DEPARTMENT OF COMPUTER ENGINEERING
PUNJABI UNIVERSITY

SCHEME AND SYLLABI

FOR

MASTER OF TECHNOLOGY
Computer Engineering

REGULAR & PART TIME

(SEMESTER SYSTEM)
YEAR 2016-2019
Batch 2016

FACULTY OF ENGINEERING AND TECHNOLOGY
PUNJABI UNIVERSITY, PATIALA

Scheme for **Regular** M. Tech. Computer Engineering

Sr. No.	Subject Title	Subject Code	Teaching				Sessional Awards	Theory Exam	Exam Hrs.
			L	T	P	Cr			
SEMESTER-I									
1.	Computer network technologies	MCE-101	3	1	0	3.5	50	50	3 hrs.
2.	Research Methodology	MCE-106	3	1	0	3.5	50	50	3 hrs.
3.	Elective Course-I	MCE	3	1	0	3.5	50	50	3 hrs.
4.	Elective Course-II	MCE	3	1	0	3.5	50	50	3 hrs.
5.	Research Lab	MCE -150	0	0	4	2	100	--	--
6.	**Open Elective								
		Total credits				16	Total Marks	500	
SEMESTER-II									
1.	Design Principles of operating System	MCE-103	3	1	0	3.5	50	50	3 hrs.
2.	Software Engineering Concepts and Methodologies	MCE-104	3	1	0	3.5	50	50	3 hrs.
3.	Elective Course-III	MCE	3	1	0	3.5	50	50	3 hrs.
4.	Elective Course-IV	MCE	3	1	0	3.5	50	50	3 hrs.
5.	Minor Project	MCE-151	0	0	6	3	100		
	**Open Elective							--	--
		Total credits				17	Total Marks	500	
SEMESTER-III									
1.	Advanced Data Structure And Applications	MCE-102	3	1	0	3.5	50	50	3 hrs.
2.	Advanced Database Systems	MCE-105	3	1	0	3.5	50	50	3 hrs.
3.	Elective Course-V	MCE	3	1	0	3.5	50	50	3 hrs.
4.	Elective Course-VI	MCE	3	1	0	3.5	50	50	3hrs
5.	Major Project	MCE-152	0	0	6	3	100		--
	**Open Elective								
		Total credits				17	Total Marks	500	

SEMESTER-IV							
DISSERTATION	MCE-153						
**Open Elective							

Total Credits= 50

Scheme for Part Time M. Tech. Computer Engineering

Sr. No.	Subject Title	Subject Code	Teaching				Sessional Awards	Theory Exam	Exam Hrs.
			L	T	P	Cr			
SEMESTER-I									
1	Core Course-I	MCE	3	1	0	3.5	50	50	3 hrs.
2.	Elective Course-I	MCE	3	1	0	3.5	50	50	3 hrs.
3.	Research Lab	MCE -150	0	0	4	2	100	--	--
4.	**Open Elective								
						9	Total Marks	300	
SEMESTER-II									
1.	Core Course-II	MCE	3	1	0	3.5	50	50	3 hrs.
2.	Core Course-III	MCE	3	1	0	3.5	50	50	3 hrs.
3.	Elective Course-II	MCE	3	1	0	3.5	50	50	3 hrs.
4.	**Open Elective								
		Total credits				10.5	Total Marks	300	
SEMESTER-III									
1.	Core Course-IV	MCE	3	1	0	3.5	50	50	3 hrs.
2.	Elective Course-III	MCE	3	1	0	3.5	50	50	3 hrs.
3.	Minor Project	MCE-151	0	0	6	3	100		
4.	**Open Elective							--	--
		Total credits				10	Total Marks	300	
SEMESTER-IV									
1.	Core Course-V	MCE	3	1	0	3.5	50	50	3 hrs.
2.	Elective Course-IV	MCE	3	1	0	3.5	50	50	3 hrs.
3.	Elective Course-V	MCE	3	1	0	3.5	50	50	3 hrs.
4.	**Open Elective								
		Total credits				10.5	Total Marks	300	
SEMESTER-V									
1.	Core Course-VI	MCE	3	1	0	3.5	50	50	3 hrs.
2.	Elective Course-VI	MCE	3	1	0	3.5	50	50	3 hrs.
3.	Major Project	MCE-152	0	0	6	3	100		--
4.	**Open Elective							--	--
		Total credits				10	Total Marks	300	
SEMESTER-VI									
DISSERTATION		MCE-153							
**Open Elective									

Total Credits= 50

List of Core Subjects

MCE 101	COMPUTER NETWORK TECHNOLOGIES
MCE 102	ADVANCED DATA STRUCTURE AND APPLICATIONS
MCE 103	DESIGN PRINCIPLES OF OPERATING SYSTEM
MCE 104	SOFTWARE ENGINEERING CONCEPTS AND METHODOLOGIES
MCE 105	ADVANCED DATABASE SYSTEMS
MCE 106	RESEARCH METHODOLOGY

LIST of Electives

MCE 201	NETWORK SECURITY
MCE 202	DIGITAL IMAGE PROCESSING
MCE 203	OBJECT ORIENTED ANALYSIS AND DESIGN USING UML
MCE 204	WEB SERVICES
MCE 205	MULTIMEDIA SYSTEMS
MCE 206	ADVANCED PROGRAMMING LANGUAGES
MCE 207	NATURAL LANGUAGE PROCESSING
MCE 208	SOFT COMPUTING
MCE 209	EMBEDDED SYSTEMS
MCE 210	WIRELESS AND MOBILE NETWORKING
MCE 211	PARALLEL AND DISTRIBUTED SYSTEMS
MCE 212	SOFTWARE PROJECT MANAGEMENT
MCE 213	E-BUSINESS
MCE 214	ADVANCED MICROPROCESSOR AND PROGRAMMING
MCE 215	DESIGN AND ANALYSIS OF ADVANCED ALGORITHMS
MCE 216	ADVANCED COMPUTER ARCHITECTURE
MCE 217	DATA WAREHOUSING & DATA MINING
MCE 218	ADVANCED COMPUTER GRAPHICS
MCE 219	GRID COMPUTING
MCE 220	ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS
MCE 221	COMPILER DESIGN
MCE 222	BUSINESS INTELLIGENCE

SEMINAR AND MINOR PROJECT

MCE 150	Research Lab
MCE 151	SELF STUDY & SEMINAR
MCE 152	MINOR PROJECT

DISSERTATION

MCE 153	DISSERTATION

****LIST OF OPEN ELECTIVE COURSES**

(STUDENT CAN OPT ANY NUMBER OF COURSES FROM OPEN ELECTIVE LIST IN ANY SEMESTER)

1. MICRO ECONOMIC ANALYSIS (M.A. BUSINESS ECONOMICS)
2. QUANTITATIVE TECHNIQUES (M.A. BUSINESS ECONOMICS)
3. THEORY AND PRACTICE OF WAR – I (M.A. DEFENCE & STRATEGIC STUDIES)
4. PROFESSIONAL PHOTOGRAPHY (B. TECH TV, FILM PRODUCTION AND MEDIA TECHNOLOGY)
5. EARLY HISTORY OF BUDDHISM (M.A. BUDDHIST STUDIES)
6. ORIGIN & DEVELOPMENT OF SIKHISM (M.A. BUDDHIST STUDIES)
7. PHILOSOPHICAL FOUNDATIONS OF EDUCATION (M.A. EDUCATION)
8. ENGLISH PHONETICS AND PHONOLOGY (M.A. ENGLISH)
9. ART AND CULTURAL HISTORY OF INDIA (M.A. FINE ARTS)
10. GROWTH & DEVELOPMENT OF PRINT MEDIA (M.A JOURNALISM AND MASS COMMUNICATION)
11. GURU NANAK DEV: METAPHYSICS & EPISTEMOLOGY (M.A. PHILOSOPHY)
12. INDIVIDUAL AND SOCIETY (M. A. SOCIAL WORK)
13. HUMAN GROWTH AND DEVELOPMENT (M. A. SOCIAL WORK)
14. WOMEN'S MOVEMENT IN INDIA (M.A. WOMEN'S STUDIES)
15. POSITIONAL ASTRONOMY (M.SC. ASTRONOMY & SPACE PHYSICS)

****Note regarding OPEN ELECTIVE:**

(i) It is an over and above the basic requirements for M. Tech. CE degree

(ii) In addition to above open elective subjects, student can opt any other subject offered by university departments with the consent of ACD of CE department.

MCE-101 COMPUTER NETWORK TECHNOLOGIES

L	T	P	Cr
3-	1-	0	3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Basics of basics of computer networks.
Objectives: Thorough understanding of Network Technologies.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from Each section A and B of the question paper and the entire section C.

SECTION-A

Data communication Techniques, Synchronous-Asynchronous Transmission, Digital Transmission, Transmission Media, Impairments, Data encoding Techniques
Communication Networks: Circuit switching, Message switching, Packet Switching. X.25, LAN Technologies, Virtual Circuits
Network Reference models – OSI and TCP/IP, Layered architecture

Data Link Layer: Design issue, framing, error control, flow control, HDLC, SDLC, data link layer in the Internet (SLIP, PPP)
Network Layer: Routing Algorithms, shortest path, distance vector routing, Link state routing, and multicast routing. Congestion control, traffic shaping, leaky bucket, token bucket, choke packets, load shedding, internetworking- connection oriented and connectionless, fragmentation, internet architecture and addressing, IP protocol, ICMP, APR, RARP, OSPF, BGP, CIDR, IPv6.

SECTION - B

Transport Layer: Transport Service, quality of service, connection management, addressing, flow control and buffering, multiplexing, Internet transport protocols- TCP and UDP
Session layer: Dialogue management, synchronization and remote procedure call.

Presentation layer: date representation, data compression, network security and cryptography
Application layer: SMTP and World Wide Web

Reference Books:

1. A. S. Tanenbaum, "Computer Networks", Pearson Education
2. W. Stallings," Data and Computer Communications", PHI
3. J.F. Kurose, K.W. Ross, "Computer Networking: A Top-Down Approach featuring the Internet", Pearson Education
4. L.L. Peterson, B.S. Davie, "Computer Networks: A Systems Approach", Pearson Education

MCE-102 ADVANCED DATA STRUCTURES AND APPLICATIONS

L T P Cr
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Basics of Data Structures
Objectives: Thorough understanding of Data Structures

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

Section A

Complexity Analysis & Elementary Data Structures
Asymptotic notations – Properties of big oh notation – asymptotic notation with several parameters – conditional asymptotic notation – amortized analysis – NP completeness – NP-hard – recurrence equations – solving recurrence equations
Arrays, linked lists, trees and sparse matrices.

Heap Structures
Min-max heaps – D-heaps – Leftist heaps –Binomial heaps – Fibonacci heaps –Skew heaps

Search Structures Binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – Btrees.

Section B

Graph Algorithms:
Topological sort, minimum Spanning tree, single-source shortest paths, all-pairs shortest paths, bi-connected components, strongly connected components, cycles, articulation points, bridges.

Applications
Huffman coding – Garbage collection and compaction – Topological sort –Mincut maxflow algorithm – Activity networks – Set representation – Set union and find operations.

Reference Books:
1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Galgotia, 1999.
2. Adam Drozdex, Data Structures and algorithms in C++, Second Edition, Thomson learning – vikas publishing house, 2001.
3. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Printice –Hall, 1988.
4. Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, ”Introduction to Algorithms”, PHI.

MCE-103 DESIGN PRINCIPLES OF OPERATING SYSTEM

L	T	P	CR
3	1	0	3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: This course requires the prior knowledge of Computer fundamentals and data representation.

Objectives: The objective of the course is to overview the state of the art of Operating System fundamentals. The contents allow the reader to apply these concepts to a real operating system.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction, OS Structure, services and components, multitasking, multiprogramming, time sharing, Real Time Systems, multithreading
Process Management, CPU scheduling, Deadlocks

Inter-process Communication, Concurrent Processing and concurrency control
Memory management, Virtual memory, Demand Paging and Page Replacement Algorithms

SECTION – B

I/O and Device management, buffering and spooling file management, file storage, Access methods and free space management

Operating System Security: Introduction, External & Operational security. Threat monitoring auditing, Access control, H/W security

Distributed & Multiprocessor system: Introduction to Distributed Operating system, Multiprocessor operating system organization, Recovery and Fault Tolerance

Case study of UNIX / LINUX: Introduction, kernel & shell, file system, shell programming

Reference Books:

1. Silberschatz and Galvin, "Operating System Concepts", Addison-Wesley publishing
2. A. S. Tanenbaum, “Modern Operating Systems”, Pearson Education
3. H.M. Dietel, “An Introduction to Operating System”, Pearson Education
4. William Stallings, “Operating Systems”, Pearson Education

MCE-104 SOFTWARE ENGINEERING CONCEPTS AND METHODOLOGIES

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Basics of System analysis and design.
Objectives: Thorough understanding of software Engineering concepts.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Principles and Motivations**:** History; definitions; why engineered approach to software development; Software development process models from the points of view of technical development and project management: waterfall, rapid prototyping, incremental development, spiral models, Agile Software Development, Selection of appropriate development process.

Software Development Methods: Formal, semi-formal and informal methods; Requirements elicitation, requirements specification; Data, function, and event-based modeling; Some of the popular methodologies such as Yourdons SAD, SSADM etc

Software Project Management: Principles of software projects management; Organizational and team structure; Project planning; Project initiation and Project termination; Technical, quality, and management plans; Project control; Cost estimation methods: Function points and COCOMO

SECTION B

Software Quality Management: Quality control, quality assurance and quality standards with emphasis on ISO 9000; Functions of software QA organization does in a project; interactions with developers; Quality plans, quality assurance towards quality improvement; Role of independent verification & validation; Total quality management; SEI maturity model; Software metrics.

CASE tools-classification, features, strengths and weaknesses; ICASE; CASE standards.

Configuration Management: Need for configuration management; Configuration management functions and activities; Configuration management techniques; Examples and case studies.

Software Testing Fundamentals: Basic Terminology, Testing Techniques and strategies.
Brief introduction to various standards related to Software Engineering.

Recommended Books:

1. Roger Pressman, Software Engineering - A Practitioners Approach, McGraw Hill(2009).
2. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company(2006).
3. James F. Peter, Software Engineering - An Engineering Approach, John Wiley & Sons(2006).

MCE-105 ADVANCED DATABASE SYSTEMS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**
Prerequisites: Database fundamentals
Objectives: Thorough understanding of Databases.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION – A

Introduction:
Database System Concepts and Architecture, Data Independence, Data Models, SQL: DDL, DML, DCL, Database Integrity, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Advanced Transaction Processing and Concurrency Control:
Transaction Concepts, Concurrency Control: Locking Methods, Time-stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.

Object Oriented and Object Relational Databases:
Object Oriented Concepts with respect to Database Systems, OODBMS, OORDBMS, ORDBMS Design, Mapping of classes to relations, OORDBMS Query Language (representation of objects by create type, encapsulation of operations, inheritance, storing data about objects, retrieving, updating and query object tables).

Parallel Databases: Parallel Databases, Distributed Databases, Difference between them, Architecture of Distributed Databases, Architecture of Parallel Databases.

SECTION – B

Distributed Databases:
Fragmentation, Replication and Allocation for distributed databases, Intra-query parallelism, Inter-query parallelism, Intra-operation parallelism, Inter-operation parallelism.

Backup and Recovery Techniques:
Backup and Recovery Concepts, Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management, Recovery Control in Distributed Systems.

Introduction to Pl/SQL: procedure, trigger and cursor.

XML and Internet Databases:
Structured, Semi Structured, and Unstructured Data, XML Hierarchical Data Model, XML Documents, DTD, XML Schema, XML Querying: XPath, XQuery.

Emerging Database Technologies:
Introduction to Mobile Databases, Main Memory Databases, Deductive Database Systems and brief overview of Datalog, Temporal Databases and brief introduction to TSQL, Multimedia Databases brief overview of respective query language and Spatial and Multidimensional Databases,.

Breif Introduction to Data Warehouse, Data Mining and OLAP

Reference Books:

Ramez Elmasri, Shamkant Fundamentals of Database Systems, Fifth

1. Navathe Edition, Pearson Education, 2007.
2. C.J. Date An Introduction to Database Systems, Eighth Edition, Pearson Education.
3. Alexis Leon, Mathews Leon Database Management Systems, Leon Press.
4. S. K. Singh Database Systems Concepts, Design and Applications, Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke Database Management Systems, Tata McGraw-Hill.
6. Abraham Silberschatz, Henry F. Korth, S. Sudarshan Database System Concepts, Tata McGraw-Hill.
7. Thomas Conolly, Carolyn Begg Database Systems", Pearson Education

MCE-106 RESEARCH METHODOLOGY

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction to Research Methodology: meaning, objectives, types, significance. Research Process, Problems faced in India.
Research Problem: formulation, preparation and presentation of research proposal.Research funding.

Research Design: features, types, experimental designs. Types of sample designs.
Data Collection: primary and secondary data, validation. Processing and Analysis of data: processing operations and problems, types of analysis, use of statistical measures in analysis.

SECTION-B

Sampling: fundamentals, distributions, sampling theory, sample size determination. Testing of Hypothesis: procedure, parametric tests –z-test, t-test, chi-square test, F-test. Analysis of variance.

Interpretation: meaning, need, technique, precaution. Presentation: Report Writing, Oral presentation. Use of software for statistical analysis: SPSS, Minitab.

REFERENCES:

1. “Research Methodology: Methods and Techniques” by C.R. Kothari.
2. “Research Methodology: An Introduction” by Wayne Goddard, Stuart Melville.
3. “Research Design: Qualitative, Quantitative, and Mixed Methods Approaches” by John W. Creswell.
4. “Research Methods, Design, and Analysis” by Larry B. Christensen, R. Burke Johnson and Lisa A. Turner.
5. “Statistical Methods for Research Workers” by R. A. Fisher.

MCE-201 NETWORK SECURITY

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Fundamentals of computer Networks
Objectives: Thorough understanding of the basics of computer networks and protocols.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Principles of Security, Basic Cryptographic techniques, Classification of attacks, Virus, Worm, Trojan Horse, Spam etc.

Symmetric Key Cryptography : Algorithm types and modes, Cryptographic Algorithms Asymmetric Key Cryptographic Algorithms, Digital Signature.

SECTION -B

Digital Envelope, Message Authentication Code, Message Digest

Public-Key Infrastructure (PKI) Authentication: Classifications, Mutual authentication Algorithms, Kerberos

Security in layers and domains: IPsec, Secure Socket Layer (SSL), E-mail Security, Electronic transactions

REFERENCE BOOKS :

1. Cryptography and Network Security : Atul Kahate , TMH
2. Cryptography and Network Security : Principles & Practices : William Stallings, 4th Edition Pearson & Printice Hall
3. Network Security : Kaufman , Perlman, Speciner, Pearson Education

MCE-202 DIGITAL IMAGE PROCESSING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Fundamentals of computer graphics and Signal Processing

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction and Digital Image Fundamentals: Digital Image representation, Read and display image in C language, Fundamental steps in Image processing, Elements of digital Image processing, Sampling and quantization, some basic relationships like neighbor's connectivity, distance measure between pixels. Image Enhancement methods: Point Operations, Histogram processing, Spatial Domain, Enhancement by point processing, Spatial filters: low pass filters, High pass filter, Median, Max Min, Mean, Alpha-trim, High-boost filter, Laplacian, Gradient filters.

Image Transforms: Discrete Fourier transform, some properties of two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT, Implementation algorithm of FFT, Introduction to Walsh and Haar Transform. Frequency domain filtering algorithms: Lowpass filtering, Highpass, Homomorphic filtering, Color image processing.
Image Restoration: Image Degradation model, Noise Models, Restoration in spatial domain: Mean filter, Order statistic filter, adaptive filter, Inverse filtering, Wiener filter, Constrained least square restoration.

SECTION-B

Image Compression: Coding Inter-pixel and Psycho visual redundancy, Image Compression models, Error free compression: Huffman, Arithmetic, Runlength, Lossy Compression: Block Transform Coding based on DCT, Introduction to still Image Compression standard.
Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region Orientation Segmentation.

Representation and Description: Representation schemes like chain coding, Boundary Descriptors: Fourier, Statistical moments.
Recognition and Interpretation: Elements of Image Analysis, Pattern and pattern classes, Decision Theoretic methods: minimum distance classifier.
Brief Introduction to :Digital Watermarking. Morphological image processing: erosion, Dilation, opening, closing, Hit-or-Miss Transformation.

Reference Books:

1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", AWL.
2. Annadurai, "Fundamentals of digital image processing", Pearson Education

3. A.K. Jain," Fundamentals of Digital Image Processing", Pearson Education.
4. W. K. Pratt," Digital Image Processing".
5. Ramesh Jain, Brian G. Schunck, "Machine Vision", TMH.

MCE-203 OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Fundamentals of object oriented programming

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction to Object: Object Orientation, Development, Modeling, Object Modeling technique.
Object modeling: Objects and classes, Links and Association, Generalization and inheritance, Grouping constructs, Aggregation, Abstract Classes, Generalization as extension and restriction, Multiple inheritance, Meta data, Candidate keys, Constraints.
Dynamic modeling: Events and states, Nesting, Concurrency, Advanced Dynamic Modeling concepts
Functional modeling: Functional Models, Data flow diagrams, Specifying operations, Constraints, Relation of Functional model to Object and Dynamic Models.

Design Methodology, Analysis: Object modeling, Dynamic modeling, Functional modeling, Adding operations, Iterating Analysis.
System design: Subsystems Concurrency, Allocation to processor and tasks, Management of data stores, Handling Global Resources, Handling boundary Conditions, Setting Trade-off priorities.
Object Design: Overview, Combining the three models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, Document Design Decision.

Comparison of methodologies: Structured Analysis/Structured Design, Jackson Structured Development.
Implementation: Using Programming Language, Database System, outside Computer.
Programming Style: Object Oriented Style, Reusability, Extensibility, Robustness, Programming-in-the-large.

SECTION B

UML: Basics, Emergence of UML, Types of Diagrams.
Use Case: Actors, Use Case Diagram, Relationships between Use Cases.
Classes: Class Diagram, Classes, Objects, Attributes, Operations, Methods, Interfaces, Constraints, Generalization, Specialization, Association, Aggregation.

Behavioral Diagrams: Activity Diagram, Collaboration Diagram, Sequence Diagram, Statechart Diagram.

Implementation Diagrams: Component Diagram, Deployment Diagram

References Books:

1. Rambough, “Object Oriented Modeling and Design”, Pearson Education, 2002
2. Bernd Oestereich, “Developing Software With UML”, Pearson Education.
3. BOOCH, “Object Oriented Analysis and Design”, Addison Wesley
4. Pierre-Alain Muller, “Instant UML”, Shroff Publishers, 2000
5. Booch, Rumbaugh, Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley, 1999
6. Booch, Rumbaugh, Jacobson, “The Unified Modeling Language Reference Manual”, Addison Wesley, 1999
7. Rebecca Wirfs-Brock, “Design Object Oriented Software”, PHI

MCE-204 WEB SERVICES

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Fundamentals of HTML

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

Section-A

Introduction: Web services and their benefits-Architecture-Key Languages: HTML, XML, Platform for web services, Introduction to Platform Elements: SOAP, WSDL, UDDI, RDF (Resource Description Framework), RDF syntax, RDF Schema.

Role of XML, XML and Web services, SOA (Service Oriented Architecture), XML Namespaces, Structuring with Schemas and DTD, Designing XML based Applications, Overview of SOAP, SOAP Message Structure, WSDL, HTTP, RPC, RMI, HOP, CORBA

Section – B

Design and modeling of Web services, Publishing a Web service, Handling XML documents in a Web service, Deploying and Packaging a Service, Taxonomies and Ontologies for advanced web applications: Ontology modeling, languages for representing ontologies on web, rules and interfaces.

Current Issues: Semantic Web, Role of Meta Data in web content, Architecture of Semantic web, Content Management, Workflow, XLANG, BPEL4WS.

References:

1. R. Schemelzer et al. “XML and Webservices”, Pearson.
2. S. Chatterjee and J. Webber, “Developing Enterprise Web Services: An Architect’s Guide”, PHI
3. G. Antoniou et al, “Semantic Web Primer”, MIT Press.
4. J. Davies et al, “Semantic Web Technologies: Trends and Research in Ontology-based Systems”, Wiley & Sons
5. Jeffrey C. Jackson, “Web Technologies: A Computer Science Perspective”, Prentice Hall
6. Mc Govern, et al, “Java Web Services Architecture” , Morgan Kauf Mann Publishers, 2005
7. Designing Web Services with J2EETM 1.4 Platform JAX-RPC, SOAP and XML technologies, Inderjeet Singh, Sean Brydon, Greg Murray,VijayRamchandran, Thierry Violleau, Beth Stearns copyright 2004, Sun Microsystems.

MCE-205 MULTIMEDIA SYSTEMS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**
Prerequisites: Fundamentals of computer graphics and image processing

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION – A

Introduction: Introduction to Multimedia, Introduction to Hypermedia and Hyper Text, Multimedia Systems and Desirable Features, Applications, Trends in Multimedia
Multimedia Technology: Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, SGML, ODA, Multimedia Standards for Document interchange, MHEG.

Storage Media : Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards,
Image,Graphics and Video: Graphic/Image File Formats, Graphic/Image Data, Colour in Image and Video, Basics of Video ,Types of Video Signals, Analog Video, Digital Video, TV standards

SECTION – B

Video Compression: Basics of Information theory, Classifying Compression Algorithms: Lossless, Lossless/Perceptual Compression Algorithms: Entropy Encoding, Run-length Encoding, Huffman Coding, Huffman Coding of Images, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques, Differential Encoding, Scalar Quantization; Lloyd Max, Vector Quantization, Frequency Domain Methods, JPEG Compression, Video Compression; H. 261 Compression, Intra Frame Coding, Inter-frame (P-frame) Coding, MPEG Video Compression, The H.261 and MPEG Video Bit stream.

Audio Compression: Introduction to MIDI, Audio Compression, Psychoacoustics, Perceptual Audio Coder, Simple Audio Compression Methods; PCM, DPCM, MPEG-1 Audio Compression, ADPCM speech coder, Vocoders: LPC, CELP.
Multimedia System architecture**,** Components, Quality of service.

Reference Books

1. Li, Drew , Multimedia Computing, Pearson Education, Latest Edition ,
2. Ralf Steinmetz and Klara Nahrstedt, Multimedia Computing Communications and Applications By Pearson Educations
3. Prabhat K. Andleigh, Kran Thakkar, Multimedia System Design, PHI, Latest Edition
4. Fred Halsall Multimedia Communications, Pearson Education, Latest Edition

MCE-206 ADVANCED PROGRAMMING LANGUAGES

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: Fundamentals of computer programming

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction to Programming Language, Characteristics of programming language.
The structure and operation of a computer, Hardware and firmware computers, Translator and simulator computers, Syntax, semantics and virtual computers, hierarchies of computers, binding and binding time.
Data object, variable and constants, data types, specification of elementary data types, declarations, type checking and type conversion, assignment and initialization, numeric data types, enumerations, Boolean, characters

Structured data object and data types, specification of data structure types, implementation of data structure types, declarations and type checking for data structures, vector and arrays, record, character strings, variable sized data structures, pointers and programmer-constructed data objects, sets, file and input/output. Evolution of the data type concept, Abstraction, encapsulation, and information hiding, subprogram, type definitions, abstract data types

SECTION B

Introduction to Sequence Control: Implicit and explicit sequence control, sequence control within expression, sequence control between statements, subprogram sequence control, recursive subprogram, exceptions and exception handlers, Co-routines, scheduled subprograms, tasks and concurrent execution, data structures and sequence control.
Data Control: names and referencing environments, static and dynamic scope, block structure, local data and local referencing environments, shared data, task and shared data.

Storage Management: Major Runtime elements requiring storage, programmer and system controlled storage management, storage management phases, static storage management, stack based storage management, heap storage management. Syntax And Translation: General syntactic criteria, syntactic elements of language, stages in translation, formal definition of syntax. Operating and Programming Environment: Batch processing environment, interactive environments, embedded system environments, programming environments.

Case study/ Seminar on State-of-the-art topics in Programming Languages: Markup Languages, Wireless Markup Languages, Mobile agent paradigm, Cloud Computing etc. Illustration of the above concepts using representative languages: C, C++, Java, LISP and Prolog etc.

References:

1. Terrence W. Pratt, "Programming Languages, design and implementation second edition" PHI.
2. Sebesta, R.W., Concepts of Programming Languages, Addison Wesley.
3. Sethi, Ravi, Programming Languages-Concepts and Constructs, Addison-Wesley.
4. Tucker, A.B. and Noonan, R., Programming Languages-Principles and Paradigms, McGraw Hill.

MCE-207 NATURAL LANGUAGE PROCESSING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: To describe the techniques and algorithms used in processing (text and speech) natural languages.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction: Natural Languages, Application of Natural Language Understanding, Different levels of language analysis
Regular Expressions, Finite state automata, Morphological analysis: Inflectional and derivational morphology, Finite state morphological parsing.

Probabilistic Theory: Introduction to probability, conditional probability, Bayes' rule and its application.
N Grams: Introduction, Importance, Unsmoothed N-grams, Normalizing, Maximum Likelihood Estimation, Smoothing and different methods of smoothing. Entropy and Perplexity.
POS Tagging: Introduction, Word Classes, Rule Based POS, Stochastic POS, Markov assumption, Markov chain, HMM Tagging, Issues of Ambiguity, Multiple tags, Multiple words and unknown words.

SECTION B

Parsing: Introduction, Top down parsing, Bottom up parsing, Problems with top down and bottom up parsing, The Earley algorithm.
Feature and Unification: Introduction, Feature Structures, Unification of Feature Structures.
Semantics: Introduction, Semantical Analysis, Lexical Semantics.

Word Sense Disambiguation: Selectional Restriction based Disambiguation, Robust WSD - Machine learning approaches and dictionary based approaches.
Machine Translation: Introduction, Different methods of MT.
Speech Processing: Issues in Speech Recognition, The Sound Structure of Language, Signal processing, Speech Recognition, Prosody and Intonation.

Reference Books:

1. D. Jurafsky and J. Martin, "Speech and Language Processing", Pearson Education
2. James Allen, “Natural Language Understanding”, Pearson Education.
3. Bharati A., Chaitanya V and Sangal R, "Natural Language processing: A Paninian Perspective",
Prentice Hall of India.

MCE-208 SOFT COMPUTING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Prerequisites: To get basic knowledge of different soft computing techniques. Different problem solving techniques and their implementations and applications are explained. Intelligent systems and learning techniques are introduced.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION – A

FUZZY SET THEORY : Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology .Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning. Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems.

OPTIMIZATION : Derivative-based Optimization Descent Methods, The Method of Steepest Descent – Classical Newton's Method, Step Size Determination ,Derivative-free Optimization. Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

SECTION – B

NEURAL NETWORKS: Supervised Learning Neural Networks Perceptrons : Adaline, Backpropagation Multilayer Perceptrons , Radial Basis Function Networks ,Unsupervised Learning Neural Networks , Competitive Learning Networks , Kohonen Self-Organizing Networks ,Learning Vector Quantization , Hebbian Learning.

NEURO FUZZY MODELING: Adaptive Neuro-Fuzzy Inference Systems Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling , Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Introduction to Genetic Algorithm.

References Book:

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hil.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y..
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI.
4. James Freeman A. and David Skapura M, "Neural Networks - Algorithms, Applications &

Programming Techniques" Addison Wesley.
5. Yegnanarayana B , "Artificial Neural Networks", Prentice Hall of India Private Ltd., New Delhi.

MCE-209 EMBEDDED SYSTEMS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: Students will learn about programming paradigms used in parallel computation, about the organization of parallel systems, and about the application of programs and systems to solve interesting problems

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION – A

Introduction to embedded systems definition and Classification, Overview of Processors and hardware units in an embedded system, Software embedded into the system.

Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits Examples of embedded systems: characteristics and requirements, Applications, software issues and architecture.

Interrupt synchronization: General features of interrupts, Interrupt vectors and priorities, External interrupt design approach, Interrupt polling.

Definitions of process, tasks and threads, ISRs and tasks by their characteristics, Operating System Services Goals, Kernel, Process Management, Memory Management, File System Organization and Implementation.

SECTION – B

Real time operating systems: RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics, Round Robin Scheduling, Time Slicing, Rate Monotonics, Preemptive Scheduling, Introduction to Vx Works.

Inter process communication and synchronization, Shared data problem, Use of Semaphore(s), Inter Process Communications using Signals, Semaphore, Message Queues, Mailboxes, Pipes, Remote Procedure Calls (RPCs).

I/O Devices - Synchronous and Asynchronous Communications from Serial Devices, Communication Devices - UART and HDLC - Parallel Port Devices, USB and advanced I/O Serial high speed buses- ISA, PCI, PCI-X and cPCI.

REFERENCES BOOKS:

1. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint
3. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001
4. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware /Software Introduction, John Wiley, 2002

MCE-210 WIRELESS AND MOBILE NETWORKING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Pre-requisites: Fundamentals of Computers & Electronics Engineering.
Objectives: To acquaint the students with the fundamental concepts of wireless communication and digital cellular standards which are helpful in understanding the state-of-the-art technology in mobile communications and wireless networking.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Wireless Transmission: Introduction, Frequencies for radio transmission, Overview of signals and antennas, signal propagation, Multiplexing techniques: TDM, FDM, CDM & SDM, Analog and Digital Modulation techniques, Spread spectrum: Direct sequence, Frequency Hopping. Introduction to Mobile Communication, Cellular concept, Frequency reuse.

Digital Cellular Mobile Systems: Introduction, GSM digital cellular standard: GSM services, GSM architecture, GSM Radio aspects, Security aspects, Handover, Call flow sequence in GSM, Evolutionary directions.

SECTION - B

CDMA digital cellular standard: Services, Radio aspects, Security aspects, Traffic channels, Key features of IS-95 CDMA system, Evolutionary directions

Mobile Data Communications: Overview of circuit switched and packet switched data services on cellular networks, Wireless local area networks: Introduction, IEEE 802.11 wireless LAN, Support of mobility on the internet: Mobile IP.

Reference Books:

1. Jochen Schiller, “Mobile Communications”, Pearson Education
2. Raj Pandya, “Mobile and Personal Communication-System and Services”, PHI
3. W. Stallings, “Wireless Communications and Network”, Pearson Education

MCE-211 PARALLEL AND DISTRIBUTED SYSTEMS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: Students will learn about programming paradigms used in parallel computation, about the organization of parallel systems, and about the application of programs and systems to solve interesting problems

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION – A

Fundamental Issues: Need for Parallel Computing, Scope of Parallel Computing, Issues in Parallel Computing, Parallelism in uniprocessor system, Architectural-classification.
Applications of parallel processing, Multiprocessors, Multicomputers and Multithreading.

Introduction: Synchronous - vector/array, SIMD, Systolic, VLIWs.
Hardware taxonomy: Flynn's classifications, Handler's classifications.
Basic issues of parallel computing: delay, concurrency, communication topology, load balancing and scaling.

SECTION – B

Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks. Processor organization - Static and dynamic interconnections.
Performance Metrics: Granularity, Scalability, Load Balancing, speedups and Efficiency.

Introduction to PRAM and its models, Parallelism approaches: data parallelism and control parallelism.
Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, functional and dataflow programming.

Reference Books:

1. Kai, Hwang and Briggs, Parallel Architecture and Computing, Tata McGraw Hill Co.
2. M. J. Quinn. Parallel Computing: Theory and Practice, McGraw Hill, New York, 1994.F.T.Leighton, Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes, Morgan Kaufinann Publishers, San Mateo, California
3. Joseph Ja Ja, An Introduction to Parallel algorithms, Addison Wesley

MCE-212 SOFTWARE PROJECT MANAGEMENT

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: This course offers a good understanding of methods and techniques of software testing and quality management concepts and prepares students to be in a position to develop error free and quality software.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction to software Project management, types of project, Importance of management, Problems with software projects, Environmental Appraisal with Projects, Requirement Specification, Management Control, Steps in project planning , Programme Management, Managing resources within programme, Strategic programme management

Assessment of projects, Cost-benefit Analysis, Cash flow forecasting, Cost-benefit evaluation techniques, Risk evaluation ,Selection of an appropriate project technology, Choice of process model, Data Structure, Delivery Model, Basis for software estimation, Problem with over and under estimates, Estimation Techniques, Expert judgment, Albrecht Function Point Analysis, Function points Mark II, COSMIC Function point, COCOMO Model

SECTION B

Objective of Planning, Project Schedule, Activities – Sequencing and Scheduling, Development of Project Network, Time Estimation, Forward and backward Pass, Critical Path and Activities. Introduction to Risk, Risk categories, identification, assessment, planning, management, Software Configuration Management Process: Version Control, Change Control. PERT and CPM Models, Monte Carlo Simulation

Resources, Nature of Resources, Resource Requirement, Scheduling, Counting and Costing, Monitoring Framework, Cost Monitoring, Earned Value Analysis, Project targets, Change Control Management **.**Management Spectrum, Associating human resource with job, Motivation, Oldham- job Characteristics Model, Decision Making, Leadership, Stress, Health and Safety

Case Study of any organization

Reference Books:

1.Bob Hughes & Mike Cotterell : Software Project Management, 4th , Tata McGraw Hill
2.Prasanna Chandra : Projects – Panning, Analysis, Selection, Financing, implementation and Review, 6th , Tata McGraw Hill Publication
3. Jeffrey Pinto : Project Management, Pearson Publications.

MCE 213 **E-BUSINESS**

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: This course offers a good understanding of electronic transactions via Internet

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

Section - A

Overview of e-Business: E-business infrastructure, business design for e-Business, challenge traditional definitions of value, value in terms of customer experience, major business trends.
E-Business Architecture: E-Business architecture design issues, self-diagnosis as a first step of e-Business design, issues of application integration, integrating application clusters into E-Business architecture, aligning the E-Business design with application integration.

Supply Chain Management: Supply chain networks, overview of supply chain models and modeling systems. Understanding supply chain through process mapping and process flow chart. Introduction to e-SCM, e-SCM fusion.
Customer Relationship Management: Need of CRM, architecture of CRM, challenges in CRM implementation, e-CRM evolution, multi channel CRM, CRM in B2B model.

Section - B

Enterprise Resource Planning: Need of ERP solution, ERP usage in the real world, Future of ERP applications, A ERP Case Study. Business Process Re-engineering: Continuous process improvement model, business process re-engineering (BPR), break-through re-engineering model.
Knowledge Management Applications: What are knowledge management applications, elements of business intelligence applications, knowledge management in the real world, data warehousing, online analytical processing (OLAP).
Translating e-business into action: The overall process – translating e-business into action, basic phases of e-Blueprint planning, e-business project planning checklist, key elements of a business case.

Reference Books:

1. S Sadagopan, “ERP A Managerial Perspective”, TMH
2. Alexis Leon, “ERP Demystified”, TMH
3. Stanley A. Brown, “Customer Relationship Management – A strategic imperative in the world of e-business”
4. Jagdish N. Seth, Atul Parvatiyar, and G. Shainesh, “Customer Relationship Management”, TMH
5. Sunil Chopra, Peter Meindl, “Supply Chain Management”, PHI.
6. Ravi Kalakota, Marcia Robinson, “e-Business – Roadmap for Success”, Pearson ed.

MCE-214 ADVANCED MICROPROCESSOR AND PROGRAMMING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

Section-A

8085 Microprocessor: Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals, address, data and control buses, clock signals, instruction cycles, machine cycles, and timing states, instruction timing diagrams.

Programming of 8085 microprocessor: Basic instruction set, writing assembly language programs, looping, counting and indexing operations, stacks and subroutines, conditional call and return instructions, debugging programs.

Section-B

8085 Interfacing and Interrupts: Bus interfacing concepts, timing for the execution of input and output(I/O) instructions, I/O address decoding, memory and I/O interfacing memory mapped I/O interfacing of matrix input keyboard and output display, Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SOD and SID lines, interrupt structure of 8085, RST(restart) instructions, vectored interrupt, interrupt process and timing diagram of interrupt instruction execution, 8259 A interrupt controller, principles block transfer (Direct memory access) techniques.

Programmable Interface and peripheral devices: Programming and applications of 8455/8156 programmable I/O ports and timer, 8255A programmable peripheral interface , 8253/8254 programmable interval timer, 8257 direct memory access controller, 8279 programmable keyboard/display interface.

Reference

1. Microprocessor, Architecture, Programming and Application with 8085-Gaonkar, John Wiley Eastern , Ltd, Publication

2. Microprocessors and interfacing-Douglas V Hall, Tata Mc-Graw Hill publication

MCE-215 DESIGN AND ANALYSIS OF ADVANCED ALGORITHMS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: This subject provides a comprehensive introduction to the modern study of computer algorithms. It discusses Engineering issues in algorithm design, as well as mathematical aspects.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Analysis of algorithms: Notation for Algorithms, Complexity of Algorithm, Growth of functions, Models of computation, Algorithm control structures, performance analysis

Elementary Data Structures: Stacks and Queues, Lists, Trees, Dictionaries, Sets and graphs.

Basic design methodologies: Incremental & Divide and conquer Approach, Dynamic Programming, Backtracking, Greedy algorithms, Branch and Bound

SECTION-B

Particular algorithms: Disjoint set manipulation, Matrix multiplication, Pattern matching, Sorting and Searching algorithms, combinatorial algorithms, String processing algorithms. Algebraic algorithms, Graph algorithms

Problem classes, NP-completeness, deterministic and nondeterministic polynomial time algorithms, theory of lower bounds Approximation algorithms

Reference books:

1. Aho, “Design & Analysis of Computer Algorithms”, Pearson Education

2. Horowitz, S. Sahni, “Fundamentals of Computer Algorithms”, Galgotia Publishers

3. Knuth, “The Art of Programming”, Vol I to II, Pearson Education

4.Nitin Upadhyay,”The Design & Analysis of Algorithms”,S.K.Kataria publication

MCE-216 ADVANCED COMPUTER ARCHITECTURE L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: This Course offers a good understanding of the various functional units of a computer system and prepares a student towards designing a basic computer system. Finally the student will be introduced to the area of advanced computer architectures.

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Parallel computer models: Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks Program and network properties :Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms,Control flow versus data flow,Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. Processors and Memory Hierarchy : Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

Memory Technology :Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology.

SECTION-B

Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches. Pipelining :Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines.

Vector Processing Principles: Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement.

REFERENCES:

1. **Kai Hwang**, "*Advanced computer architecture"; TMH, 2000.*

2. **J.P.Hayes,** *"computer Architecture and organization", MGH, 1998.*
3. **M.J Flynn,** *"Computer Architecture, Pipelined and Parallel Processor Design", Narosa Pb.*
4. **D.A.Patterson, J.L.Hennessy,** *"Computer Architecture:A quantitative approach", Morgan Kauffmann, 2002.*
5**. Hwang and Briggs,** *" Computer Architecture and Parallel Processing"; MGH*

MCE-217 DATA WAREHOUSING AND DATA MINING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Need for strategic information, Decision support system, Knowledge discovery & decision making, need for data warehouse, definitions of Data warehousing and data mining, common characteristics of Data warehouse, Data Marts, Metadata, Operational versus analytical databases, trends and planning of Data warehousing.

Multidimensional data model, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations. Data warehouse process & architecture, OLTP vs. OLAP, ROLAP vs. MOLAP types of OLAP, servers, 3 – Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

SECTION B

Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications. Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification. Data mining techniques: Association rules, Clustering techniques, Decision tree knowledge discovery through neural

Networks & Genetic Algorithm, Rough Sets, Support Victor Machines and Fuzzy techniques. Mining Complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Data bases and mining Word Wide Web.

Reference Books

1. Alex Berson,Stephen J. Smith, "Data Warehousing, Data Mining,& OLAP", Tata McGraw- Hill, 2004.
2. Data Mining – Concepts & Techniques; Jiawei Han & Micheline Kamber – 2001, Morgan Kaufmann.
3. Building the Data Warehouses; W.H. Longhman, C. Klelly, John Wiley & Sons.
4. Data Mining Intorductory and Advanced Topics, Dunham, Pearson Education.

MCE-218 ADVANCED COMPUTER GRAPHICS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objectives: Understanding the fundamental graphical algorithms and operations and its implementation on computer. Get a glimpse of recent advances of hardware and software in computer graphics

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction: Fundamentals of Computer Graphics, Applications of computer graphics, Image processing vs Computer Graphics.
Overview of Graphics Systems: Display devices, Raster scan and Random scan display systems, Input and Hard-copy devices, Graphics software.
Scan conversion algorithms: Lines, Circles, Ellipses and Character.
Region Filling: Rectangles, Polygons, Ellipse arcs, Thick primitives

Two Dimensional Geometrical Transformations: 2-D transformation, Homogeneous co-ordinates and matrix representation of 2-D transformations, Composition of 2-D transformation.
Two Dimensional Viewing and Clipping: Window to view-port mapping, Clipping of Lines, Circles, Ellipses, Polygons.
Three Dimensional Object Representations: Polygon surfaces, Curved lines and surfaces, Quadric and Super-quadrics, Spline representation, Bezier and B-Spline curves, Fractal-Geometry methods.

SECTION - B

Three Dimensional Geometrical Transformations: Matrix representation of 3-D transformations, Composition of 3-D transformations.
Projections: Perspective projections and Parallel projections
Three Dimensional Viewing and Clipping: 3-D Viewing, Clipping, Viewing Transformation

Visible Surface Detection: Back-Face detection, Depth-Buffer method, The Z-Buffer algorithm, The Painter's Algorithm, Scan line algorithms, Area-subdivision algorithms.
Illumination and Surface-Rendering Methods: Basic Illumination models, Halftone patterns and Dithering Techniques, Polygon-Rendering methods, adding surface details.
Color Models for Raster Graphics: RGB, CNY, YIQ.
Introduction to Computer assisted animation

Reference Books:

1. D. Hearn & M.P. Baker, "Computer Graphics", PHI
2. W.M. Newman, R.F. Sproull, "Principles of Interactive Computer Graphics", McGraw-Hill
3. R.A. Plastock & G. Kalley, "Computer Graphics", McGraw-Hill
4. D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, "Computer Graphics – Principles and practice", Pearson D. Hearn & M.P. Baker, "Computer Graphics", PHI

MCE-219 GRID COMPUTING

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

OBJECTIVES
To understand the genesis of grid computing, applications of grid computing, to understand the technology and tool kits to facilitated the grid computing

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction - Definition and Scope of grid computing
What is a grid? Infrastructure of hardware and software, history and evolution of Grid Computing, Grid challenges, Issues in Management of Grid Models.
Computing Initiatives
Grid Computing Organizations and their roles – Grid Computing analog – Grid Computing road map.

Architecture: Components of Layered Grid Architecture, Service Oriented Architecture (SOA),Open Grid Services Architecture (OGSA), Grid architecture models, Grid Resource Information Service (GRIS),Overview of Resource Managers, Grid Portals, Clouds

SECTION B

Grid Computing Tool Kits
Globus GT 3 Toolkit – Architecture, Programming model, High-level services – OGSI .Net middleware Solutions
Grid Scheduling, Resource Management, Resource Reservations

Open Grid Service Architecture and Data Grids

Application Types: geographically distributed, high-throughput, on demand, collaborative, and data intensive supercomputing, computational steering, real-time access to distributed instrumentation systems.

REFERENCE BOOKS
1. Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson/PHI PTR.
2. Ahmar Abbas, “Grid Computing: A Practical Guide to technology and Applications”, Charles River media.
3. *Luis Ferreira et al., Grid Computing in Research and Education, ibm.com/redbooks.*

MCE-220 ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction to AI: Definitions, Historical foundations, Basic Elements of AI, Characteristics of intelligent algorithm, AI application Areas

Problem solving: State space search; Production systems, search space control: depth-first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis

Handling uncertainty: Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.

Knowledge Based Systems: Proportional Logic, FOPL, Clausal Form, Resolution & Unification. Knowledge representation, acquisition, organisation & Manipulation, Semantic nets, Frames, Conceptual Dependency, Scripts & CYC.

SECTION B

Machine Learning. Concept of learning, Concept creation, learning automation, supervised and Unsupervised Learning, learning tasks & learning strategies, single layer & multiplayer Perceptions, Back propagation, learning by inductions, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks Samuel's checkers algorithm. Hopfield nets, Adaptive resonance theory

Expert Systems: Need and justification for expert systems, Basic Components & architecture of Expert systems, ES-Shells, Representing & Using Domain Knowledge, Knowledge acquisition in expert Systems. Case studies: MYCIN, RI.

Reference Books:

1. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill.
2. George F. Luger, “Artificial Intelligence – Structures and Strategies for Complex Problem Solving", Pearson Education.
3. Russell & Norvig, "Artificial Intelligence ‘a Modern Approach", Pearson Education.
4. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI.
5. E. Charnaik and D. McDermott," Introduction to Artificial Intelligence", Addison-Wesley Publishing Company.
6. Nils J. Nilson, “Principles of Artificial Intelligence”, Narosa Publishing Co.

MCE-221 COMPILER DESIGN

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION-A

Introduction: Basics of programming, Language processor, Translation process, Compiler phases, Cousins, Phases, Compiler construction tools.Lexical analysis: Lexical Analyzer, its role, input buffering, Specifications and recognition of tokens, Lexical analyzer generator

Syntax analysis: Context-free Grammars, writing Grammar, Top-Down parsing-recursive descent and predictive parsers, Bottom-Up parsing, operator Precedence parsing, LR Parsers, Parser generator. Construction of syntax trees, Syntax directed translation and semantic analysis, type checking, simplification of a simple type checker, type conversions and their evaluation.

SECTION - B

Code Generation: Intermediate code generation, Intermediate languages- syntax trees, postfix codes, triples. Intermediate code generation for various type of statements, Issues in design of code generator, Target Machines, Run-Time storage management, Basic blocks and flow graphs, next-use information, Register allocation and assignment, Simple Code Generator

Optimization Strategies: Code optimization, Sources of optimization, Peephole optimization, Global data flow analysis, optimization of basic blocks, Loop in flow graphs, Global data flow analysis, Code improving transformations, Data flow analysis

Reference Books:

1. Alfred Aho, Jeffry D Ullman, Ravi Sethi, " Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2003.
2. A.I. Holub, "Compiler Design in C". PHI ,2003.
3. J.P. Bennet,"Introduction to Compiler Techniques",2nd Edition ,TMH,2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C",PHI,
5. Kenneth C. Louden,"Compiler Construction: Principles and Practice", Thomson Learning, 2003.

MCE-222 **Business Intelligence**

L T P CR
3- 1- 0 3.5

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Instructions for paper-setter: The question paper will consist of three sections A, B and C. Each section A and B will have five questions from the respective sections of the syllabus (05 marks each). Section C will have one question with 10 short answer objective type parts (02 marks each), which will cover the entire syllabus uniformly.

Instructions for candidates: Candidates are required to attempt seven questions selecting three questions each from sections A and B of the question paper and the entire section C.

SECTION A

Introduction to Business Intelligence
Introduction to digital data and its types – structured, semi-structured and unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices.
Basics of Data Integration (Extraction Transformation Loading)
Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL using Kettle.

SECTION B

Introduction to Multi-Dimensional Data Modeling
Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using Microsoft Excel.
Basics of Enterprise Reporting
A typical enterprise, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard, enterprise reporting using MS Access / MS Excel, best practices in the design of enterprise dashboards.

RECOMMENDED BOOKS:

1 R.N. Prasad and Seema Acharya, Fundamentals of Business Analytics, Wiley India Ltd.
2 Mike Biere, Business Intelligence for the Enterprise, Prentice Hall Professional.
3 Teo Lachev, Applied Microsoft Analysis Services 2005: And Microsoft Business Intelligence Platform, Prologika Press.
4 David Taniar, Progressive methods in data warehousing and business intelligence: concepts and competitive analytics, Idea Group Inc (IGI).
5 Data warehousing: the ultimate guide to building corporate business intelligence, Birkhäuser.
6 Mark Humphries, Michael W. Hawkins, Michelle C. Dy, Data warehousing: architecture and implementation, Prentice Hall Professional.

MCE-150 RESEARCH LAB

L T P CR
0- 0- 4 2

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40%

Objectives: Students must gain knowledge about how to use tools like MS EXCEL, MS WORD, LATEX etc in research paper writing. Students must gain some knowledge about any one of the tools like MATLAB, SPSS, OPNET, NS2 etc. according to chosen research area.

Each student must choose research area **(**in Computer Engineering) **in consultation with the Supervisor(s) assigned to him/her.** Each student will be required to complete a course on Lab Work comprising of advanced practicals related to research area chosen. The software tool as well as experiments in the Lab will be decided by the concerned supervisor, and/or coordinator. Each student has to give at least two midterm presentations/viva voce to the concerned supervisor or to the committee constituted by the Head/Coordinator. The student will be required to complete the assignments given by the supervisor and must gain paper writing skills. **Each student must publish a paper on the research area.**

The final evaluation will be done by the internal Examiners Committee constituted by the Head of the department.

MCE-151 MINOR PROJECT

L T P CR
0- 0- 6 3

Maximum Marks: 50
Minimum Pass Marks: 40%

Objectives: Problem identification for research work, Literature survey to identify research gaps for research work, Finalize title of research work and to develop research paper writing skills.

Each student will be required to identify a research problem and perform survey literature on the same. The title and objectives for the research work will be chosen by the student in consultation with the Supervisor(s). Each student will be required to show his progress weekly to His/her supervisor. Each student has to give at least two midterm seminars to the concerned supervisor or to the committee constituted by the Head/Coordinator. At the end, student must have a sufficient knowledge about the existing techniques in the research area on which he/she want to work and will be required to submit the Seminar Report and present a talk to an audience of Faculty/Students to defend a title in front of the **Project Evaluation Committee.** Each student must publish a paper on the research area.

The final evaluation will be done jointly by the internal Examiners Committee appointed having Faculty Advisor as one of its members.

MCE-152 **MAJOR PROJECT**

L	T	P	CR
0	0	6	3

Maximum Marks: 50
Minimum Pass Marks: 40%

Objectives: Develop some of the existing techniques using some simulation tool and to develop research paper writing skills.

Each student will be required to implement some of the existing techniques related to the research title chosen under MINOR PROJECT. Each student will be required to show his progress weekly to His/her supervisor and has to give at least two midterm seminars to the concerned supervisor or to the committee constituted by the Head/Coordinator. At the end, student must have a sufficient knowledge and must show simulation results of existing techniques in the chosen research area and will be required to submit the Seminar Report and present a talk to an audience of Faculty/Students in open defense in front of the **Project Evaluation Committee.** Each student must publish a paper on the research area.

The final evaluation will be done jointly by the internal Examiners Committee appointed having Faculty Advisor as one of its members.

MCE-153 DISSERTATION

Each student will be required to complete a Dissertation and submit a written Report on the topic on selected research area of modern technology related to Computer Engineering including interdisciplinary fields. Each student must consult supervisor weekly to show his/her progress. The student should submit a signed progress report after every 15 days. Finally, the student will be required to fill pre-submission form. Only after the approval from supervisor and pre-submission dissertation screening committee, candidate can appear in pre-submission seminar in front of the Dissertation Monitoring Committee having main Supervisor as one of its members.

The Dissertation will be sent to the External Examiner for its evaluation only after its due approval by the Dissertation Monitoring Committee during pre-submission seminar. The external evaluation will be done jointly by the main Supervisor and external examiner appointed. The dissertation (non-credit course) will be either approved or rejected. The external examiner will evaluate the dissertation and the viva-voce will be fixed by the competent authority. After Viva-voce, the examiners (internal and external) will approve/reject the dissertation. In case, the dissertation is rejected, then the thesis will be sent to another examiner for evaluation. If second examiner clears the dissertation, then it will be considered as pass, otherwise the candidate will rework and resubmit the dissertation after giving pre-submission seminar to internal examiner committee.

The final dissertation will be evaluated jointly by the external examiner (in case of revision same examiner) and the Main Supervisor.