SCHEME

For

MCA COURSE

In

DEPARTMENT OF COMPUTER ENGINEERING

(w.e.f Session 2016)

DEPARTMENT OF COMPUTER ENGINEERING

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY
FARIDABAD

YMCA UNIVERSITY OF SCIENCE & TECHNOLOGY

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 ENGINEERING

VISION

The department aims to make a place at both national and international level by producing high quality ethically rich computer engineers conversant with the state-of-the-art technology with the ability to adapt the upcoming technologies to cater to the ever changing industrial demands and societal needs. It endeavours to establish itself as a centre of excellence by contributing to research areas having IT impact on the people's life and nation's growth.

MISSION

- To provide the future leaders in the area of computer engineering 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 IT related technologies.
- To educate the students about their professional and ethical responsibilities.
- To ensure continuous interaction with the industry and academia through collaborative research projects.

ABOUT THE PROGRAM

The Master of Computer Application (MCA) program has a strong flavor 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 the subject. The scheme, number of courses, contents of courses are all designed to cater the requirement of industry. 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. 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 Application 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 and project management.

DEPARTMENT OF COMPUTER ENGINEERING

MCA PROGRAMME

PROGRAMME EDUCATION OBJECTIVES

PEO1	To solidify foundation of mathematics, 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 mathematics, science, engineering fundamentals, and an engineering specialization to 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 modeling 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.

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY
FARIDABAD

SYNOPSIS OF
SCHEME OF STUDIES & EXAMINATIONS
3 YEARS MCA SEMESTER I-VI (2016-2019)

Total Credits: 161
Total Theory Subjects: 27
Total Labs including Seminars, Projects :24 Industrial Training: 1 (one complete semester)

Total Teaching Schedule:

Lectures	Tutorials	Practical	Total
96	9	71	176

Total Marks:

Sessional	End Term	Total
2050	2100	4150

Itemized Break-up:

	No.	Hours	Marks	Credits
Theory Subjects	27	105	2500	103
Labs	18	71	900	36
Seminar	3	6	150	6
Projects	2	4	100	4
Industrial Training	1	1 semester	500	12
Total			4150	161

CHOICE BASED CREDIT SYSTEM SCHEME

Program Core Courses (PCC)			
Sr. N.	**Name the Subject**	**No. of Lectures / Tutorial**	**No. of Credits**
1	Mathematical Foundations of Computer Science	4	4
2	Computer Fundamentals and Programming in C	4	4
3	Data Communication and Network Analysis	4	4
4	Internet and Web Designing	4	4
5	Data Base Management Systems	4	4
6	Data Structures	4	4
7	Computer Organization and architecture	4	4
8	Computer Graphics and Multimedia	4	4
9	Object Oriented Programming using C++	4	4
10	Operating System	4	4
11	Analysis & Design Of Algorithms	4	4
12	Principals of System Programming & Compiler Design	4	4
13	Artificial Intelligence and Expert Systems	4	4
14	Software Engineering	4	4
15	JAVA Programming	-	4
16	Advanced Java Programming	4	4
17	Design of Unix OS & Shell Programming	4	4
18	Software Testing & Quality Assurance	4	4
19	Computer based Management System and E Commerce	4	4
20	Visual languages Programming	4	4
21	.Net Technology	4	4
22	Object Oriented Software Engineering	4	4
23	Advanced Data Base Systems	4	4
		Total Credits	**92**

Skill Enhancement Courses(SEC) :Labs			
Sr. No.	**Name the Lab**	**No. of contact hours**	**No. of Credits**
1	FOCP Lab	4	2
2	Web Designing Lab	4	2
3	DBMS Lab	4	2

4	Software Tools Lab	4	2
5	Data Structure lab using C	4	2
6	OOPS Lab	4	2
7	Operating System Lab	4	2
8	Computer Graphics Lab	4	2
9	ADA Lab	4	2
10	System Programming Lab	4	2
11	JAVA Lab	4	2
12	Artificial intelligence lab	4	2
13	Advanced JAVA LAB	4	2
14	USP Lab	4	2
15	VLP Lab	3	2
16	Dot Net programming using C# and / or VB. Net	4	2
17	* ADS (Working with MS SQL Server)	4	2
18	OOSE Lab	4	2
Total credits			36

Skill Enhancement Course (SEC) : Projects

Sr. No.	Name the Lab	No. of contact hours	No. of Credits
1	Minor Project 1 (semester IV)	2	2
2	Minor Project 2 (Semester V)	2	2
3	Major Project	24	12

Discipline Specific Elective (DSE)

Sr. No.	Name the Subject	No. of contact hours	No. of Credits
DSE Group I	Simulation and Modeling	4	4
	Theory of Computation	4	4
	Neural Networks	4	4
	Advance Computer Networks.	4	4
	Soft Computing.	4	4
	Multimedia and its Application	4	4
	Distributed Operating Systems	4	4
DSE Group II	Open Source Technology.	4	4
	Network Security.	4	4
	Mobile Computing.	4	4
	Digital Image Processing.	4	4
	Software Project Management.	4	4
	Data warehousing & Data Mining	4	4

General Elective Course(Courses offered by IT & CA Department)		
Sr. No	**Code**	**Name the Subject**
1	GEC-1	Intelligent Systems
2	GEC-2	Cyber laws and Security
3	GEC-3	Soft Computing
4	GEC-4	Web Technology and Information Retrieval
5	GEC-5	Intellectual Property and Rights

Mandatory Audit Course(MAC) (Mandatory to Qualify)			
Sr. No	**Code**	**Name the Subject**	**No. of contact hours**
1.	AUD01	German-1	2
2.	AUD02	German-2(With German-1 as prerequisite)	2
3.	AUD03	French-1	2
4	AUD04	French-2(With French-1 as prerequisite)	2
5	AUD05	Sanskrit-1	2
6	AUD06	Sanskrit-2(With Sanskrit-1 as prerequisite)	2
7	AUD07	Personality Development	2
8	AUD08	Interview and Group discussion skills	2
9	AUD09	Yoga and Meditation	2
10	AUD10	Art of living/Living Skills	2
11	AUD11	Contribution of NSS towards Nation/role of NSS	2
12	AUD12	Physical Education	2

Master of Computer Applications (MCA) Regular Programme
Syllabus and Scheme of Examination
W.e.f. 2016-17
MCA First Year

Semester-I

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Couse Type
		Lectures	Tutorial					
MCA-16-101	Mathematical Foundations of Computer Science	3	1	4	60	40	100	PCC
MCA-16-103	Computer Fundamentals and Programming in C	4		4	60	40	100	
MCA-16-105	Data Communication and Network Analysis	4		4	60	40	100	
MCA-16-107	Internet and Web Designing	4		4	60	40	100	
MCA-16-109	Data Base Management Systems	3	1	4	60	40	100	
MCA-16-111	FOCP Lab	4		2	20	30	50	SEC
MCA-16-113	Web Designing Lab	4		2	20	30	50	
MCA-16-115	DBMS Lab	4		2	20	30	50	
MCA-16-117	Software Tools Lab	4		2	20	30	50	
MCA-16-119	Seminar	2		2		50	50	
	Total	36	2	30	380	370	750	

Semester – II

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lectures	Tutorial					
MCA-16-102	Data Structures	3	1	4	60	40	100	PCC
MCA-16-104	Computer Organization and architecture	4		4	60	40	100	
MCA-16-106	Computer Graphics and Multimedia	4		4	60	40	100	
MCA-16-108	Object Oriented Programming using C++	4		4	60	40	100	
MCA-16-110	Operating System	3	1	4	60	40	100	
MCA-16-112	Data Structure lab using C	4		2	20	30	50	SEC
MCA-16-114	OOPS Lab	4		2	20	30	50	
MCA-16-116	Operating System Lab	4		2	20	30	50	
MCA-16-118	Computer Graphics Lab	4		2	20	30	50	
	Audit Course	2		-	-	-	-	MAC
	Total	36	2	28	380	320	700	

Semester – III

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lectures	Tutorial					
MCA-16-201	Analysis & Design Of Algorithms	3	1	4	60	40	100	PCC
MCA-16-203	Principals of System Programming & Compiler Design	3	1	4	60	40	100	
MCA-16-205	Artificial Intelligence and Expert Systems	3	1	4	60	40	100	
MCA-16-207	Software Engineering	3	1	4	60	40	100	
MCA-16-209	JAVA Programming	4		4	60	40	100	
MCA-16-211	ADA LAB	4		2	20	30	50	SEC
MCA-16-213	System Programming Lab	4		2	20	30	50	
MCA-16-215	JAVA LAB	4		2	20	30	50	
MCA-16-217	Artificial intelligence lab	4		2	20	30	50	
	Total	32	4	28	380	320	700	

SEMESTER-IV

Paper Code	Course	Course Requirements (Hrs)		Credits	University Exams	Internal Assessments	Total	Course Type
		Lectures	Tutorial					
MCA-16-202	Advanced Java Programming	4		4	60	40	100	PCC
MCA-16-204	Design of Unix OS & Shell Programming	4		4	60	40	100	
MCA-16-206	Software Testing & Quality Assurance	3	1	4	60	40	100	
MCA-16-208	Computer based Management System and E Commerce	4		4	60	40	100	
MCA-16-210	Visual languages Programming	4		4	60	40	100	
MCA-16-212	Advanced JAVA LAB	4		2	20	30	50	SEC
MCA-16-214	USP LAB	4		2	20	30	50	
MCA-16-216	Minor Project 1	2		2	20	30	50	
MCA-16-218	VLP LAB	3		2	20	30	50	
MCA-16-220	Seminar	2		2		50	50	
MCA-18-222	General Elective	3		3				GEC
	Total	37	1	33	380	370	750	

SEMESTER-V

Paper Code	Course	Course Requirements (Hrs)	Credits	University Exams	Internal Assessments	Total	Course Type
MCA-16-301	.Net Technology	4	4	60	40	100	PCC
MCA-16-303	Object Oriented Software Engineering	4	4	60	40	100	
MCA-16-305	Advanced Data Base Systems	4	4	60	40	100	
MCA-16-307	Elective1(Chosen from list of electives)	4	4	60	40	100	DSE
MCA-16-309	Elective 2 (Chosen from list of electives)	4	4	60	40	100	
MCA-16-311	Dot Net programming using C# and / or VB. Net	4	2	20	30	50	PCC
MCA-16-313	* ADS (Working with MS SQL Server)	4	2	20	30	50	
MCA-16-315	OOSE Lab	4	2	20	30	50	
MCA-16-317	Minor Project 2	2	2	20	30	50	SEC
MCA-16-319	Seminar	2	2		50	50	
	Total	36	30	380	370	750	

ELECTIVE I

1. **Simulation and Modeling**
2. **Theory of Computation**
3. **Neural Networks.**
4. **Advance Computer Networks.**
5. **Soft Computing.**
6. **Multimedia and its Applications**
7. **Distributed Operating Systems**

ELECTIVE II

1. **Open Source Technology.**
2. **Network Security.**
3. **Mobile Computing.**
4. **Digital Image Processing.**
5. **Software Project Management.**
6. **Data warehousing & Data Mining**

Semester – VI

Paper Code	Course	Course Requirements (Hrs)	Credits	University Exams	Internal Assessments	Total	Course Type
MCA-16-302	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** **Marks**
3. **Conduct Marks** **50 Marks**

TOTAL **500 Marks**

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-101
SUBJECT NAME: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
NO OF CREDITS: 4

MCA SEMESTER I	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To make the students familiar with Relations and their types , Equivalence and Partial Order relations , POSET, HASSE Diagrams, Lattices, their properties and types.
2. To make student understand functions their types, Composition and Recursively defined function
3. To give knowledge about Propositions, basic operations in propositions, Finding tautologies and contradictions, Quantifiers and Mathematical Induction.
4. To discuss the concept of Algebraic Structures and their types and make student familiar of Cosets and Lagrange's theorem.
5. To make the students understand Graphs, their types and different algorithms based on Graph Theory.
6. To make the students familiar with Automata Theory. To make the students understand Regular expressions, Regular Language and conversions.
7. To make the students understand NFA, DFA and conversion of various machines.

UnitI:

Relation: Relations, Properties of Binary relation, Matrix representation of relations, Equivalence relations, Partial order relation.

Function: Types, Composition of function, Recursively defined function

Algebraic Structures: Properties, Semi group, Monoid, Group, Abelian group, Subgroup, Cyclic group, Cosets, Normal Subgroups, Lagrange's Theorem, Permutation groups.

Unit-II

Propositional Logic: Boolean algebra, Propositions, logical operations, Tautologies, Contradictions, Logical implication, Logical equivalence, Normal forms, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers, Mathematical Induction.

Unit-III

Lattices and Boolean algebra: Introduction, Partially Ordered Set, Hasse diagram, well ordered set, Lattices, Properties of lattices, Bounded lattices, Complemented and Distributive lattices.

Unit-IV

Graphs: Introduction to graphs, Directed and undirected graph , Homomorphic and Isomorphic graphs, Sub graph , Cot Points and Bridges , Multigraph and Weighted graph, paths and circuits, Shortest path in weighted graphs, Eurelian path and circuits ,Hamilton pats and circuits, planar graphs. Euler's Formula.

Unit-V

Theory of Automata: Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph. Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA. Optimizing DFA, FA with output: Moore machine, Mealy machine, Conversions.

Course Outcomes:

The students will be:

a. Able to solve the problems of set theory, functions, relations and lattices.
b. Able to apply basic operation in propositions, validate the arguments and formalize the arguments in propositional logic.
c. Familiar with the algebraic structure and able to use to prove theorems like Lagrange's theorem
d. Able to use the core ideas of graph theory, trees and various algorithms to solve the problems based on the same.
e. Able to construct finite state machine, equivalent regular expression, and conversion of various machines like Moore, mealy etc.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->					
		a	**b**	**c**	**d**	**e**
	1	√				
	2	√				
	3		√			
	4			√		
	5				√	
	6					√
	7					√

REFERENCES

1. C.L.Liu: Elements of Discrete Mathematics McGraw Hill.

2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series.
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P. & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen : Discrete Mathematics and its applications, TMH
6. Doerr Alan &Levasseur Kenneth; Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.
7. Theory of Computer Science; K.L.P. Mishra. N. Chandrasekaran
8. Hopcroft J.E., Ullman J.D.: Introduction to Automata theory, Languages and Computation, Narosa Publishing House, New Delhi.
9. Any other book(s) covering the contents of the paper in more depth.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-103
SUBJECT NAME: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C
NO OF CREDITS: 4

MCA SEMESTER I — SESSIONAL: 40
L P — THEORY EXAM: 60
4 0 — TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To understand the major components of computer system, the types and functions of OS.
2. To know about different programming languages and their corresponding Translators and to learn about the basic concepts of Networking.
3. To understand the building blocks of C language like variables, data types, managing I/O etc.
4. To understand the different statements like sequential, decision making, iterative such as if-else, loops.
5. To understand derived data types like arrays and structures.
6. To learn about the concept of Pointers, understand functions and also to understand file handling and dynamic memory allocation schemes.

UNIT-I: AN OVERVIEW OF COMPUTER SYSTEM AND OPERATING SYSTEMS

Fundamentals: Evolution of computers, Hardware organization of a computer. Introduction to microprocessors, generation of microprocessors, commonly used CPUs. Input/output Devices, Input/output ports and connectors.

Different Number Systems:- Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, and their inter- conversions.

Operating System Basics: Introduction to Operating system, Functions of an Operating Systems, Classification of Operating Systems, Basic introduction to DOS, UNIX/LINUX OS, Windows XP, working with Windows. Introduction to computer viruses.

UNIT-II: BASIC INTRODUCTION TO PROGRAMMING LANGUAGES

Machine Language, Assembly Languages, High level Languages, Types of high level languages, Complier, Interpreter, Assembler, Loader, Linker, Relationship between Compiler, Loader and Linker.

UNIT-III: BASIC INTRODUCTION TO COMPUTER NETWORKS

Data Communication, modulation, Network devices, LAN, LAN topologies, WAN, OSI Reference model Introduction to Internet and protocols: TCP/IP ref. model, Backbone network, Network connecting devices. Hypertext documents, HTTP, DNS, Network Security.

UNIT-IV: AN OVERVIEW OF C

Constants, Variables and Data types, operators and Expressions, managing I/O operations, Decision Making and branching, Decision Making and looping, Arrays, Character Arrays and Strings, User Defined Functions

UNIT-V: STRUCTURE AND UNION IN C

Defining structure, declaring variables, Accessing structure members, structure initialization, copying and comparing structures variables, and operations on individual members, Array of structure, structure with structure, unions, and size of structure.

UNIT-VI: POINTERS IN C

Introduction, Understanding Pointers, Accessing the address of a variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a variable through its pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factors, pointers and Arrays, Pointer and Character Strings, Arrays of Pointers, Pointers as Function Arguments, Functions Returning Pointers, Pointers to Functions

UNIT-VII: DYNAMIC MEMORY ALLOCATION AND FILE MANAGEMENT IN C

Introduction, Dynamic memory allocation, allocating a block of memory: Malloc, allocating multiple blocks of memory: Calloc. Releasing the used space: Free, Altering the size of block: Realloc, Defining and opening file, closing file, I/O operation on files, error handling during I/O operations, Random Access to files and command line arguments.

Course Outcomes:

The students will be able to:

a. To tell about the components of a computer system and fundamentals of Operating Systems and Networking.
b. To understand the building blocks of C language like variables, data types, managing I/O etc.
c. To understand and solve basic problems on different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays and structures.
d. To understand and solve problems on Pointers and functions, file handling and dynamic memory allocation schemes.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	**Course Outcomes----------->**				
		a	**b**	**c**	**d**
	1	√			
	2	√			
	3		√		

	4			√	
	5			√	
	6				√

REFERENCES

1. Fundamental of Information Technology by A.Leon&M.Leon.
2. UNIX Concepts and Application(4/e) by Sumitabha Das
3. Programming Languages (4th Edition) by Pratt IW
4. Fundamentals of Computers and Programming with C by A. K. Sharma Dhanpat Rai publications
5. Computer Networks (4th Edition) by Andrew S. Tanenbaum
6. Digital Principles and Application by Donald Peach, Albert Paul Malvino
7. Operating System Concepts, (6th Edition) by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-105
SUBJECT NAME: DATA COMMUNICATION AND NETWORK ANALYSIS
NO OF CREDITS: 4

MCA SEMESTER I	SESSIONAL: 40
L P	THEORY EXAM: 60
4 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

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 become familiar with 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, application layer protocols including various switching mechanism.

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 board 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. Network Applications: File transfer protocol, electronic mail, World Wide Web.

Course Outcomes:

The students will be able to:

a. Independently understand basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.

b. Enumerate 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. To become familiar with basic protocols of data link layer, how they can be used to assist in network design and implementation, IEEE standards for LAN and MAN.

d. Analyze the features and operations of various network layers, application layer protocols including various switching mechanism.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOME

Course Objectives ---->	**Course Outcomes ------->**			
	a	**b**	**c**	**d**
1	√			
2	√	√		
3		√	√	
4				√

REFERENCES

1. A.S. Tanebaum : 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. Behrouz Forouzan 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 APPLICATION
CODE: MCA-16-107
SUBJECT NAME: INTERNET AND WEB DESIGNING
NO OF CREDITS: 4

MCA SEMESTER I	SESSIONAL: 40
L P	THEORY EXAM: 60
4 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To familiarize the students with the basic concepts of internet, its history and ways to connect to internet.
2. To provide a detailed understanding of search engines
3. To familiarize the student with the fundamental language of internet i.e. HTML and cascading style sheets.
4. To teach the student the students the basics of client side JavaScript and server side programming constructs
5. To familiarize the student with the basics of delivering multimedia over web pages.

Unit-I

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.

Unit-II

Creating Web Page Graphics: Putting Graphics on a Web Page, Custom Backgrounds and Colours, Creating Animated Graphics. Web Page Design and layout, Advanced Layout with Tables, Using Style Sheets. Introduction to Client side programming using Java script

Unit-III

DNS working: Configuring Internet Connection, Connecting LAN to Internet. Single User, Multi User, Server, Workstation, Client-Server environment, E-Mail Concepts - configuring E-Mail Program, Sending and Receiving Files through E-Mail, Fighting Spam, Sorting Mail, and Avoiding E-Mail Viruses.

Unit-IV

Architecture of Web Browsers: Different setting for browser, Surfing the Net, Online Chatting , Messaging, and Conferencing Concepts, E-Mail mailing lists, Usenet newsgroup concepts-Reading usenet newsgroups, internet Relay Chat, Instant messaging, Web-Based chat rooms and discussion boards, Voice and Video conferencing. Streamlining Browsing, Keeping track of Favorite Web Sites, Web Security, Privacy, and Site-Blocking. Search Engines, Categories of search Engines, Searching Criterion, Searching the Web – Audio and Video on the Web.

Course Outcomes

At the end of the course/session the student would be

a. Acquainted with the basics of internet, its applications and ways to connect to it
b. Learned the basics and types of search engines
c. Have a hands on HTML and learned the need and basics of CSS and the concepts of client side JavaScript
d. Acquainted with the difference between client side and server side scripting
e. Familiar with the basics of multimedia over web.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives--□	Course Outcomes----□					
		a	**b**	**c**	**d**	**e**
	1	√				
	2	√	√			
	3			√		
	4			√	√	
	5					√

TEXT BOOKS

1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
3. Gill, Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co., New Delhi.

REFERENCE BOOKS

1. Margaret Levine Young: Internet - The Complete Reference.
2. Harley Hahn: The Internet - Complete Reference, TMH.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-109
SUBJECT NAME: DATA BASE MANAGEMENT SYSTEMS
NO OF CREDITS: 4

MCA SEMESTER I SESSIONAL: 40
L T P THEORY EXAM: 60
3 1 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To study about the basics of DBMS, client server architecture and database models.
2. To become familiar with the 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.

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.

Unit-III

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-IV

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.

Course Outcomes:

The students will be

a. Familiar with the basics of DBMS, client server architecture and database models.
b. Familiar with the relational model and relational algebra calculus.
c. Familiar with the normalization forms.
d. Familiar with the transaction management and concurrency control mechanisms.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2		√		
	3			√	
	4				√

TEXT 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.

REFERENCE BOOKS

1. P. Radha Krishna: Database Management Systems, HI-TECH Publications.
2. C.J. Date: Introduction to Database Systems, Pearson, Education.
3. Rob & Coronel: Data base Systems design, Implementation, and Management, latest Edition, Thomson.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-102
SUBJECT NAME: DATA STRUCTURES
NO OF CREDITS: 4

MCA SEMESTER II	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. Demonstrate familiarity with major algorithms and data structures.
2. Analyze performance of algorithms.
3. Choose the appropriate data structure and algorithm design method for a specified application.
4. Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs.
5. Use various data structures effectively in application programs.
6. Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, merge sort, quick sort and heap sort.
7. Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
8. Demonstrate understanding of various searching algorithms.
9. Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.

UNIT-I

Overview of 'C': Introduction, Flow of Control, Input output functions, Arrays and Structures, Functions

Data structures and Algorithms: an overview: concept of data structure, choice of right data structures, types of data structures, basic terminology Algorithms, how to design and develop an algorithm: stepwise refinement, use of accumulators and counters; algorithm analysis, complexity of algorithms Big-oh notation.

Arrays: Searching Sorting: Introduction, One Dimensional Arrays,

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

Searching: Linear search, Recursive and Non recursive binary Search.

Sorting: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Shell sort, Heap sort

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, B Trees, Application of trees.

Graphs: Introduction, terminology, 'set, linked and matrix' representation, Graph traversal techniques: BFS, DFS, operations on graphs, Minimum spanning trees, Applications of graphs.

UNIT-IV

File Handling and advanced data Structure: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files. AVL trees, Sets, list representation of sets, applications of sets, skip lists

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

a. Understand and describe the concepts of data structure, data types and how basic data structure like arrays, records, linked list, stacks, queues, trees and graphs are represented in memory and are used in various applications.
b. Implement and know when to apply standard algorithm for sorting and searching.
c. Analyze algorithm and determine their complexity.
d. Apply fundamental algorithmic problems including Tree traversal, graph traversal and their applications.
e. Understand the complex data structures like file system.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

	Course Outcomes----------->					
Course Objectives----------->		**a**	**b**	**c**	**d**	**e**
	1	√				
	2			√		
	3	√				
	4	√				
	5	√				
	6		√			
	7					
	8		√		√	
	9					√

TEXT BOOKS

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
2. Data Structures using C by A. K. Sharma, Pearson
3. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.

REFERENCE BOOKS

1. Fundamentals of Data structures by Ellis Horowitz &SartajSahni, Pub, 1983,AW
2. Fundamentals of computer algorithms by HorowitzSahni and Rajasekaran.
3. Data Structures and Program Design in C By Robert Kruse, PHI,
4. Theory & Problems of Data Structures by Jr. SymourLipschetz, Schaum's outline by TMH
5. Introduction to Computers Science -An algorithms approach , Jean Paul Tremblay, Richard B. Bunt, 2002, T.M.H.
6. Data Structure and the Standard Template library – Willam J. Collins, 20

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-104
SUBJECT NAME: COMPUTER ORGANIZATION AND ARCHITECTURE
NO OF CREDITS: 4

MCA SEMESTER II SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To become familiar with how Computer Systems work & its basic principles
2. To become familiar with how to analyze the system performance.
3. To become familiar with concepts behind advanced pipelining techniques.
4. To become familiar with the current state of art in memory system design
5. To become familiar with how I/O devices are being accessed and its principles.
6. To provide the knowledge on Instruction Level Parallelism

Unit I

Basic Principles and General system architecture: Data Representation: Fixed Point, Floating Point, Stored program control concept, Flynn's classification of computers (SISD, MISD, SIMD, and MIMD), control and data path of a typical register based CPU, Register Transfer Language, Bus structures, Micro-operations: Arithmetic, Logic, Shift.

Unit II

Computer Organization and Design: Instruction cycle, Fetch-Decode-Execute cycle(typically 3 to 5 stages), Instruction code, computer registers, computer instructions, type of instructions, memory reference, register reference, I/O reference, Hardwired controlled unit.

Unit III

Micro programmed Control: Micro programmed controlled unit, Control memory and address sequencing, Design of Control Unit.

Unit IV

Central Processing Unit: General Register Organization, Stack Organization, Addressing Modes: register, immediate, direct, indirect, indexed, Operations in the instruction set: Arithmetic and Logical, Data Transfer and Manipulation, Program Control, RISC Vs. CISC architectures.

Unit V

Memory Hierarchy& I/O techniques: The need for memory hierarchy(Locality of reference) Main Memory, Associative Memory, Cache Memory, Auxiliary Memory, memory parameters (access/ cycle time, cost per bit) Virtual Memory, Memory Management Hardware Input/output

Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct Memory Access.

Unit VI

Introduction to parallelism: Goals of parallelism (Exploitation of concurrency, throughput enhancement), Amdahl law, Parallel computer structure, Architectural classification schemes, Parallel processing Applications.

Course Outcomes:

a. To learn the basic principles on how computers works, how they are designed and their different architectures?
b. To understand the different type of instructions and their formats used by the computer to perform operations.
c. To understand the in depth architecture and organization of a modern computer with its various processing units (control units).
d. Understand and analyze the performance measurement, data representation and memory Hierarchy of the computer system.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives--------->	Course Outcomes---------->			
	a	**b**	**c**	**d**
1	√		√	
2			√	√
3	√		√	
4				√
5	√		√	
6		√	√	

TEXT BOOKS

1. Mano, M.M. : Digital Logic and Computer Design, Prentice- Hall of India.
2. Stallings, William : Computer Organization & Architecture.

REFERENCE BOOKS

1. Gill, Nasib Singh and Dixit J.B.: Digital Design and Computer Organization, University Science Press (Laxmi Publications), New Delhi.
2. Kai Hwang : Advanced Computer Architecture, McGraw Hill International.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-106
SUBJECT NAME: COMPUTER GRAPHICS AND MULTIMEDIA
NO OF CREDITS: 4

MCA SEMESTER II SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To learn the principles of hardware and software behind the graphical environment. To learn about the design and implementation of graphical object by understanding basic algorithms for scan conversion of different graphical primitives and filling their inner areas.
2. To learn about transformation and modeling of original primitive and their clipped version into dimensional space by understanding the different algorithms.
3. To learn projecting any graphical primitive from higher dimensional space to 2-D space.
4. To learn the various aspects of rendering visible surfaces.
5. To learn the creation of animated objects and their images by knowing various aspects of media and learn the concept of audio, images and videos. Also, to learn minimization of memory requirements for graphical objects by rendering objects and surfaces and compressing Images.

Unit-I : An Introduction to Graphics System

Computer Graphics and Its Types, Application of computer graphics, Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

Unit-II : Output Primitives and Attributes of Output Primitives

Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives : Line Attributes, Color and Grayscale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Ant aliasing.

Unit-III : Two-dimensional Geometric Transformations

Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Unit- IV : Multimedia

Introduction to Multimedia **:** Classification of Multimedia, Multimedia Software, Components of Multimedia – Audio : Analog to Digital conversion, sound card fundamentals, Audio play backing and recording Video, Text : Hyper text, Hyper media and Hyper Graphics, Graphics and Animation : Classification of Animation. Authoring Process and Tools. Case Study: A graphics software Mat Lab, Use of Mat Lab in graphics application, Features of Mat Lab, Generalize application by using Mat Lab.

Course Outcomes:

On completing this course students will

a. Understand the basics of computer graphics, different graphics systems and applications of computer graphics. Implement the various algorithms for scan conversion and filling of basic objects and their comparative analysis.
b. Use of geometric transformations on original and clipped graphics objects and their application in composite form in 2D and 3D.
c. Understand the techniques for improving the object appearance by projecting 3D scene on 2D screen.
d. Create interactive graphics applications and games that use animation techniques, audio, video by minimizing memory requirements through compression techniques.

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MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-→	**Course Outcomes----→**				
		a	**b**	**c**	**d**
	1	√			
	2		√		
	3		√	√	
	4			√	√
	5				√

REFERENCES

1. Donald Hearn and M. Pauline Baker : Computer Graphics, PHI Publications.
2. Plastock : Theory & Problem of Computer Gaphics, Schaum Series.

3. Foley & Van Dam : Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Tosijasu, L.K. : Computer Graphics, Springer-Verleg.
6. S. Gokul : Multimedia Magic, BPB Publication.
7. Bufford : Multimedia Systems, Addison Wesley.
8. Jeffcoate : Multimedia in Practice, Prectice-Hall.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-108
SUBJECT NAME: OBJECT ORIENTED PROGRAMMING USING C++
NO OF CREDITS: 4

MCA SEMESTER II SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE : Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To become familiar with object oriented programming and compare with the procedural programming.
2. To make familiar with the basic concept and syntax of the language.
3. Introduce to program using more advanced C++ features such as composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates etc.
4. Make familiar to build C++ classes using appropriate encapsulation and design principles.
5. Improve the problem solving skills.
6. Be able to apply object oriented or non-object oriented techniques to solve bigger Real World Computing problems.

UNIT-I : Introduction to C++

Introduction; Characters used in C++; Basic data types, Data type modifiers; C++ Tokens – identifiers, keywords, constants, variables; Input – Output statements, structure of a C++ program; **Escape Sequence (Backslash Character Constants);** Operators and Expressions – arithmetic, relational, logical, and conditional operator; special operators – sizeof(), comma, assignment operators; Flow of control – compound statement, the if and if-else, and switch statements, the while, do-while, and for loops, break and continue statements, exit() function; Arrays – one dimensional and multi-dimensional arrays, array initialization; Structures – referencing structure elements, arrays of structures, initializing structures, assigning structures, nested structures; Functions – prototypes, calling a function, parameter passing , call by value, call by reference, array parameters, returning values from functions.

UNIT-II : POINTERS

Introduction to pointers- the '&' and '*'operators; pointer variables; dangling pointers; pointers and arrays; array of pointers; pointers and structures; dynamic allocation; self-referential structures, introduction to linked structures and lists;

UNIT-III : Programming Techniques- A Survey

Introduction to programming paradigms – unstructured programming, structured , procedural, and modular programming; drawbacks of structured programming; Object Oriented programming.

UNIT-IV : Classes and Objects

Introduction to objects; classes – declaration in C++, abstraction and encapsulation, creating objects; array of objects; objects as function arguments, scope resolution operator, static data members; properties of classes and objects.

UNIT-V : Functions: advanced concepts

Polymorphism, Function overloading; inline functions; friend functions- Member functions of a class as friends of another class, Friend Function as a bridge between two classes; friend classes; recursion – types of recursion: linear, binary, tail recursion

UNIT-VI : Constructors and Destructors

Constructors – types of constructors: default, user defined, parameterized, copy constructors, and constructors with default arguments; rules for constructor definition and usage; destructors - rules for destructor definition and usage.

UNIT-VII : Inheritance: Extending classes

Introduction to code reuse; containership-aggregation; inheritance – visibility modes, 'Open Close Principle'(OCP) types of inheritance: multilevel, multiple inheritance; function overriding – virtual functions, 'Liskov's Substitution Principle' (LSP), pure virtual functions; roles of constructors and destructors in inheritance; virtual base class – graph inheritance.

UNIT-VIII : Templates: code sharing (Genericity):

Introduction to code sharing; templates; generic classes; templates with more than one generic parameter;

UNIT-IX : Operator overloading

Introduction to operator overloading, overloading of binary operators, arithmetic assignment operators; overloading of unary operators; overloading of input-output operators; rules of operator overloading.

UNIT-X : File handling in C++

File concepts; files and streams; opening and closing of files – functions get(), getline(), put() etc., opening files using function open(); reading and writing blocks and objects into the files; detecting 'end of file' (eof)

UNIT-XI : Exception handling

Introduction – traditional error handling; exception handling in C++ - 'try, throw, and catch blocks', multiple throw and multiple catch blocks, throwing objects; situations of usage of exception handling.

Course Outcomes:

The students will be able to

a. Differentiate between various programming paradigms available and familiar with the basic concept of the C++
b. Build the classes using proper syntax and applying the various features of the language.

c. Implement and build the advanced concepts of the language into the classes like inheritance, polymorphism, templates, pointers, exception handling and file I/O
d. Apply the object oriented concepts to the real world problems.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOME

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2	√			
	3		√	√	
	4			√	
	5				√
	6				√

REFERENCES

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,

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-110
SUBJECT NAME: OPERATING SYSTEM
NO OF CREDITS: 4

MCA SEMESTER II	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

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 I/O management and File systems.

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. Operating System services, System Calls and System program.

Unit-II : Process and CPU Scheduling

Process concepts, Process Lifecycle, Operation on processes, Cooperating Processes, Interprocess Communication, Scheduling Criteria, Scheduling Algorithm, Introduction to threads.

Unit-III : 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-IV:Memory Management

Logical versus Physical Address Space, Swapping, Relocation, fixed & variable partitioning, Contiguous Allocation, Paging, Segmentation with Paging.
Virtual Memory Management: principal of locality, Demand Paging, Performance of Demanding Paging, Page Replacement Algorithm, Allocation of Frames, Thrashing.

Unit-V : File System Interface

Types of files**,** Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management.

Disk management: need of disk scheduling, disk scheduling criteria, disk scheduling algorithm.

Unit-VI : I/O Management

I/O Systems: I/O Hardware, I/O software, types of I/O, kernel I/O subsystems.

Course Outcomes:

a. Learn various types of OS and also understand various functions of OS.
b. Understand how the operating system shares hardware resources between processes, tasks, threads, and users
c. Learn the process management and its storage in memory and disk.
d. Learn various memory management schemes , file system and I/O schemes.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
	a	**b**	**c**	**d**
1	√	√	√	√
2		√	√	
3	√	√	√	
4	√		√	√
5	√		√	√

REFERENCES

1. Silberschatz&Galvin : Operating System Concept, Wiley, Latest Edition.
2. Milan Milenkovic : Operating Systems, Tata McGraw – Hill Latest, Edition.
3. Principles of operating system: Dr.NareshChauhn, Oxford University press.
4. William Stallings: Operating Systems, PHI, Latest Edition.
5. A.S. Tanenbaum: Modern Operating Systems, Latest edition Pearson/PHI.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-201
SUBJECT NAME: ANALYSIS & DESIGN OF ALGORITHMS
NO OF CREDITS: 4

MCA SEMESTER III	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. Introducing students with mathematical preliminaries required to analyze and design computer algorithms and study advanced data structures required to design efficient computer algorithms.
2. Familiarizing 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. Introducing the concept 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.

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

Unit-II
Divide and Conquer: General method, binary search, ternary search algorithm, merge sort, quick sort, selection, strassen's matrix multiplication, analysis of algorithms for these problems.

Unit-III
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-IV
Dynamic Programming: General method, single source shortest path, all pair shortest path, optimal binary search trees, 0/1 knapsack, the traveling salesman problem.

Unit-V
Back Tracking: General method, 8 queen's problem, graph coloring, sum of subsets, Hamiltonian cycles, analysis of these problems.

Unit-VI
Branch and Bound: General Method, 0/1 knapsack and traveling salesman problem.

Unit-VII

NP-Hard and NP-Completeness: P, NP, NP-Hard, NP-Complete, Cook's Theorem and Problem Solving.

Course Outcomes:

a. Able to 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. Choose among different types of data structures the best one for different types of problems and recognize the general principles and good algorithm design techniques for developing efficient computer algorithms. Familiarizing students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc.
c. Decide on the suitability of a specific algorithm design technique for a given problem.
d. Design efficient algorithms for new situations, using as building blocks the techniques learned and apply algorithm design techniques to solve certain NP-complete problems.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-- ^	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2		√		
	3			√	
	4				√

REFERENCES

1. Fundamental of Computer algorithms, Ellis Horowitz and SartajSahni, 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. Johan 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 APPLICATION
CODE: MCA-16-203
SUBJECT NAME: PRINCIPALS OF SYSTEM PROGRAMMING & COMPILER DESIGN
NO OF CREDITS: 4

MCA SEMESTER III	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To give exposure of system software components and different software tools used in programming environment and to make them learn functionality of different system software and utilities.
2. To make students familiar with basics terminology used in Lexical Analysis of program and various methods used to develop Lexical analyzer
3. To introduce Parsers and its various techniques like top down and bottom up parsers, their implementation.
4. To introduce various systems directed translation schemes, generation of intermediate code and explain principle source of optimization, issues and their solutions.

Unit-I : Evolution of the Components of Systems Programming

Assemblers, Loaders, Linkers, Macros, Compilers. Software Tools: Variety of Software tools, Text editors, Interpreters and program generators, Debug Monitor, Programming environment. Loader Schemes compile and go loader, general loader schemes, absolute loader, Subroutine linkage, reallocating loader, Direct Linkage Loader, Binders, Linkage loader, overlays.

Unit-II: Compiler

Phases of Compiler, Compiler writing tools, Lexical Analysis, Finite Automata, Regular Expression, From a Regular expression to an NFA, NFA to DFA, Design of Lexical Analyzer. Syntax Analyzer, CFG, Role of the Parser, CFG, Top Down Parsing, Recursive descent parsing, predictive parsers, Bottom up Parsing, Shift reduce, operator precedence parsers, LR Parsers.

Unit-III: Syntax directed definition

Construction of Syntax trees, Intermediate code generation, Intermediate Languages, Syntax trees, post fix form. Symbol table: contents of Symbol table, Data Structures for Symbol table; Runtime storage Administration.

Unit-IV: Code optimization and code generation

Principles sources of optimization, loop optimization, DAG Representation of Basic blocks, Code generation – problems in code generation, a simple code generator, Register allocation and Assignment, Peephole optimization.

Course Outcomes:

a. The students will be able to understand how different system software works together in programming environment.
b. The students will implement deterministic/ non deterministic finite automata.
c. The students will be able to identify the challenges in various parsing schemes and their rectifications.
d. The students will be familiar with basic issues of code optimization and able to understand register allocation and assignment methods their limitations and benefits.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2		√		
	3			√	
	4				√

REFERENCES

1. Donovan: Systems Programming, Tata McGraw Hill.
2. Dhamdhere: System Software, Tata McGraw Hill.
3. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman: Compilers Principles, Techniques and Tools, Addison Wesley.
4. Alfred V. Aho and Jeffrey D. Ullman: Principles of Compiler Design, Addison Wesley.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-205
SUBJECT NAME: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS
NO OF CREDITS: 4

MCA SEMESTER III	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course objectives:

Students undergoing this course are expected to:

1. To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements.
2. Searching as a problem-solving technique: a review of "conventional" searching methods including breadth-first, depth-first, best-first search any many more heuristic techniques. Heuristic functions and their effect on performance of search algorithms.
3. Represent the knowledge in different forms as well as an understanding of other topics such as minimax, resolution, etc.
4. Know the use of fuzzy logic and temporal reasoning.
5. Realize the different methods of Planning and learning.
6. Introduction to genetic algorithms.
7. Introduction about NLP along with Rule based and Non Rule based expert system

Unit-I : Fundamental Issues in IS

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, DFS,BFS

Unit-II : Heuristic search techniques

Generate & Test: Hill Climbing(simple & steepest), Best first search/A*, Problem Reduction/AO*, Constraint satisfaction, MEA.

Unit-III : Knowledge representation issues

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-IV: Reasoning under uncertainty

An introduction, Default reasoning &Closed world assumptions, Model & Temporal logic, Fuzzy logic, Bayesian Probabilistic inference, Dempster Shafer theory, Heuristic reasoning methods

Unit-V : 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

Unit-VI : Natural Language and Expert system development life cycle

Introduction to Natural Language Processing, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system(Rule Based and Non-Rule Based), Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge Engineering, Cognitive behavior, Acquisition techniques.

Course outcomes:

After undergoing the course, Students will be able to:

a. Able to understand the importance, the basic concepts and the Applications of AI.
b. Able to efficiently apply various search techniques used for Intelligent systems
c. Able to efficiently represent the various knowledge representation schemes used for intelligent systems.
d. Able to apply some statistical like Bayes Theorem and Soft computing techniques (like ANN and GA) to solve the AI problem.
e. Able to understand the phases and the architecture of various advanced system like NLP based system and Expert System.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives---------->	Course Outcomes---------->					
		a	**b**	**c**	**d**	**e**
	1	√				
	2		√			
	3			√		
	4				√	
	5				√	
	6				√	
	7					√

REFERENCES

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. Principals of AI(Nills .J.Nilsson)
4. DAN. W.Petterson

5. AI by Russel and Norvig, Pearson education
6. Petrick Henry Winston(AI)

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-207
SUBJECT NAME: SOFTWARE ENGINEERING
NO OF CREDITS: 4

MCA SEMESTER III — SESSIONAL: 40
L T P — THEORY EXAM: 60
3 1 0 — TOTAL: 100

NOTE : Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To enable the students to apply a systematic application of scientific knowledge in creating and building cost effective software solutions to business and other types of problems. Students can understand different phases to make software & study them in detail.
2. To make the students understand project management concepts & their metrics. They are also familiar with the calculation of staffing for a particular project, its cost & schedule.
3. To make the students understand requirement engineering and its models (Information, functional, behavioral). Students are also aware about the design models & its principles (data design, component design, interface design & architectural design).
4. To make the students understand different testing techniques for different projects and to develop quality software ,its maintenance & introduce about software reliability.

Unit-I : Introduction

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, Incremental Model, Aspect-oriented Model, Agile Model.

Unit-II : Software project management

Project management concepts, Planning the software project, Estimation—LOC based, FP based, Use-case based, empirical estimation COCOMO- A Heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management.

Unit-III : Requirements, Analysis and specification

Software Requirements engineering, Requirement engineering process, Requirement Engineering Tasks, Types of requirements, SRS.

Unit-IV : System modeling

Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling, The mechanics of structured analysis: Creating entity/ relationship diagram, data flow model, control flow model, the data dictionary.

Unit-V:System Design

Design principles, the design process; Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding; Effective modular design: Functional independence, Cohesion, Coupling; Design Heuristics for effective modularity, Data Design, Architecture Design, Interface Design

Unit-VI :Software Testing and maintenance

Testing terminology—error, bug/defect/fault, failure, Verification and validation, Test case design, Static testing ,Dynamic testing--- Black box testing—Boundary value analysis, White box testing-- basis path testing, Unit testing, Integration testing, Acceptance Testing, debugging, debugging process debugging approaches. Software maintenance categories, Models

Unit-VII : Software Quality Models and Standards

Quality concepts, Software quality assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO 9126 Standard

Unit-VIII : Advanced 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.

Course Outcomes:

a. Students will be able to understand basic concepts of software engineering, Software life cycle models.
b. Students will be able to calculate the cost & staff for a particular project at the start.
c. Students will be able to make an unambiguous SRS (software requirement specification) after collecting requirements of any client.
d. Students will be able to make a good design of software's and manage risk in software if persist and debug & test the quality and errors in the software by making systematic approach i.e. Software engineering.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives----□	**Course Outcomes----□**				
	a	**b**	**c**	**d**
1	√			
2		√		√
3			√	√

	4				√

REFERENCES

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. JW&S,
7. An Integrated Approach to software engineering by Pankaj jalote , 1991 Narosa,
8. Software Testing : Principles and Practices, Dr. Naresh Chauhan.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-209
SUBJECT NAME: OBJECT TECHNOLOGY(JAVA)
NO OF CREDITS: 4

MCA SEMESTER III SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. Study the software and hardware requirement and installing the java.
2. To introduce with the java programming constructs like variable, primitive data types, operators, type conversion, type casting etc.
3. To introduce with the of development program by using classes, object, nested classes, constructors etc.
4. To introduce with the java programming by creating package, use of packages, adding a class to a package.
5. To introduce with conversion of numbers and Strings, manipulations of strings, Unboxing and autoboxing.
6. To make students with the implementation of interface, inheritance of classes, polymorphism, abstract class.
7. To make familiar with creating file, deleting file, copying the content in files, reading and Writing in files, managing Metadata etc.
8. The students will be able to handle the checked and unchecked exception , Basics of AWT, components and containers.

UNIT-I : Fundamentals OF OOP and JAVA

Need of OOP, Principles of Object Oriented languages, Procedural Language vs. OOPS, Applications of OOPS, Origin of JAVA, features of JAVA, JAVA Environment, Hardware and Software Requirements, Byte Code , Installing JDK,Difference between C++ and JAVA,

Command-Line Arguments, Environment Variables, System Utilities, Command-Line I/O Objects, PATH and CLASSPATH

UNIT-II : JAVA Programming Constructs

JAVA program structure ,Variables, Primitive Data Types, Identifiers, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive type Conversion and Casting, Flow of Control(Conditional Statements, Loops,Branching Mechanism) Command Line Arguments.

UNIT- III : Classes and Objects

Defining a class, creating objects, methods(declaration, invocation, overloading), constructors ,garbage collection, static keyword, this keyword, arrays, inheritance and its types, method overriding, super keyword, final keyword, abstract class.

UNIT-IV: Interfaces and Packages

Defining Interface, Extending and implementing interface, interface vs. abstract classes. JAVA API packages, using system packages, naming conventions, creating packages, accessing a package, using package, adding class to a package.

UNIT-V: Exceptions, Multithreading & I/O

Types of errors, exception handling techniques, user defined exceptions, multiple catch statement, finally statement.

Multithreading, life cycle of a thread, creating new threads in 2 ways, thread priority. Streams and File I/O.

UNIT-IV:Applets and AWT

Difference between applets and applications, life cycle of an applet, common methods used in displaying the output, applet tag, adding applet to HTML file, executing the applet, passing parameters to applets.

Basics of AWT, Components and Containers, Layouts.

Course Outcomes:

After the course completion the students will be:

1. Familiar with fundamentals of object oriented programming using java, JDK, architecture of JVM and able to understand the difference between the C++ and Java
2. Able to do object oriented programming in java by defining class, creating object, invocation of methods, using of packages and class libraries, String and Collections.
3. Will be able to use interface, abstract class , polymorphism and File handling to solve the complex problem
4. Will be able to programming with multithreading, applet, GUI based programmes and handle the exceptions

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2	√			
	3		√		
	4		√		
	5		√		
	6			√	
	7			√	
	8				√

REFERENCES

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

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-202
SUBJECT NAME: ADVANCED JAVA PROGRAMMING
NO OF CREDITS: 4

MCA SEMESTER IV SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To understand the various concepts of advanced java programming and to familiarize the student with the AWT hierarchy and to acquaint the student the concepts of event handling of JAVA
2. To understand the concepts of Swing package and learn the basics of data access using JDBC
3. To master the server side programming using Servlets and to familiarize the students with the concepts of reusable classes using JAVA Beans and Struts Framework
4. To understand the concept of Scripting language like JavaScript and master JSP

UNIT-I : NUMBERS, STRINGS & COLLECTIONS

The Numbers Classes, Formatting Numeric Print Output, Strings, Converting Between Numbers and Strings, Manipulating Characters in a String, The String Builder Class, Autoboxing and Unboxing, The Collection Interface, The Set Interface, The List Interface, Map interface. Generics and Annotation.

UNIT-II : I/O IN JAVA

I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning, Formatting, I/O from the Command Line, Data Streams, Object Streams, File I/O, The Path Class, Path Operations, File Operations, Checking a File or Directory, Deleting a File or Directory, Copying a File or Directory, Moving a File or Directory,, Managing Metadata (File and File Store Attributes), Reading, Writing, and Creating Files, Random Access Files

UNIT-III : AWT & 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-IV : SERVLET & JDBC

Advantages over applets, Servlet alternatives and features, Servlet Architecture, Servlet Lifecycle,GenericServlet, HttpServlet,Passing and Retrieving parameters to servlets, Server Side Include, Cookies, filters, Security Issues.

Introduction to JDBC, JDBC vs. ODBC, JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces

UNIT-V: JAVA BEANS and JAVASCRIPT

Introduction and Advantages of JavaBeans, BDK Introspection, Properties, JavaBeans API,EJB, Introduction to Struts Framework.

Need of JavaScript, Features and Basic Programming constructs of JavaScript(variables, arrays, and functions), Objects, Dialog Boxes, and Event Handling

Course Outcomes

At the end of the course, the student would have

1. To understand the various concepts of advanced java programming and to familiarize the student with the AWT hierarchy and to acquaint the student the concepts of event handling of JAVA
2. To understand the concepts of Swing package and learn the basics of data access using JDBC
3. To master the server side programming using Servlets and to familiarize the students with the concepts of reusable classes using JAVA Beans and Struts Framework
4. To understand the concept of Scripting language like JavaScript and master JSP

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives----→	**Course Outcomes----→**									
		a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**I**
	1	√	√	√						
	2				√	√				
	3						√	√		
	4								√	√

REFERENCES

1. Uttam K. Roy, " Advanced Java Programming", Oxford University Press, ISBN : 0-19-945550-3
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
3. Internet & Web Technologies – Raj Kamal, TMH
4. Herbert Shield " The complete reference-JAVA2" , TMH

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-204
SUBJECT NAME: DESIGN OF UNIX OS & SHELL PROGRAMMING
NO OF CREDITS: 4

MCA SEMESTER IV SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To familiarize the students with the basic concepts of single & multiuser Operating System, basic structure of UNIX kernel and its subsystems,
2. To introduce with the concept of file subsystem, inodes and how files are managed by inodes.
3. To introduce the Students to introduce process control subsystem, process scheduling paradigms and different types of scheduling employed in UNIX,
4. To introduce with memory management subsystems viz. swapping and demand paging.
5. To acquaint students with command structure of UNIX, various types of shells and types of commands and familiarize students with some general commands, directory and file related commands, process related and user communication related commands in UNIX. filters and piping, system administration and some system administration related commands.
6. To introduce various editors available in UNIX and the detailed working on the most Vi editor
7. To introduce with basics of shell programming, wild cards and how to write simple shell programs, introduce concepts of decision control, looping, nested looping and control flow clauses in shell programming. Also make them write the related shell programs.

UNIT-I : Theoretical Concepts and File system of UNIX

Evolution of UNIX, Basic features of UNIX, Architecture of UNIX kernel: File subsystem and process control subsystem, UNIX Vs LINUX, Various flavors of UNIX and LINUX.

Hierarchical structure of UNIX File system, Types of files, data structures of the file subsystem; 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.

UNIT-II : Process Control System and Memory management:

Concept of a process, state transitions, data structures, Context of a process, Layout of the system memory, process scheduler, scheduling parameters, Fair share scheduler. Swapping: Data structures, implementation of swapping processes in and swapping out; Demand Paging: Data structures, page stealer process, fault handler.

UNIT-III : UNIX Commands

Structure of UNIX command, Internal and external commands, Basic utilities, logging in and out, changing passwords, File and directory related Commands: Absolute and relative path names, Creation and deletion of files and directories, Compression of files, file permissions, basic operations on files, simple filters and advanced filters, printer commands, Process related commands, Communication related commands, I/O redirection: standard input, output and error, piping; Vi editor and related commands, TCP/IP networking commands.

UNIT-IV:Shell Programming and System Administration

Types of shells and their features, shell's interpretive cycle, Shell wild cards, Shell variables, interactive shell scripts, shell keywords, positional parameters, using shift on positional parameters, passing command line arguments, arithmetic operations, taking decisions, loop control structures.

The administrator privileges, maintaining security, user and group management, startup and shut down, Disk related commands, Backup and recovery, password aging, advanced administration commands.

Course Outcomes:

a. Basic concepts of UNIX Operating System, its kernel and different subsystems of kernel, types of shells.
b. The student will be able to understand Process Control subsystem, its State diagram, types of scheduling and memory management policies.
c. Execute various types of commands on the standard shell viz. basic commands, directory and file related, pipe and filter related, process related, user communication related and the system administration related commands.
d. How to work on the standard editor and write shell scripts using this editor involving decision control, looping and control flow statements.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2	√			
	3		√		
	4			√	
	5				√
	6				√
	7			√	√

REFERENCES

1. The Design of the UNIX Operating System: Maurice J Bach, PHI

2. UNIX: Concepts and Applications: Sumitabha Das, Tata McGraw Hill.
3. UNIX Shell Programming: YashwantKanetkar, BPB publications.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-206
SUBJECT NAME: SOFTWARE TESTING AND QUALITY ASSURANCE
NO OF CREDITS: 4

MCA SEMESTER IV	SESSIONAL: 40
L T P	THEORY EXAM: 60
3 1 0	TOTAL: 100

NOTE : Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To get familiar the students about basic concepts of software testing and its techniques.
2. To study the concepts of Verification and validation activities.
3. To study in detail the process of performing the black box and white box testing approaches with examples.
4. To get familiar the students the concept of regression testing.
5. To study about the various testing automation and debugging tools and case studies.
6. To study the basic and advanced concepts of object oriented testing.

Unit-I :Testing terminology and Methodology

Definition of testing, goals, psychology, model for testing, effective testing, limitations of testing, Importance of Testing, Definition of Failure, faults or bug, error, incident, test case, test ware, life cycle of bug, bug effects, bug classification, test case design, testing methodology, development of test strategy, verification, validation, Static testing: Inspection ,Review and Walkthrough, dynamic testing, testing life cycle model, testing techniques, testing principles, Testing Metrices.

Unit-II:Verification and validation

Verification activities, verification of requirements, verification of HL design, verification of data design, verification of architectural design, verification of UI design, verification of LL design, introduction to validation activities

Unit-III:Dynamic testing

White Box testing: Boundary value analysis, equivalence class portioning, state table based testing, decision table based, error guessing.

Black Box Testing: Logic coverage criteria, basic path testing, graph matrices.

Unit-IV:Validation Testing

Unit testing, drivers, stubs, integration testing, methods, functional testing, system testing, recovery testing, security testing, stress testing, performance testing, usability testing

Unit-V:Regression Testing

Objective of regression testing, Regression test process, Regression testing techniques.

Unit-VI:Test Automation and debugging

S/w measurement and testing, testing metrics and tools

Case Study: Testing for Object-oriented and web-based systems

Unit-VII:Object-Oriented Testing

Use-case based testing; Class testing, Testing Exception handling

Course Outcomes:

a. Design and develop the bug free software systems using basic concepts of software testing.
b. Identify, formulate, review, estimate and analyze complex engineering problems of software testing using principles of mathematics.
c. Create, select and apply appropriate techniques, modern engineering concepts and IT tools for software testing.
d. Analyze verification, validation activities, static, dynamic testing, debugging tools and techniques and importance of working in teams.
e. Implement and analyze the concepts of object oriented testing, web testing and regression testing.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	**Course Outcomes----------->**					
		a	**b**	**c**	**d**	**e**
	1	√				
	2		√		√	
	3				√	
	4	√				√
	5			√		√
	6				√	√

REFERENCES

1. G.J Myers, The Art of Software Testing, John Wiley & Sons, 1979
2. Naresh Chauhan, Software Testing Principles and Practices, OXFORD University Press.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-208
SUBJECT NAME: COMPUTER BASED MANAGEMENT SYSTEM AND E COMMERCE

NO OF CREDITS: 4

MCA SEMESTER IV SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To get familiar the students about the basic concepts of Management and its functions.
2. To introduce the concept of modern management in 21st century.
3. To study the applications of information technology in management.
4. To study about the electronic commerce, various business models and security issues while performing electronic transactions.

Unit-I:Introduction to Management: The Management Processes

Planning, Organizing, Leading and Controlling, Management Levels: Top, Middle and Bottom, Management as an art, Management as a science, Management as a profession, Functional area of Management. The Management School: Scientific Management, Classical Management, Behavioral Management, Management Science, Systems Approach, Contingency Approach.

Unit-II : Management in 21st Century

Seven-S Model, Organization Structure, Communication Process, Strategy: Institutional, Operational, Total Quality Control (TQC). Total Quality Management (TQM), Electronic Data Interchange (EDI), Just-in-Time (JIT) Approach.

Unit-III : Applications of Management Information System

Types of Information System in Organizations : Transaction Processing System (TPS), Office System, Knowledge Work System (KWS), Decision Support System (DSS), Management Information System (MIS), Executive Support System (ESS).

Unit-IV:E-Commerce

Overview of E-Commerce, Benefits of E-Commerce, Impact of E-Commerce, Applications of E-Commerce, Business Models of E-Commerce, Electronic Payment System : Introduction to Payment System : Online Payment System, Pre-paid and postpaid Payment System. Security in E-Commerce: Transaction Security, Cryptology, Authentication Protocol, Digital Signature, Knowledge Management, Business intelligence, Impact of E-commerce on individual, society and organizations.

Course outcomes:

a. The students are able to understand the concept of management and about its functions.
b. Knowledge about the various functional areas of management.

c. Study of modern management concepts in 21st century and total quality management, electronic data interchange and just in time approach.
d. Study of applications of information technology in the area of management information systems and their applications..
e. Study of various types of management Study about the electronic commerce and electronic transactions and impact of electronic commerce on organizations and society and security issues while doing electronic transactions.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives ---->		**Course Outcomes ------->**				
		a	**b**	**c**	**d**	**e**
	1		√			
	2			√		
	3				√	
	4					√

REFERENCES

1. Stoner, Freeman, Gilbert: Management, Latest, PHI Publication.
2. Kenneth, C. Laudon, Jane P. Laudon: Management Information System, Latest Edition, Pearson Education Publication.
3. P.T. Joseph: E-Commerce - A Managerial Perspective, PHI Publication.
4. Management Theory and Practice. C.B. Gupta
5. Information Technology for Management. Turban, Mclean, Wetherbe

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-210
SUBJECT NAME: VISUAL LANGUAGES PROGRAMMING
NO OF CREDITS: 4

MCA SEMESTER IV SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. Explore Visual Basic's Integrated Development Environment (IDE) and how to load, modify, and save changes made to forms and projects in the Visual Basic environment.
2. Design, create, build, and debug Visual Basic applications, also explain variables, operators and data types used in program development.
3. Define and implement form objects including data arrays, control arrays, text boxes, message boxes, dialog boxes, labels, controls, menus, frames, picture boxes, pull-down menus, and combo boxes, MDI, Image List, List View, DAO, RDO, ODBC etc.
4. Use of different type of arrays, loop structures, different type of procedures and functions
5. Use the debugger in the Visual Basic environment to set breakpoints, program step, procedure step, and error handling
6. Implementation of COM, DCOM, ActiveX, ActiveX-DLL.
7. Generation of various types of crystal reports and how to perform packaging and deployment.
8. Usage of VB script.

Unit-I :

Client Server Basics

Discover Client-Server and Other Computing Architectures, Understand File Server versus Client -Server Database Deployment, Learn About the Two Tier Versus Three Tire Client-Server Model.

Visual Basic Building Blocks and Default Controls: Forms, Using Controls, Exploring Properties, Methods and Events, Introduction to Intrinsic Controls, Working With Text, Working With Choices, Special Purpose Controls.

VB Advance Controls: Events, Menu bar, Popup Menus, Tool bar, Message Box, Input Box, Built-in Dialog Boxes, Creating MDI, Working with Menus.

Unit-II

VB Programming Fundamentals and Variables: Introduction to Variables, Variable Declaration. Arrays, Introduction to Constants and Option Explicit Statement, Assignment Statements, Working With Math Operations, Strings, Formatting Functions.

Controlling And Managing Program: All Control Statement, Loops, Error Trapping, Working with Procedures, Functions, Windows Common controls, control arrays.

Unit-III

Visual Basic and databases: Understanding the Data Controls, Introduction to DAO, Working with Record sets, Record Pointer, Filter, Sorts and Manipulation of Records.

Remote And ActiveX data Objects: Working with ODBC, Remote Data Objects and Remote data Control, Introducing ADO, ADO Data Control, Using Data Grid Control and ActiveX Data Objects.

Unit-IV

COM and ActiveX Components:

COM, Creating, Testing, Compiling, Enhancing and User Drawn ActiveXControls, Building Class Modules, ActiveX DLL.

Client-Server Development Tools: Data Reports And Crystal Reports, Packaging A Standard EXE Project.

Course Outcomes

At the end of the course, the student would have

a. Learn different type of client server architectures and introduction to VB6 tool and its related objects.
b. Learn the various programming constructs, syntax of various controls used in VB.
c. Learn various ways to access data (like data control, DAO) in VB, how to deal with errors and exceptions in VB, and some other interfaces like MDI.
d. Learn the concepts of COM, ActiveX Controls, how to make Data Reports and Crystal Reports and usage of VB script.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2	√	√		
	3		√	√	
	4	√	√		
	5			√	
	6				√
	7				√
	8				√

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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-301
SUBJECT NAME: .NET TECHNOLOGY
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

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

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, Execution of assemblies code, IL, JIT, .NET framework class library, common type system, common language specification, metadata; Interoperability with unmanaged code

Net Framework Base Classes : System Namespaces; the System Types; System.object class; System.Exception Class; System.Collections;

Unit-II : 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, Understanding Window Forms; Viewing and changing properties; Adding controls to the form.

Designing Visual Components: Using the task list

Unit-III : 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: Procedures in VB.NET, Garbage Collection, Message boxes; Dialog boxes; Menus and Toolbars; creating menu; adding Toolbars and buttons; defining an icon for a toolbar button; Adding Functionality to the Toolbar; Exception Handling.

Unit-IV : 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-V : 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

Course Outcomes:

a. Understand .net framework , its runtime environment and application 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.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-→	Course Outcomes----→				
	a	**b**	**C**	**d**
1	√			
2		√		
3		√		
4			√	
5				√

REFERENCES

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 APPLICATION
CODE: MCA-16-303
SUBJECT NAME: OBJECT ORIENTED SYSTEM DEVELOPMENT
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objective

1. Review of the concepts of Object Oriented Programming and understand the Importance of Architecture in the Software Development lifecycle.
2. Highlighting the importance of object-oriented analysis and design and its limitations.
3. To be able to understand the importance of modeling and introduction to Unified modeling Language and Objectory.
4. Pointing out the importance and function of each UML Model throughout the process of Object Oriented Analysis and Design and explaining the notation of various elements in these models.
5. To be able to understand the importance of Iteration and planning in SDLC especially in UML.

Unit-I

Introduction to object oriented methodology: Review of the Traditional Methodologies, Classes, Objects, Encapsulation, Association, Aggregation, Inheritance, Polymorphism, States and Transitions.

Object Oriented Modeling: visual modeling and its importance, – UML Approach, Conceptual model of the UML, Architecture, Software Development Life Cycle.

Object Oriented Design: Trends in software design, Design principles, Responsibility driven design, Separation of Responsibilities, Design phases and tools

Unit-II

Introduction to Objectory Software Development Process:

Introduction, Benefits, Phases and Iterations, Elaboration Stage, Construction Stage, Transition Stage.

Unit-III

Structural modeling: Objects, classes: Names, attributes, operations, responsibilities; Stereotypes and Classes Relationships: Dependencies, Generalization, Association, Structural Diagrams: Class diagram, object diagrams.

Unit-IV

Behavioral Modeling: Interaction diagrams, types of Interaction diagrams ,Activity Diagrams Activities, Transitions, Decision Points, Swimlanes Actors & Use cases, use case diagram, Use Case Relationships, Types of Relationships,

Unit-V

Architectural Modeling: Designing the System Architecture : The need for Architecture, The "4+1" view of Architecture, The Logical view, The Component View, The Process View, The Deployment View, The Use Case view. Checking the Model: Making the Model Homogeneous, Combining Classes, Splitting Classes, Eliminating Classes, Consistency Checking, Scenario Walk-through, Event Tracing, Documentation Review

Unit-VI

The Iteration Planning Process: Benefits, Goals, Design the User Interface, Adding Design Classes, The Emergence of Patterns, Designing Relationships, Designing Attributes and Operations, Designing for Inheritance, Coding, Testing, and Documenting the Iteration.

Course Outcomes

After completing this course the student must demonstrate the knowledge and ability to:

a. Show the importance of systems analysis and design in solving complex problems and how the object-oriented approach differs from the traditional approach to systems analysis and design.
b. Explain the importance of modeling and how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views and understand of the various phases of the Objectory software Development Process.
c. Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state-chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.
d. Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.
e. Show the role and function of each UML model in developing object-oriented software and understanding of the Iterative and Iterational approach to be followed in UML

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOME

Course Objectives ---- ^	**Course Outcomes ------->**					
		a	**b**	**c**	**d**	**e**
	1	√				
	2	√				
	3		√			
	4			√	√	
	5					√

REFERENCES

1. “UML User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 2000, Addison Wesley.
2. Visual Modelling with Rational Rose 2000 and UMLBy Terry Quatrani Foreword by Grady Booch, 2000.
3. “UML Reference Guide”, James Rumbaugh, Ivar Jacobson, Grady Booch, 2000, Addison Wesley.
4. “The Objectory Software Development Process”, Ivar Jacobson, Grady Booch, James Rumbaugh, 1999, Addison Wesley.
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6. Sams Teach Yourself “UML” In 24 Hours By Joseph Schmuller ,2000

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-305
SUBJECT NAME: ADVANCED DATA BASE SYSTEMS
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objective

1. To make the students familiar with The Enhanced Entity Relationship Model, Object Model
2. To make the student familiar with Object Oriented database with their advantages and storage and access methods.
3. To make the students familiar with large data repositories i.e. Data Warehouse and various Data Mining techniques for extracting and analysis of useful information.
4. To make the students familiar with Parallel and Distributed Databases: Distributed database concepts, Architectures for distributed databases,
5. To make the students familiar with Databases on Web and Semi Structured Data:
6. To make the students familiar with Enhanced Data Models for Advanced Applications.

Unit-I

The Enhanced Entity Relationship Model and Object Model: ER-model, EER-model: Subclasses, superclasses, Inheritance, Specialization, Generalization, Motivation for complex data types, User defined abstract data types and structured types.

Object-Oriented Databases : Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Database schema design for OODBMS,OQL.

Object Relational Databases: Database design for an ORDBMS - Nested relations and collections, Storage and access methods.

Unit-II

Data Warehouse: Difference between Operational database and data warehouse, Multidimensional Model, Schemas for Multi dimensional Model, Concept Hierarchies, OLAP Operations, Data warehouse architecture.

Data Mining: Introduction to data mining, Knowledge Discovery in Databases, Association Analysis, Association Rule Mining, Classification and Prediction, Cluster Analysis.

Unit-III

Parallel and Distributed Databases: Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Architectures for distributed databases, Data fragmentation, Replication, and catalog

management techniques, Query processing in distributed database; Joins, Concurrency control and Recovery in distributed databases.

Unit-IV

Databases on Web and Semi Structured Data: Overview of XML; XML Applications; The semi structured data model, Implementation issues, Enhanced Data Models for Advanced Applications; Active database concepts. Temporal database concepts; Geographic information systems, spatial databases, Deductive databases and query processing; Mobile databases, Multimedia databases.

Course outcome

a. Understand the concepts of different type of databases (Relational, Object Oriented and Object Relational Database) and can create these types of databases through various methodology available.
b. Understand the concept of large database repositories, Data warehouse and data mining. Student will be able to differentiate between data warehouse and any other database system and can to retrieve or mine the data for various purposes (like prediction, analysis etc.) from large data repositories.
c. Understand the concept of Parallel and distributed databases and different ways in which data can be stored, processed or recover on such databases.
d. Understand the concept of latest types of databases (like mobile database, GIS based, XML etc) and how they are different from the traditional database approach and will be able to identify the areas in which these types of databases are helpful.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives --->	**Course Outcomes ------->**				
		a	**b**	**C**	**d**
	1	√			
	2	√			
	3		√		
	4			√	
	5				√
	6				√

REFERENCES

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2. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.
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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-307 (1)
SUBJECT NAME: THEORY OF COMPUTATION (ELECTIVE-1)

NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

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.

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.

Unit-II: 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-III: 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-IV: Grammars

Definition, 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-V: Pushdown Automata

Introduction to Pushdown Machines, Application of Pushdown Machines

Unit-VI: Turing Machines

Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M., PCP Problem.

Unit-VII: Chomsky Hierarchies

Chomsky hierarchies of grammars, unrestricted grammars, Context sensitive languages, Relation between languages of classes.

Unit-VIII: Computability

Basic concepts, Primitive Recursive Functions.

Course Outcomes

a. The students will be able to 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. The students would be able to define 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. The students will be able to 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. The students will be able to find the various solutions of Recursive and non-recursive languages.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√			
	2		√		
	3			√	
	4				√

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6. Introduction to languages and the Theory of Computation by John C. Martin 2003, T.M.H.

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-307 (2)
SUBJECT NAME: ADVANCE COMPUTER NETWORKS (ELECTIVE-1)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To make students familiar with concepts of Data Communication, Line Encoding Schemes, Multiplexing techniques, Modulation methods and introduce B-ISDN and ATM, Optical Transmission, Network techniques, Signaling principles.
2. To make students familiar with concept of broadband network performance, traffic management aspects.
3. To make students familiar with ATM traffic parameters and transfer capabilities, Quality of service and ATM switching: matrix type, central memory, ring type switching element.
4. To make students familiar with Switching networks and ATM transmission.
5. To introduce concept of Multi-Protocol Label Switching (MPLS) and Ad-hoc Network Concepts.

Unit-I: Data Communication

Data transmission, Parallel Transmission, Serial Transmission, Line Encoding Schemes: Unipolar, Polar, Bipolar, Multiplexing techniques: TDM, FDM, Modulation methods: AM, FM, PM, Pulse Code Modulation.

Unit-II: Introduction to B-ISDN and ATM:

B-ISDN principles, Asynchronous transfer mode, Optical Transmission, Network techniques: Networking layering, Switching of virtual channels and virtual paths, applications of virtual channel/path connections, Signaling principles: capabilities required for B-ISDN signaling, signaling virtual channels, broadband network performance, traffic management aspects: overview of functions, ATM traffic parameters and transfer capabilities, Quality of service.

Unit-III: B-ISDN reference model

General aspects, layering architecture, relationship between B-ISDN PRM and OSI reference model, B-ISDN protocol reference model description and layer functions, User Network Interface.

Unit-IV: ATM

ATM based services and applications, ATM cell structure, Cell header, ATM connections: virtual path connection, virtual channel connection. ATM switching: matrix type, central memory, ring type switching element. Switching networks: Single stage networks, Multi-stage networks, ATM transmission: cell transfer functions, transmissions systems

Unit-V: Multi-Protocol Label Switching (MPLS)

How MPLS works, Installing and removing MPLS paths , Comparison of MPLS versus IP , MPLS local protection , Comparison of MPLS versus Frame Relay , Comparison of MPLS versus ATM , Comparison of MPLS VPN versus IPSec VPN , Access to MPLS networks , Benefits of MPLS.

Unit-VI: Ad-hoc Network Concepts

Routing in Ad-hoc networks, routing protocols.

Course Outcomes

The students will be able to:

a. Understand concepts of Data Communication, Line Encoding Schemes, Multiplexing techniques, Modulation methods and introduce B-ISDN and ATM, Optical Transmission, Network techniques, Signaling principles.
b. Get familiar with concept of broadband network performance, traffic management aspects.
c. Get familiar with ATM traffic parameters and transfer capabilities, Quality of service and ATM switching: matrix type, central memory, ring type switching element.
d. Get familiar with Switching networks and ATM transmission.
e. Understand the concept of Multi-Protocol Label Switching (MPLS) and Ad-hoc Network Concepts.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->					
		a	**B**	**c**	**d**	**e**
	1	√				
	2		√			
	3			√		
	4				√	
	5					√

REFERENCES

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2. Computer Networks (4th edition), Tanenbaum Andrew S., International edition, 2004.
3. ATM Networks, Third Edition: Concepts Protocols Applications by Rainer Handel. Ad-hoc Networks by Charles E.Perkins
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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-307 (3)
SUBJECT NAME: SOFT COMPUTING (ELECTIVE-1)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

To subject aims to educate the students about

1. To acquaint the students with the need for soft computing and its associated tools.
2. To tell the students about the concepts relating to fuzzy sets and logic and their applications in various domains.
3. To tell the students about the concepts relating to Neural Networks and their applications in the areas of classification and content addressable memory.
4. To acquaint the students with the need for Genetic Algorithms and their utility in solving the problems having huge state space.
5. To tell the students, how to use various soft computing tools in solving practical problems.

Unit-I: Introduction

Introduction to soft computing; Introduction to biological and artificial neural network; Introduction to fuzzy sets and fuzzy logic systems. Introduction to Genetic Algorithm, Biological Background, Creation of Offspring, Working Principle, Genetic Operators and Parameters: Cross Over, Inversion and Deletion, Mutation, Genetic Algorithms in Problem Solving, Implementation Issues.

Unit-II: Artificial neural networks and applications

Early Neural Networks, McCulloch-Pitt Network, Hebb Learning, Hebb Networks and its Application, Perceptron, Problem of Linear separability, Delta Learning Rule, ADALINE Network, MADALINE Network and their applications.

Unit-III: Backpropagation Network

Its application, Associative Memories: Concept of Energy, Auto-associative, Iterative Auto-Associative Memory(Hopfield Net), Bidirectional Associative Memories (BAM) and their application in Pattern Recognition, Introduction to Adaptive Resonance Theory.

Unit-IV: Fuzzy systems and applications

Crisp Set Fuzzy sets, Relation between Fuzzy sets, Operations on Fuzzy sets, Certain numbers and Sets Associated with Fuzzy sets, alpha-cut Decomposition Theorem, Extension Principle, Fuzzy Set of Type-k and Level-k, Fuzzy Relations, Composition of Fuzzy Relations, multi-values Logic, Fuzzy Inference, Fuzzy Inference Mechanism, Application, Applications of Fuzzy logic(At least one real Life Problem). Neuro-fuzzy systems.

Course Outcomes

After the completion of the course, the students will be able to:

a. The students will be able to understand and apply basic concepts related to fuzzy sets and logic.
b. The students will be able to understand and apply basic concepts related to neural networks.
c. The students will be able to understand and apply basic concepts related to Genetic Algorithms.
d. The students will be able to apply concepts related to Genetic Algorithms, Neural Networks and Fuzzy Logic to practical problems.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->				
		a	**b**	**c**	**d**
	1	√	√	√	√
	2	√			√
	3		√		√
	4			√	√
	5	√	√	√	√

REFERENCES

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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-307 (4)
SUBJECT NAME: MULTIMEDIA AND ITS APPLICATIONS (ELECTIVE-1)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objective:

The Student will be able to

1. Analyze and explain various technologies involved to support multimedia application Development.
2. Understand multimedia authoring and Understanding the constraints on multimedia systems and the range of technologies available to multimedia systems designers and integrators.
4. Have an insight into how the quality of multimedia systems is perceived and how this relates to the design of multimedia input, output and editing systems.
5. Understand different compression principles and different compression techniques and to know the mathematics involved in digital and analog conversion of components of multimedia.
6. Design and develop multimedia systems according to the requirements of multimedia application and understand the particular issues of virtual reality.

Unit-I: Basics of Multimedia Technology

Computers, communication and entertainment; multimedia an introduction; framework for multimedia systems; multimedia devices; CD- Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; LANs and multimedia; internet, World Wide Web & multimedia distribution network-ATM & ADSL; multimedia servers & databases; vector graphics; 3D graphics programs; animation techniques; shading; anti aliasing; morphing; video on demand.

Unit-II: Image Compression & Standards

Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; JPEG-objectives and architecture; JPEG-DCT encoding and quantization, JPEG statistical coding, JPEG predictive lossless coding; JPEG performance; overview of other image file formats as GIF, TIFF, BMP, PNG etc.

Unit-III: Audio & Video

Digital representation of sound; time domain sampled representation; method of encoding the analog signals; sub band coding; Fourier method; transmission of digital sound; digital audio signal processing; stereophonic & quadraphonic signal processing; editing sampled sound; MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface; digital video and image

compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.

Unit-IV: Virtual Reality

Applications of multimedia in various fields, intelligent multimedia system, desktop virtual reality, VR operating system, virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems.

Course Outcomes

The student will be able to

a. Design and implementation of hypermedia & multimedia systems.
b. Achieve an in-depth understanding of the impact of multimedia on personal and distributed computer systems, the range of media types and tools to support their digital conversion and manipulation of images, audio and video and their compression
c. Develop an interactive multimedia application to display their ability to use multimedia tools including multimedia authoring.
d. Evaluate and Discuss Excellent and ineffective interactive multimedia design.
e. Produce Multimedia Presentation and interactive web page design.
f. Design and implement a number of multimedia applications and Evaluate and discuss virtual reality systems.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->						
		a	**B**	**c**	**d**	**e**	**f**
	1	√	√				
	2		√	√			
	3				√		
	4		√		√		√
	5					√	
	6					√	√

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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-307 (5)
SUBJECT NAME: DISTRIBUTED OPERATING SYSTEMS (ELECTIVE-1)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

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

Unit-I: Introduction

Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts, Design issues.

Unit-II: Communication in distributed system

Layered protocols, ATM, client server model, remote procedure call, and group communication.

Unit-III: 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-IV: Processes and Processors in distributed systems

Threads, System models, Processors Allocation.

Unit-V: Distributed file systems & Shared Memory

Distributed file system Design, Distributed file system Implementation. **W**hat is shared memory, Consistency models, Page based distributed shared memory and shared variables distributed shared memory.

Unit-VI: Case study MACH

Introduction to MACH, process management in MACH, Communication in MACH, UNIX emulation in MACH.

Course Outcomes:

a. Students will learn about 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 learn about designing and implementing fault tolerant distributed systems.
c. The students should be able to demonstrate 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. Learn the various resource management techniques like the use of distributed shared memory and other resources for distributed systems.
e. This course successfully will be able to pursue independent research in distributed systems like MACH, UNIX etc.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives --->	**Course Outcomes ------->**					
		a	**B**	**c**	**d**	**e**
	1	√	√			
	2		√			
	3		√	√		
	4		√		√	
	5		√	√		
	6		√		√	√

REFERENCES

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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 APPLICATION
CODE: MCA-16-309 (1)
SUBJECT NAME: OPEN SOURCE TECHNOLOGY (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To introduce open source technology for development of web applications.
2. For Study the problems with traditional commercial software.
3. To make the student familiar with the open source scripting language for programming in web environment i.e. PHP.
4. For study the open source management system and connection with database.
5. To introduce the student with the open source web server, software tools.

UNIT-I

Introduction : the need of open Sources, advantages of Open sources application , Open Source Development Model Licences and Patents ,FOSS, BSD, Free Software Movement, commercial software vs. Open Source software Commercial aspects of Open Source movement - Certification courses issues - global and Indian. Copyrights and copy lefts, Application of Open Sources. Problems with traditional commercial software

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.

Course Outcomes

a. The student will be familiar with need of open source technology, open source development model, application of open sources, aspects of open source movement
b. The students will be aware about the problems with traditional commercial software.
c. The student will be familiar with basis syntax of PHP, common PHP scripts elements.
d. The student will be familiar with creating of the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
e. The students will be familiar with Working of different web Servers.
f. The students will be aware about the software tool and process like Eclipse IDE, Selenium ID.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives -->	**Course Outcomes ------->**					
	a	**B**	**c**	**d**	**e**	**f**
1	√				√	√
2		√				
3			√	√		
4				√		
5	√				√	√

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1. The Linux Kernel Book Rem Card,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

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-309 (2)
SUBJECT NAME: NETWORK SECURITY (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. 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.

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.

Course Outcomes:

After the completion of this course the student will 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.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives --->	Course Outcomes ------->			
	a	**B**	**c**	**d**
1	√			
2	√		√	
3		√		
4		√		√
5	√	√		

REFERENCES

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 APPLICATION
CODE: MCA-16-309 (3)
SUBJECT NAME: MOBILE COMPUTING (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To introduce the concept of wireless communication along with its history, application, and market.
2. To make the student familiar with basic terminology like frequency, signals, bandwidth, signals and spread spectrum etc.
3. To introduce the concept of cellular system and design of cellular system. To make the students familiar with different handoff strategies.
4. To introduce the MAC and Telecommunication system and make the student familiar with the wireless LAN including Bluetooth technology.
5. To introduce the concept of Mobile Network layer, IP Packet delivery and adhoc network routing and make the student familiar with mobile transport layer along with satellite communication.

Unit-I

Examples of wireless communication systems, paging systems, Cordless telephone systems, comparison of various wireless systems, Introduction to mobile computing, issues in mobile computing, impacts of mobility and portability in wireless communication.

Unit-II

Second generation cellular networks, third generation wireless networks, cellular system: GSM- mobile services, architecture radio interlace, protocol, localization, calling, handover, security, new data services, Blue tooth and Personal Area Networks.

Unit-III

Handoff management: Radio Link Transfer, Link transfer types, Hard handoff, MCHO Link transfer, MAHO/NCHO Link transfer, Subrating MCHO Link transfer, Soft Handoff, Adding a new BS, Dropping a BS

Unit-IV

Frequency reuse, interference and system capacity, improving coverage and capacity, tracking and grade of service, improving coverage and capacity, intelligent cell concept, in building communication.

Course Outcomes

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

a. Able to understand the concept of wireless communication, its advantages over traditional wired network communication, different application of wireless communication system.
b. Familiar with the various terms such as frequencies, signals, multiplexing, modulation and spread spectrum techniques, frequency reuse and hand off strategies.
c. Able to understand and classify different multiplexing strategies and modulation strategies.
d. Differentiate between ALOHA and slotted ALOHA. Familiar with GSM, GSM system architecture, GSM protocol architecture, handover procedure and security.
e. Familiar with IEEE standard 802.11, CSMA/CA access method, fragmentation, MAC Management, Bluetooth, piconet, scatternet, Bluetooth protocol stack and ad hoc network.
f. Able to understand the concept of Mobile IP, its goals and other terminologies. Able to differentiate between IPV4 and IPV6 along with mobile transport layer, TCP, satellite communication, categories, routing and handover in satellite communication.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->						
		a	**b**	**c**	**d**	**e**	**f**
	1	√	√				
	2		√				
	3		√	√	√		
	4		√		√	√	
	5					√	√

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REFERENCES

1. Wireless Communications: Theodore S Rappaport; Pearsons
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 APPLICATION
CODE: MCA-16-309 (4)
SUBJECT NAME: DIGITAL IMAGE PROCESSING (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V SESSIONAL: 40
L P THEORY EXAM: 60
4 0 TOTAL: 100

NOTE**:** Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. 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. Demonstrated understanding of 2D Fourier transforms concepts.
5. Demonstrated understanding of the fundamental image enhancement algorithms such as histogram equalization and specification techniques, Color image enhancement etc.
6. Understand the concepts of and how to perform Image restoration and reconstruction, image compression and image segmentation methods.

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 distributions, Spatial averaging, DirectionalSmoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering,Color image enhancement.

Unit-III: Image Restoration

A 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

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.

Unit-V: Image Compression

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Course Outcomes:

a. The student will able to learn the fundamental concepts of digital image processing.
b. The student will able to understand the application 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.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOME

Course Objectives-->	Course Outcomes---------->					
	a	**b**	**c**	**d**	**e**
1	√	√			
2		√	√		
3				√	
4				√	
5					√
6					√

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Second Editi on, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
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   E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice H allProfessional Technical Reference, 1990.
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7. Milan Sonka et aI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Bro okes/Cole, VikasPublishing House, 2nd edition, 1999,

MASTER OF COMPUTER APPLICATION
CODE: MCA-16-309 (5)
SUBJECT NAME: SOFTWARE PROJECT MANAGEMENT (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V	SESSIONAL: 40
L P	THEORY EXAM: 60
4 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. Understand the fundamental principles of Software Project management and will also have a good knowledge of responsibilities of project manager and how to handle these.
2. Understand the project planning process and be familiar with the different methods and techniques used for project management.
3. Acquire knowledge of project reporting, defect analysis and prevention.
4. Impart knowledge of the various quality techniques.

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

Course Outcomes:

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.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->			
	a	**b**	**c**	**d**
1	√			
2	√	√		
3			√	√
4				√

REFERENCES

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2. Software project management in practice by Pankaj Jalote, 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 Naresh Chauhan, Oxford University press, India

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MASTER OF COMPUTER APPLICATION
CODE: MCA-16-309 (6)
SUBJECT NAME: DATA WAREHOUSING & DATA MINING (ELECTIVE 2)
NO OF CREDITS: 4

MCA SEMESTER V	SESSIONAL: 40
L P	THEORY EXAM: 60
4 0	TOTAL: 100

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives

1. To understand the basic principles, concepts and applications of data warehousing and data mining.
2. 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.

Unit-I

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

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 Preprocessing: 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.

Course outcomes:
After undergoing the course, Students will be able to understand

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. How Data Mining is one step in the whole KDD process.
e. The use of tools and techniques of data mining and the design of new data mining techniques.

MAPPING OF COURSE OBJECTIVES AND COURSE OUTCOMES:

Course Objectives-->	Course Outcomes---------->					
	a	**b**	**c**	**d**	**e**
1	√				
2	√	√			
3			√	√	
4		√			
5		√		√	√
6					√

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