynamic programming, backtracking and branch and bound algorithms) and are able to apply them while designing algorithms.
4. To study the concepts of NP-complete problems and different techniques to deal with them. Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- a. Analyze and compare complexity for different types of algorithms for different types of problems and apply mathematical preliminaries to the analyses and design stages of different types of algorithms.
- b. Apply different types of data structures, analyze the best one for different types of problems and recognize the general principles and good algorithm design techniques for developing efficient computer algorithms.

- c. Analyze on the suitability of a specific algorithm design technique for a given problem.
- d. Implement efficient algorithms for new situations, using as building blocks the techniques learned and apply algorithm design techniques to solve certain NP-complete problems.

Syllabus:

Unit-I **INTRODUCTION:** Brief Review of stacks, queues, graphs, binary search tree, set and disjoint set union, general sorting algorithms, Analysis of algorithms in terms of space and time complexity.

Unit-II **DIVIDE AND CONQUER SEARCH, SORT AND GREEDY METHODS:** General method, binary search, ternary search algorithm, merge sort, quick sort, selection, strassen's matrix multiplication, analysis of algorithms for these problems. Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths, optimal storage on tapes, optimal merge patterns and analysis of these problems.

Unit-III **DYNAMIC PROGRAMMING AND BACK TRACKING:** General method, single source shortest path, all pair shortest path, optimal binary search trees, 0/1 knapsack, the traveling salesman problem. General method of backtracking, 8 queen's problem, graph coloring, sum of subsets, Hamiltonian cycles, analysis of these problems.

Unit-IV **BRANCH AND BOUND:** General Method, 0/1 knapsack and traveling salesman problem. **NP-Hard And NP-Complete PROBLEMS:** P, NP, NP-Hard, NP-Complete, Cook's Theorem and Problem Solving.

Text / Reference Books:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publ.,
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH.
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986.
5. John Wiley & Sons,
6. Writing Efficient Programs, Bentley, J.L., PHI
7. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, 1997, MGH.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-104-V

SUBJECT NAME: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

MCA SEMESTER II

NO OF CREDITS: 4

SESSIONAL: 25

L P T

THEORY EXAM: 75

4 0 0

TOTAL: 100 Pre-

Requisite: Basic Calculus and Concept of Probability

Successive: None

Course objectives:

1. To understand the Domain of AI and basics techniques used for searching and knowledge representation.
2. To learn the different methods of Planning and learning, and to learn Neural network and genetic algorithms and their Applications.
3. To introduce the architecture of Rule based and Non Rule based expert system
4. To design and apply various machine learning algorithms for supervised learning.
6. To design and apply Explore supervised and unsupervised learning paradigms of machine learning.

Course outcomes:

Upon successful completion of the course, the students will be able to

- a. Understood basic concepts and the Applications of AI and able to apply various search and knowledge representation techniques used for Intelligent systems
- b. Apply the planning and learning techniques and also understand the phases and the architecture of various advanced system like NLP based system and Expert System.
- c. Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- d. Understand the strength and weaknesses of various supervised and un-supervised techniques for the solving a real - world problem.

Syllabus:

Unit-I **BASICS OF AI:** Definition of AI, History, Domains AI, AI problems & State space, Some examples problems representations like Travelling Salespersons, Syntax analysis Problem, Basic issues to solve AI problems, Underlying assumptions, AI techniques, Level of model, Criteria for success, Control strategies.

Searching Techniques: DFS, BFS, Heuristic Search Techniques: Generate & Test: Hill Climbing (simple & steepest), Best first search/A*, Problem Reduction/AO*, Constraint satisfaction, MEA. And Knowledge Representation Techniques such as

Knowledge Representation Techniques: Syntax & Semantic for Propositional logic, Syntax & Semantic for FOPL, Properties for WFF's, Resolution: Resolution Basics, conversion to clausal form, Resolution of proposition logic, Unification of predicates, Resolution algorithms for predicates, Problems with FOPL, Semantic nets, Frames, Scripts

Unit-II **PLANNING & LEARNING:** Planning, Planning in Situational calculus, Representation for planning, Partial order planning, Partial order planning algorithm, Learning by Examples, Learning by Analogy, Explanation based learning, Neural nets, Genetics algorithms, Architecture of expert system (Rule Based and Non-Rule Based)

Unit-III **MACHINE LEARNING-Supervised Learning** (Regression/Classification): Introduction to Machine Learning, Types of Machine Learning (Supervised/Unsupervised), Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Support Vector Machines, Nonlinearity and Kernel Methods.

Unit-IV **UNSUPERVISED LEARNING:** K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Ensemble Methods (Boosting, Bagging, Random Forests)

Text / Reference Books:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Artificial Intelligence by Elain Rich & Kevin Knight, TMH
3. AI by DAN. W.Petterson
4. AI by Russel and Norvig, Pearson education

5. Kevin Murphy," Machine Learning: A Probabilistic Perspective", MIT Press, 2012
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer 2009 (freely available online)
7. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) ||, Third Edition, MIT Press, 2014
8. Tom M Mitchell, —Machine Learning||, First Edition, McGraw Hill Education.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-106-V

SUBJECT NAME: SOFTWARE ENGINEERING

MCA SEMESTER II

NO OF CREDITS: 4

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4 0 0

SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite: Fundamentals of Computer System

Successive: Software Project Management

Course Objectives:

1. To understand need of software engineering and fundamental principles of Software Project management
2. To understand various software models and SRS designs principles.
3. To understand the various techniques for software testing and maintenance.
4. To learn about project reporting, defect analysis and prevention.
5. To study various quality models and advanced techniques.

Course Outcomes: Upon successful completion of the course, the students will be able to

- a. The students will be able to determine the issues and challenges, formulate, review and analyze complex software project management.
- b. The students will be able to understand why majority of the software projects fails and how that failure probability can be reduced effectively.
- c. The students will be able to perform project Scheduling, tracking, risk analysis, software quality management and project cost estimation using different techniques.
- d. Apply various software testing techniques to test the software at each level of software development.

Syllabus:

Unit-I INTRODUCTION TO SOFTWARE ENGINEERING AND PROJECT MANAGEMENT:

INTRODUCTION TO SOFTWARE ENGINEERING AND PROJECT MANAGEMENT: Evolving role of software, Software Characteristics, Software crisis, Silver bullet, Software myths, Software process, Personal Software Process (PSP), Team Software Process (TSP), emergence of software engineering, Software

process, project and product, Software Process Models: Waterfall Model, Prototype Model, Spiral, Model ,RAD Model, Iterative Model, Project management concepts, Estimation—LOC based, FP based, Use-case based, empirical estimation COCOMO- A Heuristic estimation techniques

Unit-II REQUIREMENTS ANALYSIS AND SYSTEM DESIGN: Software Requirements engineering, Requirement engineering process, Requirement Engineering Tasks, Types of requirements, SRS.**System Design:** Design principles, the design process; Design concepts: Abstraction, refinement, modularity, software architecture, Effective modular design: Functional independence, Cohesion, Coupling.

Unit-III SOFTWARE TESTING AND MAINTENANCE: Testing terminology—error, bug/defect/fault, failure, Verification and validation, Test case design, Static testing ,Dynamic testing: Black box testing Techniques, White box testing techniques, basis Validation Activities: Unit testing, Integration testing, Acceptance Testing, debugging, debugging process debugging approaches, Software maintenance categories, Models, Introduction to Regression testing ,test case prioritization and Testing Tools, Introduction to testing of object oriented software.

Unit-IV SOFTWARE QUALITY MODELS, STANDARD AND ADVANCE TOPICS IN SOFTWARE ENGINEERING: Quality concepts, Software quality assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO 9126 Standard.

Unit-V ADVANCE TOPICS IN SOFTWARE ENGINEERING: Configuration Management, Software re-engineering, Reverse Engineering, Restructuring, Forward Engineering, and Clean Room Software Engineering.

Case Study: To develop SRS and SDD for a Software Project.

Text / Reference Books:

1. Software Engineering – A Practitioner’s Approach, Roger S. Pressman, 1996, MGH.
2. Fundamentals of software Engineering, Rajib Mall, PHI
3. Software Engineering by Ian Sommerville, Pearson Edu, 5th edition, 1999, AW,
4. Software Engineering – David Gustafson, 2002, T.M.H
5. Software Engineering Fundamentals Oxford University, Ali Behforooz and Frederick J. Hudson 1995
6. An Integrated Approach to software engineering by Pankaj Jalote , 1991 Narosa,
7. Software Testing: Principles and Practices, Dr.NareshChauhan.
- 8.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-108-V

SUBJECT NAME: JAVA PROGRAMMING

MCA SEMESTER II

NO OF CREDITS: 4

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SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite: Internet and Web Fundamentals

Successive: None

Course Objectives:

1. To learn Java programming constructs like variable, primitive data types, operators, type conversion, type casting etc.
2. To develop program by using classes, object, interface, multithreading, constructors, packages, polymorphism, inheritance, exception and file handling.
3. To learn various concepts of advanced java programming and understand AWT hierarchy and event handling.
4. To understand the concepts of Swing package and learn the basics of data access using JDBC
5. To implement the server - side programming using JSP and learn how to reuse classes using JAVA Beans
6. To perform the network programming and Remote method invocation.

Course Outcomes: Upon successful completion of the course, the students will be able to

- a. Implement the problems using the classes, polymorphism, inheritance, exception, files, multithread, and Interface.
- b. Create User interface using AWT and Swings and connect it to the database using JDBC.
- c. Implement server-side scripting using JSP and apply java beans to solve the problems
- d. Establish client server communication and create distributed Applications by using of the RMI.

Syllabus:

Unit-I

FUNDAMENTALS OF JAVA PROGRAMMING: Java Programming Constructs, Classes, Objects, constructors, Interfaces, Packages, Exceptions

handling, Multithreading, Streams and file I/O: Applets, Introduction to JDBC, Types of JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces.

Unit-II **AWT AND SWINGS:** AWT Class Hierarchy, Creating Containers and adding Components, Layout, Panels, event Handling, Adapter Classes, Dialog Boxes, Scrollbar, Menus, Difference between AWT and Swings, Containment Hierarchy of Swings, Adding Components, JTextField, JPasswordField, JTable, JComboBox, JProgressBar, JList, JTree, JColorChooser, Dialogs.

Unit- III **JSP & INTRODUCTION TO J2EE:** Introduction to JSP, advantage of JSP over java Servlet, architecture of JSP, Life cycle of JSP, Basic tags and implicit objects, action tags. Introduction to Java Beans, Properties, accessor Methods, Bean builder, advantages of java beans, BDK Introspection: Design patterns, Beaninfo Interface, persistence, customizer, Java beans API, EJB: Benefits of EJB, usage scenario, EJB Architecture, session Beans, Entity Beans, Introduction to Struts Framework

Unit-IV **NETWORK PROGRAMMING AND RMI :** Networking Basic, Sockets, knowing IP address, using URL Class and URL Connection Class, communication between Server and client, retrieving a file at server, RMI: RMI Architecture, RMI registry, dynamic code loading in RMI, RMI API Creating a distributed Applications using RMI, directory and Naming Services, overview of JNDI, object serialization.

Text / Reference Books:

1. Sachin Malhotra and Saurabh Chaudhary, “Programming in JAVA”, Oxford University Press, ISBN: 0-19-806358
2. E-Balagurusamy, “Programming with JAVA- A Primer” Tata McGraw-Hill Publishers, ISBN 0-07-463542-5
3. Dietel and Dietel “CORE JAVA”
4. Herbert Shield “The complete reference-JAVA2”, TMH
5. Uttam K. Roy, “Advanced Java Programming”, Oxford University Press, ISBN: 0-19-945550-3
6. Ivan Bayross, “HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
7. Internet & Web Technologies – Raj Kamal, TMH
8. Herbert Shield “The complete reference-JAVA2”, TMH

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-110-V

SUBJECT NAME: CLOUD COMPUTING

MCA SEMESTER II

NO OF CREDITS: 4

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4 0 0

SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite: Operating System, Database Management System

Successive: None

Course Objectives:

1. To study basic concepts of Cloud Computing and various cloud Technologies, service layers involved, deploy Applications over cloud computing platform, Utility Computing and Elastic Computing.
2. To understand the cloud data in Relational databases and various file systems: GFS, HDFS, Big Table, HBase and Dynamo in cloud. Also discuss in detail the Map-Reduce concept, Map-Reduce model in parallel computing and its Applications.
3. To learn fundamentals of cloud security, its tool and cloud computing security architecture and understand challenges involved in cloud computing security.
4. To analyze issues involved in cloud computing while implementing real time Applications over cloud and discuss the issues regarding intercloud environments, QOS, Dependability, data migration, streaming.
5. To learn cloud middleware, Mobile Computing, Grid Computing, Sky Computing.
6. To discuss research issues to be explored regarding load balancing, resource optimization, dynamic resource provisioning in cloud computing.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- a. The students will understand the concept of cloud computing with its service layers and Utility Computing and Elastic Computing.
- b. Deployment of Applications over cloud computing platform.

- c. The students will be able to understand various Cloud Technologies, web services and software involved in cloud computing to design enterprise Applications.
- d. The students will be able to manage cloud data in relational databases and file systems in cloud computing.

Syllabus:

Unit-I INTRODUCTION TO CLOUD COMPUTING: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and others. Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations. Cloud computing platforms: Infrastructure as service: Amazon, EC2 Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Unit-II INTRODUCTION TO CLOUD TECHNOLOGIES: Study of Hypervisors Compare SOAP and REST Web services, AJAX and Mashups-Web services, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services. Multitenant software: Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise Applications.

Unit-III DATA IN THE CLOUD: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, Features and comparisons among GFS, HDFS etc, **Map-Reduce and extensions:** Parallel computing, the map-Reduce model and its efficiency. Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce. Example/Applications of Mapreduce in cloud. Map-Reduce model

Unit-IV CLOUD SECURITY FUNDAMENTALS & QUALITY ISSUES- Privacy and Security in cloud. Cloud computing security architecture: - General Issues, Trusted Cloud computing, Microarchitectures: Identity Management and Access control, Autonomic Security. Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations and Techniques. Issues in Intercloud environments: QOS Issues and monitoring in Cloud, Dependability, data migration, streaming in Cloud. Cloud Middleware, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud.

Text / Reference Books:

1. Cloud Computing by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by GautamShroff, Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

4. Google Apps by Scott Granneman,Pearson
5. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
6. Cloud Computing: A Practical Approach, Antohy T Velte, et.al McGraw Hill,
7. Cloud Computing Bible by Barrie Sosinsky, Wiley India

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-201-V

SUBJECT NAME: BIG DATA

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

L P T

THEORY EXAM: 75

4 0 0

TOTAL: 100

Pre- Requisite: DBMS, ADBMS

Successive: None

Course Objectives:

1. Understand the problem big data and the challenges involved to handle big data.
2. Understand big data for business intelligence. Learn business case studies for big data analytics.
3. Understand NOSQL big data management. Perform map-reduce analytics using Hadoop and related tools

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Describe big data and use cases from selected business domains.
- b. Explain NoSQL big data management.
- c. Install, configure, and run Hadoop and HDFS.
- d. Perform map-reduce analytics using Hadoop.

Syllabus:

Unit-I **INTRODUCTION TO BIG DATA:** What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Unit-II **DATA MODELS:** Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless

databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

Unit-III HADOOP BASICS: Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

Unit-IV MAP REDUCE BASICS AND ITS TYPES: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.

Text / Reference Books:

1. Jeffrey Richter, Francesco Balena : Applied .Net Framework
2. Prog. In MS VB. Net, TMH Publications.
3. Herbert Schildt : Complete Reference C#, TMH Publication.
4. Michael Halvorsan : Microsoft Visual Basic.NET step by step, PHI Publication.
5. Balaguruswamy: Programming in C# , TMH Publications
6. Rebecca M.Riordan: Microsoft ADO.NET Step By Step , PHI Publication

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-203-V

SUBJECT NAME: .NET TECHNOLOGY

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

L P T

4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Object Oriented Features

Successive: None

Course Objectives:

1. To study the features of .Net Technologies & to understand Visual Studio .Net Environment
2. To learn of C# programming fundamentals
3. To learn VB.Net programming constructs
4. To learn ADO.Net Object Model.
5. To learn ASP.Net of ASP.Net Web Programming

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Understand .net framework, its runtime environment and Applications development using IDE of Visual Studio 2010 and higher versions.
- b. Implement C# and VB.Net language constructs in the form of stand-alone console and Window form Applications .
- c. Understand Database concepts in ADO.net and apply the knowledge to implement distributed data-driven Applications using VB.Net, SQL-Server and ADO.Net
- d. Design, document, debug ASP.Net web forms with server and validation controls and implement ASP.Net web services.

Syllabus:

Unit-I INTRODUCTION TO .NET FRAMEWORK: Introduction to .NET: The origin of .NET, Basics of .Net Framework & its Key design goals, 3-tier architecture, managed code, assemblies, CLR, IL, JIT, .NET framework class library, common type system, common language specification,

Understanding the Development Environment: .NET Integrated Development Environment ; Projects & Solutions, User Interface Elements, The Visual Studio Start Page; Visual Studio.Net work area; Navigational Features,

Unit-II **INTRODUCTION TO VB .NET AND C# :**Data Types C#: Data Types, Operators, Methods, Handling Strings, Jagged Array, Array list, Indexer (one Dimension) and property, Interfaces, Delegates and events.

User Interface: Understanding Window Forms; Viewing and changing properties; Adding controls to the form; Procedures in VB.NET, Garbage Collection, Message boxes; Dialog boxes; Menus and Toolbars.

Unit-III **ADO.NET:** Architecture of ADO.Net, Comparison with ADO, ADO.Net Object Model, Net Data provider, Data Adapter, Data Set, Data Row, Data Column, Data Relation, command, Data Reader, Connecting to Database, Accessing &Manipulating Data and Performing Data Updates.

Unit-IV **ASP. NET:** Anatomy of ASP .NET Page,ASP.Net Features, Introduction to Web Forms Server Controls : label, dropdown list box, Button, AdRotator , Textbox, Checkbox etc. , Validation controls, ASP.NET Web Services, State Management ,Caching, Authentication (window,.Net Passport, Forms Based), Securing ASP.NET Applications

Text / Reference Books:

1. Jeffrey Richter, Francesco Balena : Applied .Net Framework
2. Prog. In MS VB. Net, TMH Publications.
3. Herbert Schildt : Complete Reference C#, TMH Publication.
4. Michael Halvorsan : Microsoft Visual Basic.NET step by step,PHI Publication.
5. Balaguruswamy: Programming in C# , TMH Publications
6. Rebecca M.Riordan: Microsoft ADO.NET Step By Step , PHI Publication

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-205-V

SUBJECT NAME: SOFT COMPUTING

MCA SEMESTER III

NO OF CREDITS: 4

L P T
4 0 0

SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite: Basics of AI

Successive: None

Course Objectives:

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario
2. To implement soft computing based solutions for real-world problems
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms
4. To provide students an hand-on experience on MATLAB to implement various strategies

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Identify and describe soft computing techniques and their roles in building intelligent machines
- b. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
- c. Apply genetic algorithms to combinatorial optimization problems.
- d. Evaluate and compare solutions by various soft computing approaches for a given problem.

Syllabus:

Unit-I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:
Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit-II	FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making
Unit-III	NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks
Unit-IV	GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition

Text / Reference Books:

1. "Fuzzy sets and Fuzzy Logic: Theory and Applications", G.J. Klir, B. Yuan, PHI
2. "Introduction to Fuzzy sets and Fuzzy Logic", M. Ganesh, PHI
3. "An Introduction to Fuzzy Control", D. Driankov, H. Hellendoorn, M. Reinfrank, Narosa Publishing Company
4. "Neural Networks: A classroom approach", Satish Kumar, Tata McGraw Hill
5. Haykin S., "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
6. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-221-V

SUBJECT NAME: THEORY OF COMPUTATION (ELECTIVE-1)

MCA SEMESTER III

NO OF CREDITS: 4

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SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Pre- Requisite:None

Successive: None

Course Objectives

1. To understand the fundamental concepts of Finite state Systems and Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Chomsky hierarchy of grammars.
2. To acquire knowledge about Regular Grammar and Regular Sets, Context Free and Context Sensitive Grammars: Definition, Context free and Context sensitive grammar.
3. To implement push down automata and Turing machines.
4. To understand the concept of Undecidability and Computability.

Course Outcomes

Upon successful completion of the course, the students will be able to:

- a. Understand Finite State Systems, Properties and limitations of Finite State machines, Basic Definitions, Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA) and be able to explain Chomsky hierarchy of grammars.
- b. Acquired knowledge about Regular Expressions, Identities, Regular languages and finite automata, Arden theorem: Equivalence of finite automata and Regular Expressions and able to understand Context free and Context sensitive grammar, Parse trees, Ambiguity in CFG.
- c. Analyze, Design of PDA and will become familiar with Deterministic and Non-Deterministic Turing Machines, Design of TM, Universal TM, Halting problem of TM. Permutations and Combinations.
- d. Able to find the various solutions of Recursive and non-recursive languages.

Syllabus:

Unit-I **FINITE AUTOMATA AND REGULAR EXPRESSIONS:** Finite State Systems, Basic Definitions Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with e-moves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa.

INTRODUCTION TO MACHINES: Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines, Conversion of NFA to DFA by Arden's Method.

Unit-II **PROPERTIES OF REGULAR SETS:** The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Myhill-Nerode Theorem and minimization of finite Automata, Minimization Algorithm.

Unit-III **GRAMMARS:** Definition, Chomsky hierarchies of grammars, Context free and Context sensitive grammar, Ambiguity regular grammar, Reduced forms, Removal of useless Symbols and unit production, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Unit-IV **PUSHDOWN AUTOMATA:** Introduction to Pushdown Machines, Applications of Pushdown Machines

TURING MACHINES: Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M., PCP Problem. **COMPUTABILITY:** Basic concepts, Primitive Recursive Functions.

Text / Reference Books:

1. Introduction to automata theory, language & computations- Hopcroft& O.D. Ullman, R Motwani, 2001, AW
2. Theory of Computer Sc. (Automata, Languages and computation): K.L.P.Mishra& N. Chandrasekaran, 2000, PHI.
3. Introduction to formal Languages & Automata-Peter Linz, 2001, Narosa Publ.
4. Fundamentals of the Theory of Computation- Principles and Practice by RamondGreenlaw and H. James Hoover, 1998, Harcourt India Pvt. Ltd..

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-222-V

SUBJECT NAME: NATURAL LANGUAGE PROCESSING (ELECTIVE-I)

MCA SEMESTER III

NO OF CREDITS: 4

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SESSIONAL: 25

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Introduction of Formal Grammar

Successive: None

Course Objectives:

1. To study difference levels/ stages of natural language processing/ understanding and their Applications and to describe the concept of Formal languages and grammars such Chomsky hierarchy and problems associated with them.
2. To describe the top down and the bottom up parsing techniques such as CKY, Earley& Tomita's
3. To learn Finite state models and morphology of natural languages.
4. To learn about Semantics-knowledge and strategies for semantic understanding.
5. To learn speech recognition and issues associated with it and solving problems using HMM and Python language

Course Outcomes:

Upon successful completion of the course, the students will be able to

- a. Understand the difference levels/ stages and Applications of natural language processing/understanding and know & apply the concept of Formal grammars to generate various types of grammars considering problems associated with them.
- b. Compute parsing using top down and the bottom up parsing like CKY, Earley& Tomita's
- c. Develop finite state and morphological models for a given problem in language processing.
- d. Apply the Semantics-Analysis using suitable approach on real world problems.

Syllabus:

Unit-I **INTROCUTION TO NLP AND NLU** – Applications of NLP & NLU, open problem, Differences levels of Language Analysis and Ambiguities, Introduction of different classes of grammar such Chomsky hierarchy, LFG, GPSG, HPSG, TAG, GB Theory.

Unit-II **SYNTATIC PROCESSING** – Linguistic Background – Outline of English and Hindi Syntax, Basic Top down &Bottom up parsers: CKY, Earley& Tomita's, Finite state models and morphological processing, Syntactic processing using RTN &ATN

Unit-III **SEMANTIC INTRODUCTION** – Semantic and logical form, Ambiguity, Speech acts and Embedded Sentences, other strategies for Sementic Interpretation.

Unit-IV **SPEECH RECOGNITION AND SPOKEN LANGUAGE** – Issue in Speech Recognition, Sound structure, Signal processing, HMM model, NLP using Python Language, NLU and speech Recognition.

Text / Reference Books:

1. James Allen, “Natural Language Understanding”, Pearson education, 2003
2. AksharBharti, VineetChaitanya and Rajeev Sangal, “Natural Language Processing: A Paninian Perspectives”, PHI
3. Daniel Jurafsky and James Martin, “Speech and Language Processing”, 2nd Edition, PHI
4. Rajeev S., Zevarsky, “Speech processing and Recognition, PHI, 2002
5. Steven Bird, Ewan Klein and Edward Loper. “Natural Language Processing with Python”, O’ Reilly

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-223-V

SUBJECT NAME: DISTRIBUTED OPERATING SYSTEMS (ELECTIVE-1)

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

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THEORY EXAM: 75

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TOTAL: 100

Pre- Requisite: OS

Successive: None

Course Objectives:

1. To understand hardware, software and communication in distributed systems in a broader sense and also the issues in designing the distributed operating systems.
2. To understand communication, process, naming, synchronization, consistency and replication, and fault tolerance.
3. To study Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
4. To study the distributed resource management components.
5. To know the components and management aspects of Real time, Mobile operating Systems.
6. To implement algorithms of distributed shared memory, recovery and commit protocols and address MACH and UNIX operating system in a broader sense.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Familiar with distributed systems design and implementation. They will be exposed to various areas of research in distributed systems and mobile computing systems.
- b. Modify existing open source kernels in terms of functionality or features used. They will also learn about designing and implementing fault tolerant distributed systems.
- c. Understand the mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system. And identify the different features of real time and mobile operating systems.

- d. Aware with the various resource management techniques like the use of distributed shared memory and other resources for distributed systems.
- e. Conduct independent research in distributed systems like MACH, UNIX etc.

Syllabus:

Unit-I INTRODUCTION: Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts, Design issues.

COMMUNICATION IN DISTRIBUTED SYSTEM: Layered protocols, ATM, client server model, remote procedure call, and group communication.

Unit-II SYNCHRONIZATION IN DISTRIBUTED SYSTEM: Clock synchronization, Mutual Exclusion, Election algorithm: the Bully algorithm and Ring algorithm, Deadlock in Distributed Systems, Distributed Deadlock Prevention and Distributed Deadlock Detection.

Unit-III PROCESSES AND PROCESSORS IN DISTRIBUTED SYSTEMS: Threads, System models, Processors Allocation.

DISTRIBUTED FILE SYSTEMS & SHARED MEMORY: Distributed file system Design, Distributed file system Implementation. What is shared memory, Consistency models, Page based distributed shared memory and shared variables distributed shared memory.

Unit-IV CASE STUDY MACH: Introduction to MACH, process management in MACH, Communication in MACH, UNIX emulation in MACH.

Text / Reference Books:

1. Distributed Operating System – Andrew S. Tanenbaum, PHI.
2. P. K. Sinha – Distributed Operating System-Concepts and Design
3. William Stallings: Operating Systems, PHI, Latest Edition.
4. A.S. Tanenbaum: Modern Operating Systems, Latest edition Pearson/PHI.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-224-V

SUBJECT NAME: DATA WAREHOUSING & DATA MINING (ELECTIVE-I)

MCA SEMESTER III

NO OF CREDITS: 4

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SESSIONAL: 25

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Advanced Database Management System

Successive: None

Course Objectives

1. To understand the basic principles, concepts and Applications of data warehousing and data mining.
2. To differentiate Online Transaction Processing and Online Analytical processing
3. Describe the designing of Data Warehousing so that it can be able to solve the problems.
4. Learn Multidimensional schemas suitable for data warehousing along with DMQL
5. To understand various tools of Data Mining and their techniques to solve the real time problems and the task of data mining as an important phrase of knowledge discovery process.
6. To develop further interest in research and design of new Data Mining techniques.

Course outcomes:

Upon successful completion of the course, the students will be able to

- a. Design a data mart or data warehouse for any organization along with OTAP and OLAP
- b. Develop skills to write queries using DMQL and extract knowledge using data mining techniques
- c. Explore recent trends in data mining such as web mining, spatial-temporal mining
- d. Implement data Mining is one step in the whole KDD process.
- e. Apply tools and techniques of data mining in designing of new data mining techniques.

Syllabus:

Unit-I **BASICS CONCEPRS OF DATA WARE HOUSING:** Need for data warehouse, definition, Database Vs data warehouse, Data Mart, Data warehouse architecture, Star, snowflake and galaxy schemas for multidimensional databases, Defining various schemas, fact and dimension data, Concept hierarchies, Metadata repository, back end tools and utilities.

Unit-II **MULTI-DIMENTIONAL DATA MODELLING:** Data warehouse and OLAP technology, multidimensional data model and different OLAP operations, OLAP Servers: ROLAP, MOLAP and HOLAP, Data warehouse implementation, efficient computation of data cubes, processing of OLAP queries, indexing OLAP data.

Unit-III **DATA MINING:** Data Pre-processing: Cleaning, data integration and transformation, data reduction; Data mining concept, task primitives, Types of Data Mining, KDD, Architecture of data mining, Data generation & Summarization based characterization, Analytical characterization, Mining class comparisons, Mining descriptive statistical measures in large databases, Data Mining query language.

Unit-IV **MINING ASSOCIATION RULES IN LARGE DATABASES:** Association rule mining, single dimensional Boolean association rules from Transactional DBS, Multi-level association rules from transaction DBS, multidimensional association rules from relational DBS and DWS, Constraint based association mining.

Classification and Prediction: Classification by decision tree induction, Back propagation, Bayesian classification, classification based on association rules, classifier accuracy, Prediction, Linear and Non-linear regression.

Cluster analysis: Various techniques, Partitioning, hierarchical and density-based methods, Web mining, spatial data mining.

Text / Reference Books:

1. Jiawei Han & Micheline Kamber : Data Mining - Concepts & Techniques, Harcourt India Pvt. Ltd. (Morgan Kaufmann Publishers).
2. W.H. Inmon : Building Data Ware House, John Wiley & Sons.
3. S. Anahory and D. Murray: Data Warehousing, Pearson Education, ASIA.
4. Michall Corey, M. Abbey, I Azramson & Ben Taub: Oracle 8iBuilding Data Ware Housing, TMH.

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-225-V

SUBJECT NAME: SOFTWARE PROJECT MANAGEMENT (ELECTIVE-I)

MCA SEMESTER III

NO OF CREDITS: 4

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SESSIONAL: 25

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Software Engineering

Successive: None

Course Objectives:

1. To understand principles of software project management and learn project planning.
2. To learn different methods and techniques used for project management.
3. To learn about project reporting, defect analysis and prevention.
4. To study various quality assurance techniques.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- a. Understand the issues and challenges faced while doing the Software project Management.
- b. Identify, formulate, review and analyze complex software project management using principles of mathematics.
- c. Understand why majority of the software projects fails and how that failure probability can be reduced effectively. They will completely understand the complete software project planning process.
- d. Perform project Scheduling, tracking, risk analysis, quality management and Project Cost estimation using different techniques and will be able to give quality software by making systematic approach i.e. Software engineering.

Syllabus:

Unit-I **PROJECT MANAGEMENT CONCEPTS:** Management Spectrum, People, Product, Process, Project, W5HH Principle. Problems with software projects, project management and CMM, project management process: planning, execution and closure. Stepwise overview of project planning

Unit-II **SOFTWARE PROJECT PLANNING:** Programme management and project evaluation, Project planning objectives, project planning infrastructure, process planning, Selection of an appropriate process model effort estimation models, estimation techniques: Function Point Analysis, COCOMO, Use case point analysis. Activity planning & Risk Management: project schedules, projects and activities, network planning models, activity on node & activity on arrow networks.

Risk Management: identification, assessment and projection, control, RMMM plan, Measurement and tracking planning, Configuration management: baselines, configuration items, configuration process, version control, change control, configuration audit, SCM standards

Resource allocation: nature of resources, scheduling resources,

Unit-III **PROJECT EXECUTION AND CLOSURE:** project reporting structures, categories of reporting, collecting the data: partial completion reporting, risk reporting. Visualizing progress: Gantt chart, slip chart, Ball charts, Check sheet, Histogram, parito chart, Run Chart, Control Chart, Scatter plot Timeline charts. Earned value analysis, prioritizing monitoring, Project tracking, Milestone analysis, Cost impact of software defects, Defect amplification and removal, Defect analysis and prevention.

Project Closure analysis: role of closure analysis, performing closure analysis, closure analysis report

Unit-IV **SOFTWARE QUALITY ASSURANCE:** Project management vs. quality management, quality concepts, Inspection and Reviews: process, data collection, monitoring and control. Statistical SQA, SQA plan, techniques to help enhance software quality, quality metrics, ISO 9000 standard, BS 6079:1996 standard. **Case Study:** Software Project Management in CMM level 5 organizations

Text / Reference Books:

1. Software project management by Bob Hughes and Mike Cotterell, TMH

2. Software project management in practice by PankajJalote, Pearson Education
3. Software Project management by Sanjay Mahapatra
4. Software Engineering by R.S. Pressman, McGraw Hill
5. Software Testing: Principles and practices by NareshChauhan, Oxford University press, India

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-226-V

**SUBJECT NAME: WEB TECHNOLOGY AND INFORMATION RETRIEVAL
(ELECTIVE-I)**

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

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THEORY EXAM: 75

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TOTAL: 100

Pre- Requisite: Internet Fundamentals

Successive: None

Course Objectives:

1. To learn the elements of Web Search basics, Web Technology and Information Retrieval.
2. To understand the concept of web crawling and its types.
3. To build an understanding of the fundamental concepts of Information Retrieval
4. To familiarize students with the basic taxonomy and terminology of Indices.
5. To understand Heap's Law for estimation and Zipf's law for modeling distribution of terms.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- a. Understand the basic concept of Web search, Search Engines their architecture and various functional components
- b. Understand the basic concept of Web crawlers and their architecture
- c. Identify the different types of indices: inverted index, positional index, bi-word index etc
- d. Apply various language models related to information retrieval

Syllabus:

Unit-I WEB SERVER TECHNOLOGY: Web's Robot global access to information, HTML, HTTP, Accessing a web server, publishing on web server, secure HTTP, Secure Sockets Layer, WWW Proxies, IIS, **Web Search Basics:** Background and history, Anatomy of WWW, Web characteristics, Spam, The web graph, The Web

Search Users, search engines, architecture of search engines, search tools, DNS resolution, The URL frontier, Link analysis, Page Rank.

Unit-II **WEB CRAWLERS:** Basics of Web crawling, various crawling techniques, incremental crawler, parallel crawler, distributed crawlers, focused crawler, agent based crawler, Hidden web Crawler

Unit-III **INTRODUCTION TO INFORMATION RETRIEVAL:** Information retrieval problem, an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval, an inverted index, Bi-word indexes, Positional indexes, Combination schemes

Unit-IV **INDEX CONSTRUCTION:** Hardware basics, Blocked sort-based indexing, Single-pass inmemory indexing, Distributed indexing, Dynamic indexing, Other types of indexes Index compression: Statistical properties of terms in information retrieval, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression, Dictionary as a string, Blocked storage, Postings file compression.

Text / Reference Books:

1. An Introduction to Information Retrieval Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze Cambridge University Press, 2008
2. Information Retrieval – Implementing and Evaluating Search Engines (The MIT Press)by Stefan Büttcher , Charles L. A. Clarke, et al. | 11 March 2016
3. Modern Information Retrieval, by YATES | 1 January 2003
4. The Modern Algebra of Information Retrieval (The Information Retrieval Series)by SándorDominich | 18 April 2008

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-231-V

SUBJECT NAME: ADVANCED WIRELESS AND MOBILE NETWORKS

(ELECTIVE-II)

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

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THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Wireless Communication

Successive: None

Course Objectives:

1. The students should get familiar with the wireless/mobile market and the future needs and challenges.
2. To get familiar with key concepts of wireless networks, standards, technologies and their basic operations.
3. To learn how to design and analyse various medium access control mechanisms.
4. To learn how to evaluate MAC and network protocols using network simulation software tools.
5. The students should get familiar with the wireless/mobile market and the future needs and challenges.

Course Outcomes:

- a. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
- b. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
- c. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
- d. Design wireless networks exploring trade-offs between wire line and wireless links.
- e. Develop mobile Applications to solve some of the real world problems.

Syllabus:

Unit-I INTRODUCTION: Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum

technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

WIRELESS LOCAL AREA NETWORKS: IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues.

Unit-II **WIRELESS CELLULAR NETWORKS:** 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

Unit-III **WiMAX**(Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview.

WIRELESS SENSOR NETWORKS: Introduction, Applications, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

Unit-IV **WIRELESS PANs:** Bluetooth AND Zigbee, Introduction to Wireless Sensors.

Text / Reference Books:

1. Schiller J., Mobile Communications, Addison Wesley 2000.
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005.
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and ImrichChlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-232-V

SUBJECT NAME: NETWORK SECURITY (ELECTIVE-II)

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

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THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Computer Networks

Successive: None

Course Objectives

1. To understand the basic concept of Cryptography, Network Security and their mathematical models.
2. To understand various types of ciphers, DES, AES, message Authentication, digital Signature System and key management protocols.
3. To impart knowledge of major issues in network and computer system security, focusing mainly on threats from malicious software.
4. To understand common attacks on computer networks and methods to detect and remediate such attacks.
5. To acquire knowledge about network security tools and authentication Applications and public key cryptographic algorithms.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Understand theory of fundamental cryptography, encryption and decryption algorithms and using concepts of mathematics in applying these algorithms.
- b. Create, select and apply appropriate encryption techniques and modern engineering and IT tools for software security.
- c. Design and develop cryptosystems using advanced security algorithms.
- d. Apply the cryptosystems so far learned to build information and network security mechanisms.

Syllabus:

Unit-I **INTRODUCTION:** What is security?, Need of security, Why is security so hard?, various goals of security, Difference between Vulnerability, Threats, Attacks and control, Security goals, aspects of security, security services, security attacks, **Encryption Techniques:** Terminology of encryption, Requirement of encryption, cryptography, cryptanalysis, cryptanalytic attacks, symmetric ciphers: Substitution ciphers, Transposition ciphers, Data Encryption Standard (DES, Advanced Encryption Standard (AES), location of encryption devices, key distribution, Public Key Cryptography and RSA, Diffie-Hellman Key Exchange, Message Authentication and Hash Functions, MD5, SHA

Unit-II **NETWORK SECURITY:** Security services, Message confidentiality, Message integrity, message authentication, digital signature, entity authentication. **Authentication Applications:** Kerberose 95, X.509 Authentication service, Public key infrastructure. **Electronic mail Security:** Preety Good Privacy (PGP), **IP Security:** IP security overview, IP security architecture, Authentication header, Encapsulating security Payload, Combining security associations, Key management.

Unit-III **SECURITY ATTACKS IN MANET:** Security issues in MANET, Attacks in MANET: External Attack, Internal attack, Black hole attack, warm hole attack, grey hole attack, Byzantine attack, Sleep Deprivation attack, Flooding attack: RREQ flooding attack, Data flooding Attack.

Unit-IV **SECURITY ATTACKS IN WIRELESS SENSOR NETWORKS:** Security issues in WSN, Attacks in WSN: Attack against Security mechanism, Attack against basic mechanism like routing: Spoofed, altered, or replayed routing, Information, Selective forwarding, Sinkhole attacks, Sybil attacks, Wormholes, HELLO flood attacks.

Text / Reference Books:

1. William Stalling, Cryptography and Network Security, 3rd Edition. PHI New Delhi
2. William Stalling, Network Security Essentials, 2nd Edition. PHI New Delhi
3. Charles P. Pfleeger, Security in computing, 4th Edition Pearson, New Delhi
4. KazemSohrary, Wireless sensor networks, Technology, Protocols and Applications, Wiley Publishers

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-233-V

SUBJECT NAME: MOBILE COMPUTING (ELECTIVE-II)

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

L P T

THEORY EXAM: 75

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TOTAL: 100

Pre- Requisite: IWD

Successive: None

Course Objectives:

1. To understand concept of wireless communication along with its history, Applications, cellular system and its design, handoff strategies.
2. To understand the basic concepts of mobile computing.
3. To learn the basics of mobile telecommunication system .
4. To be familiar with the network layer protocols and Ad-Hoc networks.
5. To know the basis of transport and Applications layer protocols.
6. To gain knowledge about different mobile platforms and Applications development.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Understand the concept of wireless communication, its advantages over traditional wired network communication, different Applications of wireless communication system.
- b. Familiar with GSM, GSM system architecture, GSM protocol architecture, handover procedure and security.
- c. Understand the use of different protocols in network, Applications and transport layer.
- d. Gain the knowledge about real time Applications and security issues related to mobile devices.

Syllabus:

Unit-I	BASICS OF WIRELESS COMMUNICATIONS AND MOBILE COMPUTING :Examples of wireless communication systems, paging systems, Cordless telephone systems, comparison of various wireless systems, Generations of Wireless systems, Introduction to mobile computing, issues in mobile computing, impacts of mobility and portability in wireless communication.
Unit-II	Client Hardware (Desktop Vs. Mobile), Andriod Development, IOS Development, Creating and incorporating Web/ Cloud Services. Mobile Sensors, Security & Trust Management, Privacy and Ethics
Unit-III	TRANSPORT AND APPLICATIONS LAYER: Mobile IP, DHCP, Adhoc, Proactive protocol-DSDV, Reactive Routing Protocols-DSR, AODV, Hybrid Routing-ZRP, Multicast Routing-ODMRP, Vehicular Ad Hoc Networks(VANET), MANET Vs VANET Security, Mobile TCP, WAP architecture, WTA Architecture.
Unit-IV	MOBILE PLATFORMS AND APPLICATIONS: Mobile Device Operating System, Commercial Mobile Operating System, Software Development Kit, IOS, Android, Windows Phone, MCommerce, Mobile payment System, Security Issues.

Text / Reference Books:

1. Wireless Communications: Theodore S Rappaport; Pearson
2. Mobile Cellular Telecommunication: W.C.Y. Lee; McGraw Hill
3. Mobile Communications: Jochen Schiller; Pearson
4. Wireless and Mobile Network Architectures: Yi-Bing Lin, WILEY

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-234-V

SUBJECT NAME: DIGITAL IMAGE PROCESSING (ELECTIVE-II)

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

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THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Basic Mathematics

Successive: None

Course Objectives:

1. To learn the fundamental concepts and Applications of digital image processing.
2. To understand the elements of visual perception.
3. Understanding of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
4. To understand of 2D Fourier transforms concepts.
5. To understand of the fundamental image enhancement algorithms such as histogram equalization and specification techniques, Color image enhancement etc.
6. To understand the concepts of and how to perform Image restoration and reconstruction, image compression and image segmentation methods.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. The student will able to learn the fundamental concepts of digital image processing.
- b. The student will able to understand the Applications of image processing in real world.
- c. The student will able to understand the elements of visual perception.
- d. The student will able to acquire the basic knowledge of two-dimensional signal acquisition, sampling, quantization, and concepts of 2D Fourier transform.
- e. The student will able to understand the fundamental image enhancement algorithms and the concepts of Image restoration and reconstruction and the image compression and image segmentation methods

Syllabus:

Unit-I **DIGITAL IMAGE FUNDAMENTALS:** Components of Image Processing System, Fundamental Steps in Digital Image Processing, Image Processing Applications, Element of Visual Perception, brightness, contrast, hue, saturation, Sampling and Quantization, dither, Colour image fundamentals RGB, HSI models. Two-dimensional mathematical preliminaries, 2D Transforms - DFT, DCT, KLT, SVD.

Unit-II **IMAGE ENHANCEMENT :** Histogram, equalization and specification techniques, noise, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

Unit-III **IMAGE RESTORATION:** Model of Restoration Process, Unconstrained Restoration, Constrained Restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations, spatial transformations.

Unit-IV **IMAGE SEGMENTATION AND COMPRESSION:** Segmentation Introduction – Region based and Edge based techniques, Edge Detection, Edge Operators, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Region-Based Approach, Region Growing Based Segmentation, Region Splitting, and Region Merging. Need for data Compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Text / Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Pearson 2002.
3. Kenneth R. Castleman, 'Digital Image Processing', Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
5. D,
E. Dudgeon and RM. Mersereau, 'Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt, 'Digital Image Processing', John Wiley, New York, 2002
7. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brooks/Cole, Vikas Publishing House, 2nd edition, 1999,

MASTER OF COMPUTER APPLICATIONS

CODE: MCA-235-V

SUBJECT NAME: OPEN SOURCE TECHNOLOGY - (ELECTIVE-II)

MCA SEMESTER III

NO OF CREDITS: 4

L P T

4 0 0

SESSIONAL: 25

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: None

Successive: None

Course Objectives:

1. To introduce open source technology for development of web Applications.
2. For Understand and use the basic and Advanced HTML to create Web pages.
3. To understand open source scripting language for programming in web environment i.e. PHP.
4. To study the open source management system and connection with database.
5. To learn open source web server, software tools.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a. Understand the basic and Advanced HTML and apply to create web pages.
- b. Understand the basic syntax of PHP, common PHP scripts elements.
- c. Implement the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
- d. Familiar with different web Servers and software tool and process like Eclipse IDE, Selenium ID.

Syllabus:

Unit-I INTRODUCTION OPEN SOURCE TECHNOLOGY AND HTML: The need of open Sources, advantages of Open sources Applications. **Basic HTML:** Semantic,

Syntactic based styles, Style type usage, Headers and footers, Lists, Tables Advanced HTML: Frames, Forms, CGI Scripts, Dynamic documents, HTML Tools. Cascading Style Sheets: In- line Style, Internal Styles, and External Styles. Introduction to java Script, Validation by using java Script, Introduction to XML.

Unit-II OPEN SOURCE SCRIPTING LANGUAGE INTRODUCTION:What is PHP? - Basic Syntax of PHP – programming in web environment - Common PHP Script Elements - Using Variables - Constants – Data types - Operators ; Statements - Working With Arrays -Using Functions – OOP - String Manipulation and Regular Expression , **File and Directory Handling , Working With Forms ,** Introduction to advanced PHP concepts

Unit-III OPEN SOURCE DATABASE MANAGEMENT SYSTEM:
MYSQL: Introduction - Setting up an account - Starting, Terminating and writing your own MySQL Programs - Record Selection Technology - Working with Strings - Date and Time - Sorting Query Results module - Generating Summary - Working with Metadata - Using Sequences – MySQL and Web **PHP and SQL database:** PHP and LDAP ; PHP Connectivity ; Sending and receiving emails , **PHP Database Connectivity:** Retrieving data from MySQL - Manipulating data in MySQL using PHP

Unit-IV WEB SERVER : Apache Web server – Working with web server – Configuring and using apache web server, WAMP server, Lighttpd, Fnord, Nginx, Savant, tornado.
Open Source Software tools and Processors: Introduction – Eclipse IDE Platform – Compilers – Model driven architecture tools – Selenium ID – Features and uses Government Policy toward Open Source (E- Governance) – Wikipedia as an open Source Project
Case Studies: Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC, Open Office.

Text / Reference Books:

1. The Linux Kernel Book RemCard,Eric Dumas and Frank Mevel Wiley Publications sons, 2003
2. MySQL Bible Steve Suchring John Wiley sons, 2002
3. Programming PHP Rasmus Lerdorf and Levin Tatroe O'Reilly Publications, 2002
4. Fundamentals of the Internet and world wide web, Raymond Greenlaw and Ellen Hepp.

MASTER OF COMPUTER APPLICATIONS

SUBJECT NAME: HIGH SPEED NETWORKS (ELECTIVE-II)

CODE: MCA-236-V

MCA SEMESTER III

NO OF CREDITS: 4

SESSIONAL: 25

L P T

4 0 0

THEORY EXAM: 75

TOTAL: 100

Pre- Requisite: Computer Networks

Successive: None

Course Objectives:

1. To make the students familiar with High Speed Network technologies.
2. To make students aware of advantages and disadvantages of high speed technologies.
3. Study of techniques available for congestion control traffic management.
4. How to make congestion control in TCP and ATM.
5. To study integrated and differentiated services architecture.
6. Protocols for high speed communication

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- a. Understand basic high speed networks like Frame relay and ATM.
- b. Familiar with advantages and disadvantages of high speed network.
- c. Aware of congestion control traffic management techniques.
- d. Aware of TCP and ATM congestion control techniques.
- e. Use the functionality of integrated and differentiated services architecture.
- f. Familiarity with various high speed protocols currently available.

Syllabus:

Unit-I HIGH SPEED NETWORKS: Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel, Wireless LANs: Applications, requirements, Architecture of 802.11

Unit-II **CONGESTION AND TRAFFIC MANAGEMENT:** Queuing Analysis, Queuing Models, Single Server Queues, Effects of Congestion, Congestion Control, Traffic management, Congestion Control in Packet Switching Networks, Frame Relay Congestion Control.

Unit-III **TCP AND ATM CONGESTION CONTROL** **TCP:** Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO backoff, KARN's Algorithm, Window management, Performance of TCP over ATM. **Traffic and Congestion control in ATM , Requirements , Attributes , Traffic Management Frame work, Traffic Control, ABR traffic Management , ABR rate control, RM cell formats, ABR Capacity allocations, GFR traffic management.**

Unit-IV **INTEGRATED AND DIFFERENTIATED SERVICES,** Integrated Services Architecture, Approach, Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services**PROTOCOLS FOR QOS SUPPORT** **RSVP** – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms, Multiprotocol Label Switching – Operations, Label Stacking, Protocol details , RTP, Protocol Architecture, Data Transfer Protocol, RTCP.

Text / Reference Books:

1. William Stallings, “HIGH SPEED NETWORKS AND INTERNET”, Pearson Education, Second Edition, 2002.
2. Warland&PravinVaraiya, “HIGH PERFORMANCE COMMUNICATION NETWORKS”, Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
3. IrvanPepelnjk, Jim Guichard and Jeff Apcar, “MLS and VPN architecture”, Cisco Press, Volume1 and 2, 2003.

BRIDGE COURSE

SYLLABUS

MASTER OF COMPUTER APPLICATIONS

CODE: BRI -01

SUBJECT NAME: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

MCA Bridge Course

NO OF CREDITS: 4

SESSIONAL: 30

L P T

4 0 0

VIVA VOCE: 20

TOTAL: 50

Pre- Requisite: None

Successive: None

Course Objective

1. To understand Set, Relations and their types, Equivalence and Partial Order relations, POSET, HASSE Diagrams and Lattices.
2. To learn functions their types, Composition and Recursively defined function.
3. To provide an understanding of the basic concepts in probability theory.
4. To introduce the idea of applying differential and integral calculus.

Course Outcome

Upon successful completion of the course, the student will be able to:

- a) Apply set theory, functions, relations and lattices to solve computational problem.
- b) Familiar with the basic of the probability, differential and integral calculus

Syllabus:

Introduction to Sets, Operation on Sets, Relations, Properties of Binary relation, Matrix representation of relations, Equivalence relations, Partial order relation., Introduction, Partially Ordered Set, Hasse diagram, well ordered set, Lattices, **Function:** Types, Composition of function, Recursively defined function , **Basic Probability:** Discrete probability, Probability spaces, addition Principle, conditional probability, Multiplication rule, independence; Discrete random variables, Independent random variables, the multinomial distribution, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, **Calculus :** Evolutes and involutes; Evaluation of definite and improper integrals, Information to Integration ; Introduction to derivative, Rules of finding derivatives.

Text / Reference Books:

1. Discrete Mathematics by SwapankumarChakraborty, bikasKantiSarkar ,Oxford University Press
2. C.L.Liu: Elements of Discrete Mathematics McGraw Hill.
3. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series.
4. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi. 4.
5. Trembley, J.P. & R. Manohar: Discrete Mathematical Structure with Applications to Computer Science, TMH.
6. Kenneth H. Rosen : Discrete Mathematics and its Applications, TMH
7. Doerr Alan &Levasseur Kenneth; Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd

MASTER OF COMPUTER APPLICATIONS

CODE: BRI-02

SUBJECT NAME: INTRODUCTION TO PROGRAMMING LANGUAGES

NO OF CREDITS: nil	SESSIONAL: 30
L P T	VIVA: 20
4 0 0	TOTAL: 50

Pre- Requisite: None

Successive: None

Course Objectives:

- a. The course is designed to give basic introduction about the syntax of programming language.
- b. The aim is to impart knowledge about object oriented paradigm in programming languages.
- c. To understand the difference between the programming language such as C, C++ and JAVA.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Knowledge of, and ability to use, language features used in current programming languages.
2. An ability to program in different language paradigms and evaluate their relative benefits.
3. An understanding of the key concepts in the implementation of common features of programming languages.

Syllabus:

BASICS OF PROGRAMMING LANGUAGE: Understand and use the basic programming language and its types, their Characteristics, Basic constructs of C, Operators (arithmetic, logical, relational, bitwise, conditional etc), Expressions, Data types, Input-Output Library Functions, Control statements, Arrays, Strings, Functions (user defined), Recursion, Simple C programs.

INTRODUCTION TO C++ AND JAVA LANGUAGE: introduction about object and class in C++, Added Features of C++, Characteristics of Java, need for JAVA.

Text/ Reference Books:

8. Let Us C, 16TH EDITION by YashavantKanetkar, BPB publications.
9. C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall
10. Object Oriented Programming in Turbo C++ by Robert Lafore ,1994, The WAITE Group Press.
11. Herbert Schildt, —Java, The complete reference, 8th Edition, McGraw Hill Education, 2011.

MASTER OF COMPUTER APPLICATIONS

CODE: BRI-03

SUBJECT NAME: FUNDAMENTAL OF COMPUTER SYSTEM, INTERNET & WEB

NO OF CREDITS: 4	SESSIONAL: 30
L P T	VIVA VOCE: 20
4 0 0	TOTAL: 50

Pre- Requisite: None

Successive: None

Course Objectives:

- a. The course is designed to aim at imparting basic level computer knowledge to those students who have NON-IT background.
- b. To understand the basics of fundamentals of computer hardware, software and its components.
- c. To understand the use of operating system and its various functions
- d. To understand, how to explore the Internet, web resources and their use.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Use the computer for basic purposes and known to its components.
2. Demonstrate the use of Operating system
3. Familiarize with basic knowledge about data communications, the Internet and web resources.

Syllabus:

BASICS OF COMPUTERS: What is Computer, Basic Applications of Computer; Components of Computer System, Input/Output Devices, Computer Memory, Concepts of Hardware and Software; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.

OPERATING SYSTEM: What is an Operating System; Basics of Popular Operating Systems; Functions of Operating Systems, Basics of O.S Setup; Common utilities.

INTRODUCTION TO INTERNET & WEB: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is

ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing software

Text/ Reference Books:

1. Handbook of Computer Fundamentals by Nasib Singh Gill, 2016 edition.
2. Deborah Morley and Charles S. Parker; Fundamentals of Computers; Cengage Learning, India edition; 2009.
3. New Perspectives on Computer Concepts: Comprehensive, 20/e, J. Parsons, Cengage Learning, 2018, ISBN- 9781305951495
4. Fundamentals of Computers Paperback by Rajaraman V, Adabala N, 17 december 2014, PHI publications

MASTER OF COMPUTER APPLICATIONS

CODE: BRI -04

SUBJECT NAME: INTRODUCTION TO WEB TECHNOLOGY

MCA Bridge Course

NO OF CREDITS: 4

SESSIONAL: 30

L P T

4 0 0

VIVA VOCE: 20

TOTAL: 50

Pre- Requisite: None

Successive: None

Course Objective:

1. To understand basic computer network technology, Data Communications System and its components
2. To learn fundamental language of internet i.e. HTML and cascading style sheets
3. To learn basics of client side JavaScript language

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- a) Acquire knowledge about basic computer network technology, Data Communications System and its components
- b) Hand on practice on HTML and learned the need and basics of CSS and the concepts of client side JavaScript

Syllabus:

Unit -1Introduction to Computer Network: Computer Network, Needs of data Transmission, Modems and its type, **Communication channels** : Wire cable, Microwave, Fiber optics, Communication Satellites, Laser Beams, Radar **Communication Channel Configurations:** point to point and multipoint configuration **Channel Sharing:** Multiplexing, Concentration, Controlling , Introduction to bridges, Routers, Gateways, hub, IP address. **Introduction To Internet And WWW:** Hypertext Transfer Protocol (HTTP), URL, HTML: Internet Language, Understanding HTML, Create a Web Page, Linking to other Web Pages, Publishing HTML Pages, Text

Alignment and Lists, Text Formatting Fonts Control, E-mail Links and link within a page, Creating HTML Forms. Introduction to DHTML, XML, CSS, Java Script.

Text / Reference Books:

1. Essentials of Computer and Network Technology, Nasib S. Gill Khanna book publishing co. ltd
2. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
3. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
4. Fundamental of Internet and world wide web by Raymond Greenlw and Ellen Hepp , Tata McGraw –hill Education

AUDIT COURSES

SYLLABUS

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-307-V

SUBJECT NAME: GERMAN- I

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To introduce the script of German Language
2. To make students familiar with the pronunciation of basic German words
3. To learn basic vocabulary of German.
4. To make student familiar with grammar of German

Course Outcomes:

Upon successful completion of the course, the student :

- a. Learned the script of German Language
- b. Will be aware of pronunciation of basic German words.
- c. Learned vocabulary of German language.
- d. Will be able to apply the grammar rules in sentences and paragraph writing.

Unit-I Introduction

Basic Greetings in German

Unit-II Counting 1-100

Basic questions in German

Introduce yourself

Unit-III Personal Pronouns

Verb conjugations (regular verbs)

Unit-IV Articles- der, die, das

Vocabulary (classroom objects with articles)

Unit-V Days, months, seasons + im/am

Time (formal & informal)

Counting 1000+

Unit-VI Verb Conjugations (Irregular verbs)

Separable Verbs

Reference Books:

1. Netzwerk A1 by Paul Rusch
2. Studio d A1 by Funk, Kuhn, Demm

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-308-V

SUBJECT NAME: GERMAN- II(WITH GERMAN-I AS PRE-REQUISITE)

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY

EXAM: 75

2 0

TOTAL: 100

Duration of Exam: 3 hrs

Course Objectives:

1. To introduce the advance Grammar of German Language
2. To develop good writing skills in German language through paragraphs and emails
3. To make student converse in German Language through group discussions

Course Outcomes:

Upon successful completion of the course, the student:

- a. Will be able to apply the grammar rules in sentences and paragraph writing
- b. Will be able to write emails and paragraphs in German
- c. Will be able to communicate in German language.

Unit-I Hobbies

Professions

Unit-II Family

Possessive pronouns and articles

Unit-III Nominative and Accusative case

Definite and indefinite articles in German

Unit-IV Articles- der, die, das

Vocabulary (classroom objects with articles)

Unit-V Modal Verbs

Imperative

Unit-VI W-questions

Introduction

Reference Books:

1. Netzwerk A1 by Paul Rusch
2. Studio d A1 by Funk, Kuhn, Demme

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-309-V

SUBJECT NAME: FRENCH I

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0

TOTAL: 100

Duration of Exam: 3 hrs.

Each lesson is divided into three parts which consist of Dialogue, Vocabulary and Grammar.

Course Objectives:

1. To introduce the script of French Language
2. To make students familiar with the pronunciation of basic French words
3. To learn basic vocabulary of French.
4. To make student familiar with grammar of French

Course Outcomes:

Upon successful completion of the course, the student :

- a. Learned the script of French Language
- b. Will be aware of pronunciation of basic French words.
- c. Learned vocabulary of French language.
- d. Will be able to apply the grammar rules in sentences and paragraph writing.

Unit I: OBJECTIFS COMMUNICATIFS

- S'initiera à la culture française
- Decrire une personne
- Dire la nationalité
- Parler des saisons
- Localiser des objets
- Demander et donner des goûts et des préférences

Unit II: GRAMMAIRE/VOCABULAIRE

- Les verbes en (er)
- Les pronoms sujets
- Les articles définis
- Le corps humain

- Lesverbesen(ir)
- Lesarticlesinde'finis
- Lanegation
- Lesverbesen(ger)
- Lefe'minimetrepluriel
- Lesexpressionsavecfaire
- Les(nombres)(1-100)
- Lesprepositions
- L'interrogations
- Lesverbsen(re)etirreguliers
- Lesrepasfrancais
- Lesadjectifspossessifs
- De'crieuneville

References:

1. APPRENONS LE FRANCAIS Methode de Francais by MahithaRanjit , Monica Singh
2. LE NOUVEAU SANS FRONTIERES Methode de FrancaisbyPhilippeDomonique, Jacky Girardet
3. Took reference from BhartiaVidyaBhawan institute of foreign languages.

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-310-V

SUBJECT NAME: FRENCH II (WITH FRENCH-I AS PRE-REQUISITE)

MCA SEMESTER II

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0 0

TOTAL: 100

Duration of Exam: 3 hrs.

Each lesson is divided into three parts which consist of Dialogue, Vocabulary and Grammar.

Course Objectives:

1. To introduce the advance Grammar of French Language
2. To develop good writing skills in French language through paragraphs and emails
3. To make student converse in French Language through group discussions

Course Outcomes:

Upon successful completion of the course, the student :

- a. Will be able to apply the grammar rules in sentences and paragraph writing
- b. Will be able to write emails and paragraphs in French
- c. Will be able to communicate in French language.

Description du matériel

Unit-I: OBJECTIFS COMMUNICATIFS

- S'initiera à la culture française
- Salut
- Parler de la quantité
- Décrire une personne
- Parler de la famille
- Décrire la journée
- Dire l'heure
- Parler des saisons
- Interroger sur/Parler de la santé

Unit-II: GRAMMAIRE/ VOCABULAIRE

- Les verbes en (er, ir, re)
- La négation
- Les articles
- Les adverbes de quantité
- La féminin et le pluriel des noms et des adjectifs
- La position des adjectifs
- L'infinitif après un autre verbe
- Les membres de la famille
- Les verbes pronominaux
- Les nombres cardinaux et ordinaux
- Les saisons, les jours de la semaine et les mois de l'année
- La forme interrogative
- Les expressions avec (avoir)
- Les animaux
- Les couleurs

References:

1. a) APPRENONS LE FRANCAIS Méthode de Français by Mahitha Ranjit, Monica Singh
b) LE NOUVEAU SANS FRONTIERES Méthode de Français by Philippe Domonique, Jacky Girardet
2. Took reference from Bhartia Vidya Bhawan institute of foreign languages.

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-104-V

SUBJECT NAME: SANSKRIT - I

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0 0

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To introduce the script of Sanskrit Language
2. To make students familiar with the pronunciation of basic Sanskrit words
3. To learn basic vocabulary of Sanskrit.
4. To make student familiar with grammar of Sanskrit.

Course Outcomes:

Upon successful completion of the course, the student :

- a. Learned the script of Sanskrit Language
- b. Will be aware of pronunciation of basic Sanskrit words.
- c. Learned vocabulary of Sanskrit language.
- d. Will be able to apply the grammar rules in sentences and paragraph writing.

ईकाई-1: सस्कृतवर्भारा, वर्-ववच्छद, सांशब्द-नलूग, स्रीलरग, नन्नसकलरग, सवनाभ, क्रिमा-नद.

ईकाई-2: सखा-१८५०, धातरून-रट्टकायएवरट्टकाय(अस, नद, गभ), अव्ममन्नरयचम.

ईकाई-3: धातरून-
रट्टकाय(अस, नद, क), परोंकनाभ, सलज्जमोंकनाभ, नक्षमोंकनाभ, ईशवन्दना(कवर अर्).

ईकाई-4: कायकएवउननदववबलततन्नरयचम, प्रत्यम-तभन, तत्वा.

ईकाई-5: शब्दरून-फारक, कंा, नदी, सववता, पर, वं, धातरून-रोट्टकाय(अस, नद, गभ), सभमरखन.

ईकाई-6: सभास-तलरूष, अन्नठितगदमाश, अशदधध-शोधन, वातम-यचना.

क्रकताफः

1. दीनभणका, न्मसयस्वतीहाउसप्रा.लर., इडिमा.

2. भणकासस्कृतव्याकयर्, सयस्वतीहाउसप्रा.लर., इडिमा

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-312-V

SUBJECT NAME: SANSKRIT- II(WITH SANSKRIT-I AS PRE-REQUISITE)

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0 0

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To introduce the advance Grammar of French Language
2. To develop good writing skills in French language through paragraphs and emails
3. To make student converse in French Language through group discussions

Course Outcomes:

Upon successful completion of the course, the student :

- a. Will be able to apply the grammar rules in sentences and paragraph writing
- b. Will be able to write emails and paragraphs in French
- c. Will be able to communicate in French language.

इकाई-1: सस्कृतवर्भारा, वर्-ववन्मास एव समोजन, एक-दवव-अनक, स्वयसलन्ध (दीघसलन्ध, गर्सलन्ध, वदधधसलन्ध, मर्सलन्ध, नवरून्नसलन्ध).

इकाई-2: समततायांन, सख्मा-१८४ (तीनोंलरगो), शब्दरून्नप्रकयर्-अकायान्तन्नलरग, अकायान्तसीलरग, अकायान्तन्नसकलरग.

इकाई-3: नमामांः एव भववन्ममांः, साप्ताठहकठदनोंकनाभ, सख्मा-५०स१००, ईशवन्दना (कवर अर).

इकाई-4: प्रत्यम-८मन्न, तव्मत, सभमरखन, सभास-कभधायम.

इकाई-5: धातरून्नप्रकयर्, व्यजनसधध-भोऽनस्वायसधध, अनस्वायसधध, छत्वभसधध, जश्तत्वभसधध, शतचत्वभसधध, षत्वभसधध.

इकाई-6: अन्नठितगदमाश, अशदधध-शोधन, वातारान्न, वातम-यचना, वाच्मनरयवतन.

क्रकताफः

1. दीनभणका, न्मसयस्वतीहाउसप्रा.लर., इडिमा.

2. भण्कर्सस्कतव्माकयर्, सयस्वतीहाउसप्रा.लर., इडिमा.

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-303-V

SUBJECT NAME: PERSONALITY DEVELOPMENT

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0 0

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objective:

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

CourseOutcomes:

Upon successful completion of the course, the student :

- a. Will be able to achieve the goal.
- b. Will be able to achieve the balance in all situations of life.
- c. Will be able to take their decisions in all spheres of life

Syllabus:

Unit-I: Neeti satakam-Holistic development of personality Verses- 19,20,21,22 (wisdom)
Verses- 29,31,32 (pride & heroism)
Verses- 26,28,63,65 (virtue)
Verses- 52,53,59 (don't's)
Verses- 71,73,75,78 (do's)

Unit-II: Approach to day to day work and duties.

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
Chapter 3-Verses 13, 21, 27, 35,
Chapter 6-Verses 5,13,17, 23, 35,
Chapter 18-Verses 45, 46, 48.

Unit-III: Statements of basic knowledge.

ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model.ShrimadBhagwadGeeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39Chapter18 – Verses 37,38,63

References:

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (PublicationDepartment), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
3. Rashtriya Sanskrit Sansthanam, New Delhi.

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-313-V

SUBJECT NAME: INTERVIEW AND GROUP DISCUSSION SKILLS

NO OF CREDITS: 0

SESSIONAL: 25

L T P

THEORY EXAM: 75

2 0 0

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To enhance the Analytical and reasoning skills of students through case studies
2. To enhance communication skills of students through group discussions in interviews
3. To make students learn how to improve confidence level in unfavorable situations.
4. To make student understand the importance of body gestures, eye contact, self control during Group discussions and interviews.

Course Outcome:

Upon successful completion of the course, the student :

- a. Will be able to analyze the situation in a better way and correspondingly take decisions and reasoning skills of students through case studies
- b. Will be able to communicate better in a team.
- c. Will be able to develop confidence in all situations.
- d. Will be able to present themselves in better way in interviews.

Syllabus:

Quality of Content

- Comprehension of core idea
- Real life examples
- Data generation
- Reasoning

Vision /Goal Orientation

- Driving towards issue resolution
- Intelligent use of others' content

Personality

- Attitude
- Leadership
- Influencing ability
- Rapport building
- Participation
- Team

Confidence

- Motivation
- Activeness
- Energy
- Sense of humour

Communication

- Articulation
- Fluency
- Listening
- Body language
- Eye Contact

Types of G.D

- Factual Topics
- Controversial Topics
- Abstract Topics

Interview Skills

- Common Interview Questions
- What Employers Want
- Attitude and Effort
- Body Language
- Research
- The Mock Interview
- Phone Interviews
- Behavioral Interviews
- Closing the Interview
- Thank You Notes

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-117-V

SUBJECT NAME: YOGA AND MEDITATION

NO OF CREDITS: 0

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SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Duration of Exam: 3 hrs.

Course Objective:

1. To make students learn about basics of yoga and its different levels.
2. To make students learn about meditation and its relation with yoga.
3. To make students learn about benefits of pranayama.
4. To make students learn about various aasans.

Course Outcomes:

1. Students will be able to adapt yoga and good food habits in their daily life.
2. Students will be able to relax their soul by meditation.
3. Students will be able to live a healthy life by performing pranayama.
4. Students will be able to perform different aasans.

Unit-I: Introduction to yoga and its different levels, food habits, Sanskar of a yogi, PatanjaliYogsutra, its importance in life, benefits and history of yoga.

Unit-II: Meditation and its relation with yoga, mind relaxation, development of morality and ethics, prayer and its meaning, its importance in life, benefits and history of meditation.

Unit-III: Pranayam and its introduction, types of pranayam, breathing exercises, preliminary preparation before pranayam, its importance and benefits in life.

Unit-IV: Practice of different types of Pranayam: Anulom-Vilom, Kapalbhati, NadiShodhan, Agni Sar, Bhastrika, Bharamari etc.

Unit-V: Mantra and their importance, introduction to some chanting mantras, practicing some of mantrasGayatri Mantra, NamokarJaap etc.

Unit-VI: Aasan and their types, benefits of different aasans, practicing of different aasans:
Padamaasan, surya-namaskar, tadaasan, navaasan, gomukhaasan, bhujangaasan etc.

Reference Books:

1. PatanjaliYogsutra
2. YogManjari

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-314-V

SUBJECT NAME: ART OF LIVING/ LIFE SKILLS

NO OF CREDITS: 0

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SESSIONAL: 25

THEORY EXAM: 75

TOTAL: 100

Duration of Exam: 3 hrs.

Pre-requisites:

1. Getting up early in the morning, bathing, and meditation before sunrise
2. Following of five **Yamas** and five **Niyamas**
3. Avoiding 7 great sins
4. Some control over food (avoiding wine etc.)
5. Knowledge of Sanskritam

CourseObjective:

1. To make student learn about basics of Yoga.
2. To make students learn about Vedas.
3. To make students learn about Vedic routine.
4. To make students learn about Vedic science and technology.

CourseOutcome:

1. Students will be able to apply Vedic science.
2. Students will be able to adapt general manners in their life.
3. Students will be able to adapt Vedic routine in their daily life.
4. Students will be able to apply Yogas for self realization.

Syllabus:

Unit-I: **IMPORTANCE** Solution to present day problems: terrorism, pollution, personal, family, social, health, mental etc.; attainment of physical comforts, security, good governance, healthy environment etc.; bliss (ananda) of Yoga, getting rid of all miseries forever (Moksha); Why Vedic way? Vedas the oldest scriptures, word of the creator, fountain head of all religions; virtuous actions/Dharma, Pure ("Shudha") Manusmriti; practical example – Valmiki Ramayanam (pure); evidences from Veda, Manusmriti (pure), Valmiki Ramayanam (pure), NASA findings etc.

Unit-II: **VEDIC ROUTINE DAILY** Brahmajanya : Sandhya- vandanam - Place, time, duration, dress, posture, achamanam, pranayama, japa, benefit, evidences,

reading of veda/sāstra; Deva-yajnya: place, time, material; Balivaisvadevayajnya; daily livelihood / or as per āshrama requirement; “Yamas” – Ahinsa, satya, asteya, brahmacharya, aparigraha; “Niyamas” – shaucha, santosha, tapah, swadhyaya, ishwarapranidhanam; significance and impact on personal and social life.

Unit-III: **GENERAL MANNERS** Respecting the elders (specially the parents and the teacher), not to throw excreta or other impure things into water or fire, avoiding anger with an angry person etc.

Unit-IV: **VEDIC LIFE ROTINE** Four ashramas – brahmacharya, grihastha, vanaprastha, sanyāsa, duties in each.

Unit-V: **SANSKARAS:** 16 sanskāras (from conception till death) for the betterment of physical (sthūlasariram) and mental health (SūkshmaSariram), institution of marriage – virginity, age difference, sincerity towards each other etc.

Unit-VI: **Great sins (“MahāPātaka”)** and **“Prāyaschittam”**: Seven great sins – abortion, adultery, drinking wine, livelihood on interest, speaking lie after lie in the court of virtuous men, stealing gold, killing a scholarly person.

Unit-VII: **Self Realization:** The greatest achievement, becoming immortal (Moksha), ashtanga yoga.

Unit-VIII: **Vedic Science and Technology:** Proper town planning as per the Vedic texts to meet the above objectives (good governance), some fundamentals from Vedic science to understand the Vedic art of living.

Unit-IX: **Tips from Ayurveda for good health:** Drinking water after getting up from bed, very light dinner, fresh warm food, cow's products etc.

Reference books:

1. Rigveda- Sakalsakha, Yajurveda- MadhyandinSakha
2. SatapathaBrahmanam
3. Manusmriti (“Shudha”)
4. ValmikiRamayanam (“Shudha”)
5. Samarangana Sutra Dhara
6. VaisesikaDarsanam, Yoga Darsanam
7. SusrutSanhita

MASTER OF COMPUTER APPLICATIONS

CODE: VAC-307-V

SUBJECT NAME: CONTRIBUTION OF NSS TOWARDS NATION/ ROLE OF NSS

NO OF CREDITS: 0

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SESSIONAL: 25

THEORY EXAM: 75
TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To make student learn about youth leadership.
2. To make students learn about the importance and role of youth leadership.
3. To aware students about life competencies and help in decisionmaking.
4. To motivate student for social harmony and national integration.

Course Outcomes:

1. Students will be able to serve their nation by making change in society.
2. Students will be able to build leadership qualities.
3. Students will be able to play their active role in national building.
4. Students will be able to make their own decisions and solve their problems.

Unit-I: Understanding youth

- Definition, profile of youth, categories of youth
- Issues, challenges and opportunities for youth
- Youth as an agent of social change
- National youth Policy

Unit-II: Importance and Role of Youth Leadership

- Meaning and types of leadership
- Qualities of good leaders; traits of leadership
- Importance and role of youth leadership
- Youth-focused and Youth-led organizations

Unit-III: Life Competencies

- Definition and Importance of life competencies
- Communication – process, types & barriers
- Motivation – Concept & Cycle
- Problem Solving and Decision Making

Unit-IV: Social Harmony and National Integration

- Indian history and culture
- Role of youth in peace-building and conflict resolution
- Role of youth in Nation building
- Youth development programmes at the National Lever, State Level and voluntary sector

MASTER OF COMPUTER APPLICATIONS

CODE: AEC-316-V

SUBJECT NAME: PHYSICAL EDUCATION

NO OF CREDITS: 0

SESSIONAL: 25

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THEORY EXAM: 75

TOTAL: 100

Duration of Exam: 3 hrs.

Course Objectives:

1. To make student learn the basic concept of physical education.
2. To make student learn about physiological aspect of physical education.
3. To make student learn about psychological aspect of physical education.
4. To make student learn about health concepts of physical education.

Course Outcomes:

1. Learned the basic concepts of physical education.
2. Will be able to build their career in physical education.
3. Will be aware about health-related issues.
4. Learn about various sports/games.

Syllabus:

Unit-I: **Concept of Physical Education:** Meaning and definition of Physical Education, its aim and objectives Need and importance of Physical Education, Misconceptions about Physical Education & its relevance in Inter Disciplinary Context

Unit-II: **Career Aspects in Physical Education:** Career Options in Physical Education, Avenues for Career Preparation, Motivation & Self Assessment for career choices

Unit-III: **Physiological Aspects of Physical Education:** Warming up - General & Specific & its Physiological basis, Effects of Exercise on Muscular & Digestive systems, Effects of Exercise on Respiratory & Circulatory systems

Unit-IV: **Psychological Aspects of Physical Education:** Definition & role of Sports Psychology, Motivation and Achievements in Sports, Adolescent Problems & its Management.

Unit-V: **Health Concepts of Physical Education:** Role of Physical Education Programme on Community Health Promotion (Individual, Family

&Society), Effects of Alcohol, Tobacco and Drugs on Sports Performance, Obesity, Causes & Preventive Measures and Role of diet on Performance

Unit-VI: **About Games:** History of the Game/Sport, Latest General Rules of the Game/Sport, Measurement of Play Fields and Specifications of Related Sports Equipments, Important Tournaments and Venues, Sports Personalities

Unit VII: **Skill Development:** Fundamental Skills of the Game/Sport, Specific Exercises of Warm-up and Conditioning, Related Sports Terminologies, Sports Awards, Common Sports Injuries & its Prevention