# Course Structure & Scheme

**For**

# Master of Technology

**In**

# Information Technology

**Guru Gobind Singh Indraprastha University**
**Kashmere Gate, Delhi – 6 [INDIA]**
***www.ipu.ac.in***
**(2004-2005)**

**w.e.f. 2004-2005**

# SCHEME OF EXAMINATION
# M.Tech. - Information Technology

## FIRST SEMESTER EXAMINATION

| Code No. | Paper | L/P | Credits |
|---|---|---|---|
| **Theory Papers** | | | |
| ITR-601 | Algorithm Analysis & Design | 3 | 3 |
| ITR-603 | Software Engineering | 3 | 3 |
| ITR-605 | Advanced Computer Architecture | 3 | 3 |
| ITR-607 | Digital System Design | 3 | 3 |
| ITR-609 | Advanced Computer Networks | 3 | 3 |
| **For Non-CS background** | | | |
| ITR-611 | Database Management Systems | 3 | 3 |
| **For CS background** | | | |
| ITR-613 | Communication Systems | 3 | 3 |
| **Practical/Viva Voce** | | | |
| ITR-651 | Lab – I | 4 | 2 |
| ITR-653 | Lab – II | 4 | 2 |
| ITR-655 | Lab – III | 4 | 2 |
| | **Total** | **30** | **24** |

# SCHEME OF EXAMINATION
# M.Tech. - Information Technology

## SECOND SEMESTER EXAMINATION

| Code No. | Paper | L/P | Credits |
|---|---|---|---|
| **Theory Papers** | | | |
| ITR-602 | Object Oriented Software Engineering | 4 | 4 |
| ITR-604 | Embedded System Design | 4 | 4 |
| ITR-606 | Cellular & Mobile Communication | 4 | 4 |
| **Electives (Choose any Two)** | | | |
| ITR-608 | VLSI Design | 4 | 4 |
| ITR-610 | Digital Signal Processing | 4 | 4 |
| ITR-612 | Designing with ASICs | 4 | 4 |
| ITR-614 | Real Time Systems & Software | 4 | 4 |
| ITR-616 | Advanced DBMS | 4 | 4 |
| ITR-618 | Software Metrics | 4 | 4 |
| ITR-620 | Software Requirement & Estimation | 4 | 4 |
| ITR-622 | Network Design | 4 | 4 |
| ITR-624 | Network Programming | 4 | 4 |
| ITR-626 | Computer Graphics | 4 | 4 |
| ITR-628 | Fuzzy Logic & Design | 4 | 4 |
| ITR-630 | Distributed Operating System | 4 | 4 |
| ITR-632 | Programming of AVR Microcontroller | 4 | 4 |
| ITR-634 | Genetic Algorithm & Programming | 4 | 4 |
| ITR-636 | Cluster & Grid Computing | 4 | 4 |
| ITR-638 | Information Theory & Coding | 4 | 4 |
| ITR-640 | Project work | 4 | 4 |
| **Practical/Viva Voce** | | | |
| ITR-652 | Lab – IV | 4 | 2 |
| ITR-654 | Lab – V | 4 | 2 |
| ITR-656 | Lab – VI | 2 | 1 |
| **Total** | | **30** | **25** |

**w.e.f. 2004-2005**

# SCHEME OF EXAMINATION
# M.Tech. - Information Technology

## THIRD SEMESTER EXAMINATION

| Code No. | Paper | L/P | Credits |
|---|---|---|---|
| **Theory Papers** | | | |
| **Electives (Select any FOUR)** | | | |
| ITR-701 | Neural Network | 4 | 4 |
| ITR-703 | Reliability Engineering | 4 | 4 |
| ITR-705 | Software Reusability | 4 | 4 |
| ITR-707 | Advanced Animation Technique | 4 | 4 |
| ITR-709 | Object Oriented Testing | 4 | 4 |
| ITR-711 | Software Quality Management | 4 | 4 |
| BAR-713 | Quantum Information & Computation | 4 | 4 |
| ITR-715 | Design Patterns | 4 | 4 |
| ITR-717 | Software Testing | 4 | 4 |
| ITR-719 | Robotics Engineering | 4 | 4 |
| ITR-721 | Telecommunication Switching System & Networks | 4 | 4 |
| ITR-723 | Multimedia Communication & System Design | 4 | 4 |
| ITR-725 | CDMA Technology | 4 | 4 |
| ITR-727 | Microwave & Radar Engineering | 4 | 4 |
| ITR-729 | Satellite Communication | 4 | 4 |
| ITR-731 | Mobile & Personal Communication Systems | 4 | 4 |
| ITR-733 | Digital Design for Testability and Fault Tolerance | 4 | 4 |
| ITR-735 | Distributed Computing | 4 | 4 |
| ITR-737 | Computer Aided VLSI Design | 4 | 4 |
| ITR-739 | Pattern Recognition | 4 | 4 |
| ITR-741 | Bluetooth Technology | 4 | 4 |
| ITR-743 | Digital Image Processing | 4 | 4 |
| ITR-745 | MEMS And IC Integration | 4 | 4 |
| ITR-747 | Multimedia Technology | 4 | 4 |
| **Practical/Viva Voce** | | | |
| ITR-751 | Lab – VI | 4 | 2 |
| ITR-753 | Lab – VII | 4 | 2 |
| ITR-755 | Minor Project | 8 | 6 |
| **Total** | | **32** | **26** |

**w.e.f. 2004-2005**

# SCHEME OF EXAMINATION
# M.Tech. - Information Technology

## FOURTH SEMESTER EXAMINATION

| Code No. | Paper | L / P | Credits |
|---|---|---|---|
| ITR-752 | Dissertation | 30 | 25 |
| ITR-754* | Seminar & Progress Report | 10 | 3 |
| ITR-756* | Comprehensive Viva | - | 2 |
| **Total** | | **40** | **30** |

***Non University Exam System**

**NOTE:**

1. The total number of credits of the Programme M. Tech. = 105.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100.

**CS background**

1. B.E./B.Tech. in Computer Engineering/Computer Science & Engineering/Information Technology
2. M.C.A./M.C.A.[SE]/M.Sc.[IT]

**Non-CS background**

1. B.E./B.Tech. in Electronics Engineering/Electronics & Communication Enginggering
2. M.Sc. in Electronics

**Elective course will be offered only if it is either requested by 40% of sanctioned strength or 10 students, whichever is less.**

**Code No : ITR-601** **L C**

**Paper : Algorithm Analysis & Design** **3 3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Preliminaries:**

Review of growth of functions, Recurrences: The substitution method, The iteration method, The master method, Data Structures for Disjoint Sets.

**Divide and Conquer Approach:**

Merge Sort, Quick sort, Medians and Order statistics, Strassen's algorithm for Matrix Multiplications.

**Dynamic Programming:**

Elements of Dynamic Programming, Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems.

**Greedy Algorithms:**

Elements of Greedy strategy, An activity selection problem, Huffman Codes, A task scheduling problem.

**Graph Algorithms:**

Representation of Graphs, Breadth First Search, Depth First Search, Topological Sort, Strongly Connected Components, Algorithm for Kruskal's and Prim's for finding Minimum cost Spanning Trees, Dijkstra's and Bellman Fort Algorithm for finding Single source shortest paths. All pair shortest paths and matrix multiplication, Floyd – Warshall algorithm for all pair shortest paths.

**String matching:**

The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.

**NP-Complete Problem:**

Polynomial-time verification, NP-Completeness and Reducibility, NP-Completeness Proof, NP-Complete problems.

**Text Books:**

1. T. H. Cormen, C. E. Leiserson, R.L. Rivest, C. Stein, "Introduction to Algorithms", 2nd Edition, PHI.

**Reference Books:**

1. A.V. Aho, J. E. Hopcroft, J.D. Ulman, "The Design & Analysis of Computer Algorithms", Addison Wesley.
2. V. Manber, "Introduction to Algorithms – A Creative Approach", Addison Wesley.
3. Ellis Harwitz and Sartaz Sahani, "Fundamentals of Computer Algorithms", Galgotia.

**Code No : ITR-603** **L C**

**Paper : Software Engineering** **3 3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction:**

Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models, Overview of Quality Standards like ISO 9001, SEI – CMM.

**Software Requirements analysis & specifications:**

Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Rquirements documentation, Nature of SRS, Characteristics & organization of SRS.

**Software Project Planning:**

Size Estimation like lines of Code & Function Count, Cost Estimation Models, Static single & Multivariable Models, COCOMO, COCOMO-II, Putnam resource allocation model, Risk Management.

**Software Design:**

Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.

**Software Metrics:**

Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics, Information Flow Metrics

**Software Testing:**

Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards.

**Software Reliability:**

Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calender time Component.

**Software Maintenance:**

Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

**Test:**


1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International, 2001.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.


**Reference:**


1. R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
2. P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
3. Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN, 1996.
4. James Peter, W. Pedrycz, "Software Engineering", John Wiley & Sons.
5. I. Sommerville, "Software Engineering", Addison Wesley, 1999.

**Code No. ITR-605** **L C**

**Paper: Advanced Computer Architecture** **3 3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Parallel computer models:**

The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

**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.

**Advanced processors:**

Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

**Pipelining:**

Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

**Memory Hierarchy Design:**

Cache basics & cache performance, reducing miss rate and miss penalty, multilevel cache hierarchies, main memory organizations, design of memory hierarchies.

**Multiprocessor architectures:**

Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization,

**Scalable point – point interfaces:**

Alpha364 and HT protocols, high performance signaling layer.

**Enterprise Memory subsystem Architecture:**

Enterprise RAS Feature set: Machine check, hot add/remove, domain partitioning, memory mirroring/migration, patrol scrubbing, fault tolerant system.

**Text:**


1. Kai Hwang, “Advanced computer architecture”; TMH.
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design,” Morgan Kaufmann, 2nd Ed.


**References:**


1. J.P.Hayes, “computer Architecture and organization”; MGH.

2. Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication.
3. V.Rajaranam & C.S.R.Murthy, "Parallel computer"; PHI.
4. R.K.Ghose, Rajan Moona & Phalguni Gupta, "Foundation of Parallel Processing"; Narosa Publications.
5. Kai Hwang and Zu, "Scalable Parallel Computers Architecture"; MGH.
6. Stalling W, "Computer Organisation & Architecture";PHI.
7. D.Sima, T.Fountain, P.Kasuk, "Advanced Computer Architecture-A Design space Approach,"Addison Wesley,1997.
8. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing.
9. D.A.Patterson, J.L.Hennessy, "Computer Architecture :A quantitative approach";Morgan Kauffmann feb,2002.
10. Hwan and Briggs, " Computer Architecture and Parallel Processing"; MGH.

**Code No. : ITR-607** **L C**
**Paper: Digital System Design** **3 3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Specification of combinational systems using VHDL, Introduction to VHDL, Basic language element of VHDL, Behavioral Modeling, Data flow modeling, Structural modeling, Subprograms and overloading, VHDL description of gates.

Description and design of sequential circuits using VHDL, Standard combinational modules, Design of a Serial Adder with Accumulator, State Graph for Control Network, design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of a Binary Divider.

Register- transfer level systems, Execution Graph, Organization of System, Implementation of RTL Systems, Analysis of RTL Systems, Design of RTL Systems.

Data Subsystems, Storage Modules, Functional Modules, Data paths, Control Subsystems, Micro programmed Controller, Structure of a micro programmed controller, Micro instruction Format, Micro instruction sequencing, Micro instruction Timing, Basic component of a micro system, memory subsystem.

I/O subsystem, Processors, Operation of the computer and cycle time. Binary Decoder, Binary Encoder, Multiplexers and Demultiplexers,

Floating Point Arithmetic-Representation of Floating Point Number, Floating Point Multiplication.

**Text:**


1. J. Bhaskar, " A VHDL Primer", Addison Wesley, 1999.
2. M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000
3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing


**References:**


1. J.F. Wakerly, "Digital Design-Principles and Practices", PHL
2. Douglas Perry, "VHDL", MGH
3. Michae John Sebastian Smith, "Application-Specific Integrated Circuits", Addison-Wesley.
4. Z. Navabi, " VHDL-Analysis and Modeling of Digital Systems", MGH

**Code No : ITR - 609** **L C**

**Paper : Advanced Computer Networks** **3 3**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Review of Physical, Data link layer, TCP/IP: Datalink Protocols; ARP and RARP.

Network Layer: Routing algorithms and protocols, Congestion control algorithm, Router Operation, Router configuration, Internetworking, IP Protocol, IPv6 (an overview), Network layer in ATM Network.

Transport Layer: Transport Service, Transport Protocol (TCP, UDP, ATM AAL layer protocol).

Application layer: Security, DNS, SNMP, RMON, Electronic Mail, WWW.

Network Security: Firewalls (Application and packet filtering), Virtual Public Network.

**Text:**


1. Tananbaum A.S., "Computer Networks", 3rd Ed, PHI, 1999.
2. Laura Chappell (ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.


**References:**


1. Black U., "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
2. Stallings W., "Computer Communication Networks", PHI.
3 Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1&2", 3rd Ed., Addison Wesley, 1999.
4. Michael A. Miller, "Data & Network Communications", Vikas Publication.
5. William A. Shay, "Understanding Data Communications & Networks", Vikas Publication.

**Code No. ITR-611** **L** **C**

**Paper: Data Base Management Systems** **3** **3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Basic concepts:**

Database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modelling using the entity-relationship approach. Overview of hierarchical, Network & Relational Data Base Management Systems.

**Relational model, languages & systems:**

Relational data model & relational algebra: relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in sql, a relational database management systems, DB2.

DB2 Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Tablespaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers.

**Relational data base design:**

Function dependencies & normalization for relational dataases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition.

**Concurrency control & recovery techniques:**

Concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures.

Concepts of object oriented database management systems, Distributed Data Base Management Systems.

**Text:**

1. Desai, B., "An introduction to database concepts", Galgotia publications.

**References:**

1. Date, C. J. , "An introduction to database systems", 7rd Edition, Addison Wesley.
2. Date, C. J. , "An introduction to database systems", 3rd Edition, Narosa Publishing House.
3. Elmsari and Navathe, "Fundamentals of database systems", Addison Wesley.
4. Ullman, J. D., "Principals of database systems", Galgotia publications.
5. DB2 Manuals

**Code No : ITR-613** **L C**

**Paper : Communication Systems** **3 3**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Analog Modulation Methods:**

Amplitude Modulation: Generation & Demodulation of AM waves, DSBSC waves, Coherent Detection of DSBSC signal, Angle Modulation: Frequency & Phase Modulation, BW of FM waves, Generation & Demodulation of FM waves, Comparison of AM, FM & PM.

Pulse Analog Modulation:

Sampling theorem, Sampling of Low Pass and Band pass signals, Aliening, Aperture effect, PAM, PWM and PPM generation and demodulation, TDM.

**Pulse Digital Modulation:**

Pulse code modulation signal to quantization noise ratio, companding, DPCM, Prediction Filter, DM and ADM modulators and demodulators, Data Modem, Data encoding methods, ASK, FSK, PSK, QAM, M-ary systems, line coding, Inter symbol Interference, Multiplexing methods: time division multiplexing (TDM), STDM, CDMA, FDM.

**Introduction to Information Theory:**

Discrete messages, The concept of amount of information, Entropy, Information rate, mutual information, Shannon's source coding Theorem, Huffman code, Lempel –ziv code, .channel coding and channel capacity theorem. Coding to increase average information per bit, Shannon's theorem, Capacity of a Gaussian channel, Bandwidth – S/N tradeoff, use of orthogonal signals to attain Shannon's limit.

**Text / Reference Books:**


1. Taub and Schiling, "Principles of Communication Systems", TMH, 2nd Edition,
2. S. Haykin, "Analog and Digital Communication", Wiley.
3. Hancocok J. C., "An Introduction to the Principles of Communication Theory", TMH.
4. Tomasi, "Electronic Communication Systems", 4th ed., Pearson Education.
5. William Stallings – Data & Computer Communications, PHI (6th Ed.,)
6. Forouzan – Data Communication & Networking, McGraw Hill, 2nd Edition.

| **Code No: ITR-651** | **P** | **C** |
|---|---|---|
| **Lab: Lab. – I** | **4** | **3** |

The experiments will be based on the following papers:

1) Software Engineering
2) Algorithm Analysis Design

| **Code No: ITR-653** | **P** | **C** |
|---|---|---|
| **Lab: Lab. II** | **4** | **3** |

The experiments will be based on the following Papers:

1) Advanced Computer Architecture
2) Digital System Design

| **Code No: ITR-655** | **P** | **C** |
|---|---|---|
| **Lab: Lab. III** | **4** | **3** |

The experiments will be based on the following Papers:

1) Advanced Computer Networks
2) Database Management Systems/Communication System

**Code No: ITR-602** **L** **C**

**Paper: Object Oriented Software Engineering** **4** **4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction to Software Engineering:**

Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models.

**Object Methodology & Requirement Elicitation:**

Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation

**Architecture:**

Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model

**Modeling with UML:**

Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams

**System Analysis:**

Analysis Model, Dynamic Modelling & Testing

**System Design:**

Design concepts & activities, Design models, Block design, Testing

**Testing Object Oriented Systems:**

Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing

**Case Studies**

**Text Books:**

1. Stephen R. Scach, "Classical & Object Oriented Software Engineering with UML and Java", McGraw Hill, 1999.

**Code No. ITR – 604** **L C**

**Subject: Embedded Systems Designs** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction to an embedded systems design:**

Introduction to Embedded system, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

**Processes and Operating Systems:**

The Processes abstraction, Switching contexts between programs, Real-time operating systems, Intercrosses communication, Performance analysis and power consumption.

**Microcontroller:**

Role of processor selection in Embedded System (Microprocessor V/s Micro-controller), 8051 Microcontroller: Architecture, basic assembly language programming concepts, Instruction set, Addressing Modes, Logical Operation, Arithmetic Operations, Subroutine, Interrupt handling, Timing subroutines, Serial data transmission, Serial data communication

**Networks for Embedded Systems**

The $I^2C$ Bus, The CAN bus, SHARC link Ports, Ethernet, Myrinet, Internet, Introduction to Bluetooth: Specification, Core Protocol, Cable replacement protocol.
IEEE 1149.1 (JTAG) Testability: Boundary Scan Architecture

**Text:**


1. Embedded Systems by Raj Kamal, TMH
2. The 8051 Microcontroller by K.J. Ayala, Penram International
3. J B Peatman, Design with PIC Microcontrollers, Prentice Hall


**References:**


1. An Embedded Software Primer by David E. Simon, Pearson Education
2. Designing Embedded Hardware by John Catsoulis, O'reilly
3. Embedded System Design by Frank Vahid, Tony Givargis,", John Wiley & Sons, Inc
4. Building Embedded Linux Systems by Karim Yaghmour, O'reilly
5. Programming Embedded Systems by Michael Barr, O'reilly
6. Real-time systems & software by Alan C. Shaw, John Wiley & sons, Inc.
7. Computers as Components by Wayne Wolf, Harcourt India Pvt. Ltd.
8. Embedded System Design by Peter Marwedel, Kluwer Acadeemic Pub.
9. Programming and Customizing the AVR Microcontroller by Dhananjay Gadre, MGH
10. Fundamental of Embedded software by Daniel W. Lewis, PHI
11. Bluetooth Technology by CSR Prabhu & A.P. Reddi, PHI

**Code No: ITR-606** **L C**

**Paper : Cellular & Mobile Communication** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction:**

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

**Elements of Cellular Radio Systems Design:**

General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

**Interference:**

Introduction to co-channel interference, real time co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

**Cell sites and Mobile Antenna:**

Characteristics, antenna at cell site, mobile antennas

**Frequency Management and Channel Assignment**

Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

**Hand Off, Dropped Calls**

Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

**Operational Technique**

Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

**Text Books:**

1. Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill
2. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)

**Reference Books:**

1. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
2. Mobile Communication Engineering – Theory & Applications; TMH

| **Code No: ITR-608** | **L** | **C** |
|---|---|---|
| **Subject: VLSI Design** | **4** | **4** |

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Introduction to Transistor Theory: BJT, FET, CMOS

Logic Design with MOSFETs: MOSFET as switches, Complex Logic gates in CMOS, Transmission Gate Circuits, Clocking and Dataflow control. Physical Structure of CMOS Integrated circuits, Fabrication Structure of CMOS Integrated Circuits, Elements of Physical Design: Layout of basic structures, Cell concepts, FET sizing and the unit transistor, Physical design of Logic gates.

Electrical Characteristics of MOSFETs: FET RC Model, Modeling of Small MOSFETs, Electronic analysis of CMOS Logic gates: DC characteristics of the CMOS inverter, inverter switching characteristics, power dissipation, dc characteristics: AND and NOR gates, NAND and NOR transient response, Analysis of Complex Logic gates, gate design for transient performance, transmission gates and pass transistors, gate delays, driving large capacitive loads

System-level physical design: Large scale physical design, Interconnect delay modeling, crosstalk, interconnect scaling, Floorplanning and Routing, Input and Output Circuits, Power distribution and consumption.

VLSI Clocking and System Design: Clocked Flip-flops, CMOS clocking styles, pipelined systems, clock generation and distribution and distribution.

**Text:**


1. Introduction to VLSI Circuits and Systems by J.P. Uyemura, John Wiley & Sons, Inc.


**References:**


1. Principles of CMOS VLSI Design – A System Perspective by Neil H.E. Weste and Kamran Eshraghian; Addison Wesley Pub.
2. Digital Integrated Circuits by Demassa & Ciccone, Willey Pub
3. Modern VLSI Design: system on silicon by Wayne Wolf; Addison Wesley Longman Publisher
4. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshranghian; PHI
5. Digital Integrated Circuits: A Design Perspective by Jan M. Rabaey; PHI
6. Semiconductor Devices: Physics And Technology by Sze, S.M., Wiley, 1985
7. Semiconductor device modelling with SPICE by P Antognetti, G Massobrio, McGraw-Hill

**Code No: ITR-610** **L C**

**Paper : Digital Signal Processing** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Discrete time signals and systems, Z-transforms, structures for digital filters, design procedures for FIR and IIR filters. Frequency transformations: linear phase design; DFT. Methods for computing FFT. Noise analysis of digital filters, power spectrum estimation.

Signals and signal Processing: characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications.

Time Domain Representation of Signals & Systems: Discrete Time Signals, Operations on Sequences, the sampling process, Discrete-Time systems, Time-Domain characterization of LTI Discrete-Time systems, state-space representation of LTI Discrete-Time systems, random signals.

Transform-Domain Representation of Signals: the Discrete-Time Fourier Transform, Discrete Fourier Transform, DFT properties, computation of the DFT of real sequences, Linear Convolution using the DFT. Z-transforms, Inverse z-transform, properties of z-transform, transform domain representations of random signals.

Transform-Domain Representation of LTI Systems: the frequency response, the transfer function, types of transfer function, minimum-phase and maximum-Phase transfer functions, complementary transfer functions, Discrete-Time processing of random signals.

Digital Processing of Continuous-Time Signals : sampling of Continuous Signals, Analog Filter Design, Anti-aliasing Filter Design, Sample-and-hold circuits, A/D & D/A converter, Reconstruction Filter Design.

Digital Filter Structure: Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, bone FIR Digital Filter Structures, IIR Filter Structures, State-space structure, all pass filters, tunable IIR Digital filters. cascaded Lattice realization of IIR and FIR filters, Parallel all pass realization of IIR transfer function, Digital Sine-Cosine generator.

Digital Filter Design: Impulse invariance method of IIR filter design, Bilinear Transform method of IIR Filter Design, Design of Digital IIR notch filters, FIR filter Design based on truncated fonner sens, FIR filter design based on Frequency Sampling approach.

Applications of DSP.

**Text / Reference Books:**

1. Sanjit K. Mitra, “Applications DSP a Computer based approach” , TMH.
2. Allan Y. Oppenhein & Ronald W. Schater , "Digital Signal Processing”, PHI

**Code No.: ITR–612** **L** **C**

**Subject: Designing with ASICS** **4** **4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Types of ASICs – Design flow – Economics of ASICs – ASIC cell libraries – CMOS logic cell data path logic cells – I/O cells – cell compilers.

ASIC Library design: Transistors as resistors – parasitic capacitance – logical effort programmable ASIC design software: Design system – logic synthesis – half gate ASIC.

Low level design entry: Schematic entry – low level design languages – PLA tools – EDIF – An overview of VHDL and verilog.

Logic synthesis in verilog and & VHDL simulation.

ASIC Construction – Floor planning & placement – Routing.

**Text / References Book:**

1. J.S. Smith, "Application specific Integrated Circuits", Addison Wesley, 1997

**Code No.: ITR – 614** **L C**

**Subject: Real Time Systems and Software** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Introduction, Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues.

Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organiazations, Standard OS and Concurrency – Architectures, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes

Requirements and Design Specifications: Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timeing and clocks, Sementics Tools and Extensions, Statecharts-Concepts and Graphical Syntax, Semantics and Tools

Declarative Specifications: Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic

Deterministic Scheduling : Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Prority Inversiotn and Inheritance

Execution Time Prediction: Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimisation, System Interference and Architectural Complexities

Timer Application, Properities of Real and ideal clocks, Clock Servers – Lamport's Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization- Centralized Synchronization, Distributed Synchronization

Programming Languages: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Externsions, CSP and Occam

Operating Systems: Real Time Functions and Sevices, OS Architectures-Real Time UNIX and POSIX, Issues in Task management- Processes and Threads, Scheduling, Synchronization and communication

**Text Book**:

1. Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc

**Code No. ITR-616** **L C**
**Subject: Advanced DBMS** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Review of traditional DBMS's, relational algebra and relational calculus, design principles, normalization, transaction and concurrency control, recovery management.

Design Process
Design process, design evaluation, modelling process, E-R model, semantic data model, object oriented model, models and mapping normalization and denormalization. Data warehousing, OLAP and data mining.

Architecture
Architecture of DB2, SQL server and Oracle.
DB2 sever tuning, SQL server tuning, Oracle server tuning, OS tuning (Microsoft OS's)

Distributed Database Management Systems
Components, levels of data & process distribution, transparency features, data fragmentation, data replication.

Client Server Systems
Principles, components, ODBC, ADO, JDBC and JSQL overview

**Text Books:**
1. C J Date – Introduction to Database Systems, AWL
2. J L Warrington – Object Oriented Database Design, Morgan Kaufman
3. T J Tewrey – Database Modeling and Design, Morgan Kaufman

**Reference Book:**
1. DB2, Oracle & SQL Server Documentation

**Code: ITR-618** **L** **C**

**Subject: Software Metrics** **4** **4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

**Introduction:**

What is measurement and why do it? Measurement in software engineering, scope of software metrics.

**The Basics of Measurement:**

Representational theory, Measurement & Models, Measurement Scales and Scale Types, Meaningfulness in Measurement

**A Goal Framework for Software Measurement:**

Classifying software measures, Determining what to measure, Applying the framework

**Empirical Investigation & Data Collection:**

Four Principles of Investigation, Planning formal experiments, What is good data, How to define the data, How to collect data, When to collect data.

**Analyzing Software Measurement Data:**

Analyzing the results of experiments, Analysis Techniques, Overview of statistical tests.

**Measuring Internal Product Attributes, Size and Structure:**

Aspects of Software Size, Length, Reuse, Functionality, Complexity, Types of Structural Measures, Modularity and information flow attributes, Object Oriented Metrics

**Measuring External Product Attributes:**

Modeling Software Quality, Measuring aspects of quality

**Measurement and Management:**

Planning a measurement program, Measurement in practice, empirical research in software engineering.

**Text Books:**

1. Norman E. Fenton & Shari Lawrence Pfleefer, “Software Metrics”, Thomson Computer Press, 1996.

**Code No: ITR - 620** **L C**
**Subject: Software Requirements & Estimation** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Introduction to software life cycle, management activities in a software project

Requirements engineering: Requirements Elicitation, Requirement Elicitation techniques, Requirement Analysis, Requirement Analysis Models, Requirement Documentation, Requirement Management

Size Estimation: Function Point Analysis, Mask II FPA, LOC estimation, Conversion between size measures

Effort, schedule & cost estimation: Estimation factors, COCOMO-II, Putnam Estimation Model, Estimation by Analogy, Validating Software Estimates

Tools: Software Estimation Tools

Industry Resources; IFPUG, UQAM-SEMRL, COSMIC, IEEE, COCOMO

**Reference Book:**

1. "Software Requirements and Estimation", Swapna Kishore, Rajesh Naik

**Code No.: ITR - 622** **L C**
**Paper: Network Design** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Review of OSI layers, circuit types & services, topologies, networking hardware, common protocols & interfaces in physical, data, network & transport layers.

Switching technologies, multiplexing, circuit switching, packet switching X.25, frame relax, SMDs ATM, B-ISDN, traffic matrix, traffic pattern calculations, performance issues of packet networks, delay, availability and reliability

**Comparisons:** circuits Vs. packets vs frame vs cell Technologies & services, protocols & interface comparisons, switching comparisons, SMDs Vs. B-ISDN, FDDE Vs SMDS

**Network Design for Access:** Campus network design, leased line and radio modems, DDR & ISDN Access Network design, X.25 remote access network design, Frame-relay interfaces & traffic shaping VSAT & WLAN network design. Scaling access networks.

**Network Design for Backbone:** Identification & selection of internetworking devices, CISCO routers & Nortel switches, EIGRP

**Network Design for convergence:** UDP broadcasts, IP Networks for Voice, Data, Video, Fax, Soft & hard design examples for IP Technology networks, network design for digital video broadcast

**Data Network Management Systems:** Managing IP, ICMP, TCP, UDP, X.25 reporting Ethernet traffic, managing bridges & routers. Microsoft & HP, NMS Tools.

Case Studies: selected from design, architecture & topology areas of internetworks.

**Reference Books:**
1. Data Network Design; D L Spolin, Mc-Graw Hill, 1993
2. SNMP "Feit" Mc-Graw Hill Inc., 1995
3. Network Design & Case Studies "CISCO Systems Inc." , CISCO Press, 1993

**Code No.: ITR - 624** **L C**

**Paper: Network Programming** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction :** TCP/IP Architecture, TCP/IP addressing, services, FTP, SMTP, TFTP, SNMP, Network file system, domain name system, transport layer protocols, user datagram protocol, transmission control protocol.

**Interprocess communications :** File and record locking, pipes, FIFO's, stream and messages, message quues, samphorers.

**Sockets :** Sockets system cells, reserved parts, stream pipes, socket option, asynchronous I/O, Sockets and signals

**Transport Lay Interface :** Elementary TLI functions, stream and stream pipes, asynchronous I/O I/O multiplexing

**Remote Procedure calls :** Remote login, remote command execution, external data representation.

**Text/Reference Books**:


1. A. Stevens, "TCP/IP Illustrated", Vol. 1-3, Addison Wesley, 1998
2. R. Stevens, "Unix Network Programming", PHI 1998
3. J. Martin, "TCP/IP Networking – Architecture, Administration and programming", Prentice Hall, 1994.
4. D.E. Comer, "Internetworking with TCP/IP, Vol. 1, Vol. 2, Vol. 3 Principles, Protocols, and architecture, PHI, 2000
5. Feit, "TCP/IP", Mc Graw Hill, 1996

**Code No : ITR - 626** **L C**
**Paper : Computer Graphics** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Basic raster graphics algorithms for drawing 2 D Primitives liner, circles, ellipses, arcs, clipping, clipping circles, ellipses & polygon.

Polygon Meshes in 3D, curves, cubic & surfaces, Solid modeling.Geometric Transformation: 2D, 3D transformations, window to viewport transformations, acromatic and color models.

Graphics Hardware: Hardcopy & display techniques, Input devices, image scanners

Shading Tech: Transparency, Shadows, Object reflection, Gouraud & Phong shading techniques. Visible surface determination techniques for visible line determination, Z-buffer algorithm, scanline algorithm, algorithm for oct-tres, algorithm for curve surfaces, visible surfaces ray-tracing , recursive ray tracing, radio-city methods.

Elementary filtering tech, elementary Image Processing techniques, Geometric & multi-pass transformation mechanisms for image storage & retrieval.

Procedural models, fractals, grammar-based models, multi-particle system, volume rendering.

**Text Book:**

1. Foley et. al., "Computer Graphics Principles & practice", AWL.

**References Books:**

1. R.H. Bartels, J.C. Beatty and B.A. Barsky, "An Introduction to Splines for use in Computer Graphics and Geometric Modeling", Morgan Kaufmann Publishers Inc., 1987.
2. D. Hearn and P. Baker, "Computer Graphics", Prentice Hall, 1986.
3. C.E. Leiserson, T.H. Cormen and R.L. Rivest, "Introduction to Algorithms", McGraw-Hill Book Company, 1990.
4. W. Newman and R. Sproul, "Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
5. R. Plastock and G. Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, McGraw Hill, 1986.
6. F.P. Preparata and M.I. Shamos, "Computational Geometry: An Introduction", Springer-Verlag New York Inc., 1985.
7. D. Rogers and J. Adams, "Mathematical Elements for Computer Graphics", MacGraw-Hill International Edition, 1989.
8. David F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill Book Company, 1985.
9. Alan Watt and Mark Watt, "Advanced Animation and Rendering Techniques", Addison-Wesley, 1992

**Code No : ITR - 628** **L C**

**Paper : Fuzzy Logic & Design** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, $\alpha$-cuts, Properties of $\alpha$-cuts, Decomposition Theorems, Extension Principle.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Relations: Crisp & Fuzzy Relations, Projections & Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility & Ordering Relations, Morphisms, Fuzzy Relation Equations.

Possibility Theory: Fuzzy Measures, Evidence & Possibility Theory, Possibility versus Probability Theory.

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

Unertainty based Information: Information & Uncertainity, Nonspecificity of Fuzzy & Crisp sets, Fuzziness of Fuzzy Sets.

Applications of Fuzzy Logic:

**Text / References Books:**


1. G.J.Klir & T.A. Folyger,"Fuzzy Sets, Uncertainty & Information", PHI, 1988.
2. G.J.Klir & B.Yuan, "Fuzzy sets & Fuzzy logic," PHI, 1995.
3. T. J. Row, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1995.
4. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.

**Code No : ITR - 630** **L** **C**

**Paper : Distributed Operating Systems** **4** **4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Synchronization**

Language mechanisms: monitors, serializers, communicating sequential processes, Distributed mutual exclusion, Distributed deadlock detection, Clock synchronization

**Distributed shared memory**

Design and implementation of DSM systems, Consistency models

**Distributed file systems**

File accessing models, File-sharing semantics, Caching schemes, Replication, Fault tolerance

**Distributed scheduling**

Algorithms for distributed scheduling

**Theoretical foundation**

Lamport's clocks, Vector clocks, Global snapshots, recovery, Causal ordering

**Database Operating systems**

Concurrency control algorithms, Lock-based algorithms, Timestamp-based algorithms

**Communication-kernel based operating systems**

Message-passing semantics, Server processes, Distributed V kernel, Mach.

**Text / Reference Books:**


1. Singhal and Shivaratri, Advanced Concepts in Operating Systems, McGraw Hill, 1994;
2. Sinha, Distributed Operating Systems Concepts and Design, IEEE Computer Society Press, 1997, ISBN - 0-7803-1119-1;
3. Tanenbaum and Steen, Distributed Systems Principles and Paradigms, Prentice Hall, 2002.

**Code No : ITR - 632** **L C**

**Paper : Programming of AVR Microcontroller** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Microcontroller architecture, The AVR RISC Microcontroller Architcturer: AVR family architecture, Register File, Memory access and instruction Execution, I/O Memory, I/O Ports.

**AVR Instruction Set:** Program and data addressing modes, Arithmetic & Logic Instruction, Program Control Instruction, Data Transfer Instruction

**AVR Hardware Design Issues:** Power source, Operating clock sources, Reset circuit

**Hardware & Software Interfacing with AVR:** Lights & switches, Stack operation in AVR Processors, Implementing Combinational Logic, Connecting the AVR to the PC serial port, Expanding I/O, Interfacing analog to Digital converters and DAC, Interfacing with LED/LCD displays, Stepper motor interface with AVR.

**Communication links for the AVR Processor:** RS-232 Link, RS-422/423 link, SPI and microwave bus, IrDA Data link, CAN

**AVR System Development tool:** Code assembler, Code simulator, Evaluation boards, AVR emulator, Device Programmer

**Text Book:**

1. Programming and Customizing the AVR Microcontroller by Dhananjay V. Gadre, TMH

**Code No : ITR - 634** **L C**

**Paper :Genetic Algorithm & Programming** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Basics of biological evolution: Darwin, DNA, etc. Basics of GAs: selection, recombination and mutation. Choices of algorithm: (mu,lambda), (mu+lambda), steady-state, CHC, etc. Linkage and epistasis. The standard test functions. Fitness and objective functions: scaling, windowing etc. Representational issues: binary, integer and real-valued encodings; permutation-based encodings.Operator issues: different types of crossover and mutation, of selection and replacement. Inversion and other operators.

Constraint satisfaction: penalty-function and other methods; repair and write-back; feasibility issues. Experimental issues: design and analysis of sets of experiments by t-tests, F-tests, bootstrap tests etc.Some theory: the schema theorem and its flaws; selection takeover times; optimal mutation rates; other approaches to providing a theoretical basis for studying GA issues.Rival methods: hill-climbing, simulated annealing, population-based incremental learning, tabu search, etc. Hybrid/memetic algorithms.

Multiple-solutions methods: crowding, niching; island and cellular models. Multi-objective methods: Pareto optimisation; dominance selection; VEGA; COMOGA.

Genetic programming: functions and terminals, S-expressions; parsimony; fitness issues; ADFs. Evolving rules and rule-sets. SAMUEL and related methods. Classifier systems: the Pittsburgh and Michigan approaches. Credit allocation: bucket-brigade and profit-sharing. Hierarchic classifier systems.

Genetic planning: evolving plans, evolving heuristics, evolving planners, optimising plans. Ant Colony Optimization: Basic method for the TSP, local search, application to bin packing.

Applications: engineering optimisation; scheduling and timetabling; data-mining; neural net design; etc. Some further ideas: co-evolution; evolvable hardware; multi-level GAs; polyploid GAs.

**Text/References Books:**


1. M. Mitchell: An Introduction to Genetic Algorithms. MIT Press, 1996.
2. W. Banzhaf, P. Nordin, R. E. Keller, F. D. Francone: Genetic Programming: An Introduction. Morgan Kaufmann, 1988.
3. E. Bonabeau, M. Dorigo, G. Theraulez: Swarm Intelligence: From Natural to Artificial Systems. Oxford University Press, 1999

**Code No : ITR - 636** **L C**

**Paper :Cluster & Grid Computing** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Cluster Computing** :Parallel systems,Cluster Architecture, Parallel Paradigms,Parallel, Programming with MPI, Resource management and scheduling

**Grid Computing**

Grids and Grid Technologies, Programming models and Parallelization Techniques, Standard application development tools and paradigms such as message-passing and parameter parallel programming,Grid Security Infrastructure, Data Management, Application Case Study: Molecular Modelling for Drug Design and Brain Activity Analysis, Resource management and scheduling, Setting up Grid, deployment of Grid software and tools, and application execution.

**Text/References Books:**


1. Buyya (editor), High Performance Cluster Computing , Vol1. and Vol.2, Prentice Hall, USA, 1999.
2. I. Foster and C. Kesselman (editors), The Grid : Blueprint for a New Computing Infrastructure , Morgan Kaufmann Publishers , 1999.
3. R. Buyya, "Economic-based Distributed Resource Management and Scheduling for Grid Computing, Ph.D. Thesis, Monash University, Melbourne, Australia, April 2002
4. Gaig Fallenstein, Grid Computing
5. Ahmar Abbas, Grid Computing : A practical guide to technology and applications

**Code No : ITR - 638** **L C**

**Paper :Information Theory & Coding** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Information, channel capacity, The concept of amount of information, entropy, Information rate, Conditional and joint entropies.

**Source coding :** Noise less coding, Shannon's first fundamental theorem, Discrete memory less channel, Mutual information, Sources with finite memory, Markov sources, Shannon's second fundamental theorem on coding, Huffman coding, Lempel – Ziv algorithm, Shannon-Fano algorithm.

**Channel coding :** Error detecting codes, Hamming distance, Error correcting codes, Repitition codes, Linear block codes, binary cyclic codes, BCH codes, Reed-Soleman codes, Golay codes.

**Convolution Coding:** Code tree, state diagram, Trellis diagram, Maximum-Likelihood decoding – Viterbi's algorithm, sequential decoding.

Network information theory, introduction to Cryptography

**Reference books:**


1. T M Gover, J M Thomos, "Elements of Information Theory", Wiley , 1991
2. Haykins S, "Digital Communications", Wiley
3. J.G.Proakis,"Digital Communications", Mc Graw Hill.

| **Code No : ITR - 640** | **P** | **C** |
|---|---|---|
| **Paper : Project Work** | **4** | **4** |

The student will submit a synopsis at the beginning of the semester for the approval to the school project committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the school for evaluation purpose at the end of the semester in a specified format.

| **Code No: ITR-652** | **P** | **C** |
|---|---|---|
| **Lab: Lab. – IV** | **4** | **2** |

The experiments will be based on the following papers:

1) Object Oriented Software Engineering (ITR-602)
2) Cellular & Mobile Communication (ITR-606)

| **Code No: ITR-654** | **P** | **C** |
|---|---|---|
| **Lab: Lab. V** | **4** | **2** |

The experiments will be based on the following Papers:

1) Elective – I
2) Elective - II

| **Code No: ITR-656** | **P** | **C** |
|---|---|---|
| **Lab: Lab. VI** | **4** | **1** |

The experiments will be based on the following Paper:

1) Embedded System Design (ITR-604)

**Code No: ITR-701** **L C**
**Subject: Neural Network** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Biological analogy, Architecture classification, Neural Models, Learning Paradigm and Rule, single unit mapping and the perception.

Feed forward networks – Review of optimization methods, back propagation, variation on Backpropagation, FFANN mapping capability, properties of FFANN's Generalization.

PCA, SOM, LVQ, Adaptive Resonance Networks.

Hopfield Networks, Associative Memories, RBF Networks.

Applications of Artificial Neural Networks: Regression, applications to function approximation, Classification, Blind Source Separation.

**Text:**


1. Haykin S., "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.


**Reference:**


1. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999.
2. Hertz J, Krogh A, R.G. Palmer, "Introduction to the Theory of Neural Computation",
3. Addison-Wesley, California, 1991.
4. Hertz J, Krogh A, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley, California, 1991.
5. Freeman J.A., D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison-Wesley, Reading, Mass, (1992).
6. Golden R.M., "Mathematical Methods for Neural Network Analysis and Design", MIT Press, Cambridge, MA, 1996.
7. Cherkassky V., F. Kulier, "Learning from Data-Concepts, Theory and Methods", John Wiley, New York, 1998.
8. Anderson J.A., E. Rosenfield, "Neurocomputing: Foundatiions of Research, MIT Press, Cambridge, MA, 1988.
9. Kohonen T., "Self-Organizing Maps", 2nd Ed., Springer Verlag, Berlin, 1997.
10 Patterson D.W., "Artificial Neural Networks: Theory and Applications", Prentice Hall, Singapore, 1995.
11. Vapnik V.N., "Estimation of Dependencies Based on Empirical Data", Springer Verlag, Berlin, 1982.
12. Vapnik V.N., "The Nature of Statistical Learning Theory", Springer Verlag, New York, 1995.
13. Vapnik V.N., "Statistical Learning Theory: Inference from Small Samples", John Wiley, 1998.

**Code: ITR-703** **L** **C**

**Paper: Reliability Engineering** **4** **4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Reliability Fundamentals: Introduction, Need for Reliability Engineering, Definition, Causes of Failures, Catastrophic Failures and Degradation Failures, Characteristic Types of Failures, Useful Life of Components, The Exponential Case of Chance Failures, Reliability Measures, Failure Data Analysis.

Reliability Mathematics: Fundamentals of Set Theory, Probability Theory, Random Variables, Discrete Distributes, Continuous Distributions, Stochastic Processes, Markov Chains

Reliability Analysis of Series Parallel Systems: Introduction, Reliability Block Diagrams, Series Systems, Parallel Systems, Series Parallel Systems, K-out-of-M Systems, Open and Short Circuit Failures, Standby Systems.

Reliability Analysis Nonseries Parallel Systems: Introduction, Path Determination, Boolean Algebra Methods, A Particular Method, Cut Set Approach, Delta-Star Method, Logical Signal Relations Method, Baye's Theorem Method.

Reliability Prediction: Introduction, Purpose, Classification, Information Sources for Failure Rate Data, General Requirements, Prediction Methodologies, Software Prediction Packages, Role and Limitation of Reliability Prediction.

Reliability Allocation: Introduction, Subsystems Reliability Improvement, Apportionment for New Units, Criticality.

Redundancy Techniques for Reliability Optimization: Introduction, Signal Redundancy, Time Redundancy, Software Redundancy, Hardware Redundancy.

Maintainability and Availability: Introduction, Forms of Maintenance, Measures of Maintainability and Availability, Maintainability Function, Availability Function, Two Unit Parallel System with Repair, Preventive Maintenance, Provisioning of Spares.

Reliability Testing: Introduction, Kinds of Testing, Component Reliability Measurements, Parametric Methods, Confidence Limits, Accelerated Testing, Equipment Acceptance Testing, Reliability Growth Testing.

**Text Book:**

1. "Reliability Engineering", K. K. Aggarwal, Kluwar Publications

**Code: ITR-705** **L** **C**

**Paper: Software Reusability** **4** **4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Introduction: Software Reuse success factors

Architecture Style: Object-oriented software engineering, application & component systems, use case components, object components, layered architecture.

Reuse processes: Object oriented business engineering, applying business engineering to define processes & organization, application family engineering, component system engineering, application system engineering

Organizing a reuse business: Its transaction, Management, working

**Reference Books:**


1. "Software Reuse", Ivan Jacobson, Griss Jacobson
2. "Measuring Software Reuse: Principales Practices, Economic Models", Joffrey S. Poutin, Addison Wesley.

**Code No: ITR - 707** **L C**

**Subject: Advanced Animation Techniques** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Rendering polygonal object: Polygon representation of 3-D object, Pixel-level process, Theoretic foundation, The theory and practices of light/object interaction, the theory and practices of parameteric representation technique, The theory and practices of anti-aliasing techniques, Shadow generation techniques, Mapping techniques, textures and environment mapping, Procedural texture mapping and modeling, Ray tracing Basic recursive ray tracing, Radiosity methods, Global Illumination models, Volume rendering technique, Overview and low-level motion specification, Animation articulated, procedural animation.

**Reference Books:**


1. A. H. Watt, "Advanced Animation and Rendering Techniques: Theory and Practices"
2. Rick Parent, "Computer Animation Algorithms and Techniques", Morgan Kaufmann Publishers
3. John Vince, "Essential Computer Animation Fast"
4. Steve Upstill, "The RenderMan Companion: A Programmer's Guide to Realistic Computer Graphics", Addison-Wesley
5. John Lasseter, "Tricks to Animating Characters with a Computer"
6. G. Scott Owen, "Renderman Tutorial for Blue Moon Rendering Tools"

**Code No: ITR - 709** **L C**
**Subject: Object Oriented Testing** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.<br>Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Purpose of testing:
Test Models: Testing Classes, Reusable components, subsystem, application systems, UML, State Machine Testing, Regression Testing, Test Automation, Testing Tools

**Reference Book:**

1. "Testing, Object-Oriented Systems", Robert V. Binder

**Code No. ITR – 711** **L C**

**Subject: Software Quality Management** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Concepts and Overview: Concepts of Software Quality, Quality Attributes, Software Quality Control and Software Quality Assurance, Evolution of SQA, Major SQA activities, Major SQA issues, Zero defect Software.

Software Quality Assurance: The Philosophy of Assurance, The Meaning of Quality, The Relationship of Assurance to the Software Life-Cycle, SQA Techniques.

Tailoring the Software Quality Assurance Program: Reviews, Walkthrough, Inspection, and Configuration Audits.

Evaluation: Software Requirements, Preliminary design, Detailed design, Coding and Unit Test, Integration and Testing, System Testing, types of Evaluations.

Configuration Management: Maintaining Product Integrity, Change Management, Version Control, Metrics, Configuration Management Planning.

Error Reporting: Identification of Defect, Analysis of Defect, Correction of Defect, Implementation of Correction, Regression Testing, Categorization of Defect, Relationship of Development Phases.

Trend Analysis: Error Quality, Error Frequency, Program Unit Complexity, Compilation Frequency.

Corrective Action as to Cause: Identifying the Requirement for Corrective Action, Determining the Action to be Taken, Implementing the Correcting the corrective Action, Periodic Review of Actions Taken.

Traceability, Records, Software Quality Program Planning, Social Factors: Accuracy, Authority, Benefit, Communication, Consistency, and Retaliation.

**Text Books:**


1. Robert Dunn, "Software Quality Concepts and Plans", Prentice-Hall, 1990.
2. Alan Gillies, "Software Quality, Theory and Management", Chapman and Hall, 1992.


**Reference Books:**


1. Michael Dyer, "The Cleanroom approach to Quality Software Engineering", Wiley & Sons, 1992.
2. Daniel Freedman, Gerald Weinberg, "Handbook of Walkthroughts, Inspections and Technical Reviews", Dorset House Publishing, 1990.
3. Tom Gilb, "Principles of Software Engineering Management", Addison-Wesley, 1988.
4. Tom Gilb, Dorothy Graham, "Software Inspection" Addison-Wesley, 1993.
5. Watts Humphrey, "Managing the Software Process", Addison-Wesley, 1990.
6. Watts Humphrey, "A Discipline for Software Engineering", Addison-Wesley, 1995.
7. Arthur Lowell, "Improving Software Quality An Insiders guide to TQM", 1993, Wiley & Sons.

**Code No. BAR – 713** **L C**

**Subject: Quantum Information & Computation** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Computers as physical systems, technological issues, Turing machines, computability, complexity, classical complexity classes, quantum complexity classes.

Review of quantum mechanics – state vectors, superpositions, unitary operators, hermitian operators, Schrodinger equation, Hamiltonian evolution, the concept of quantum measurement, the concept of qubits, quantum registers and quantum gates, quantum algorithms : Deutsch's algorithm, Shor's algorithm, Grover's search algorithm. Physical implementation of simple quantum gates.

Heisenberg uncertainty principle, polarization states of photons, quantum cryptography using polarized photons, local vs. non local interactions, entanglements, EPR paradox, Bell's theorem, Bell basis, teleportation of a single qubit – theory and the experiment.

Review of experimental successes till date; discussion on the technological feasibility of a quantum computer; candidate physical systems and the limitations imposed by noise.

**Code No.:ITR-715** **L C**

**Paper : Design Patterns** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Patterns in software engineering, definition and evolution, identifying patterns, representation, relection, usage, refactoring, anti pattern.

J2EE & Design Pattern

Sum Java center J2EE patterns catalog, The server slide .Com patterns catalog, patterns applied to the web tier, patterns applied to a persistence framework, patterns to improve performance, seal ability and security, pattern for enterprise integration, patterns applied to enable reusability, maintainability & extensibility/

VB .NET & Design Pattern:

Patterns in the Data Tier, Middle Tier, Presentation Tier, .NET remoting.

**Text / References:**


1. E. Gamma et. al., "Design Pattern, Elements of reusable object oriented software", AWL
2. C. A. Berry et. al., "J2EE design patterns applied, Wror/Spd, 2000
3. T. Fischer, "Design patterns in VB .NET, Wrox/Spd, 2002

**Code No.:ITR-717** **L C**
Paper : **Software Testing** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60** |
|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. |

**Introduction:** What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

**Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

**Structural Testing:** Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

**Reducing the number of test cases:**
Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, Slice based testing

**Testing Activities:** Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

**Object Oriented Testing:** Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

**Testing Tools:** Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools.

**Text Books:**


1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, "Software Testing", Pearson Education Asia, 2002


**Reference Books:**


1. K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
3. Boris Beizer, "Black-Box Testing – Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc., New York, 1995.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. Gordon Schulmeyer, "Zero Defect Software", McGraw-Hill, New York, 1990.

6. Watts Humphrey, “Managing the Software Process”, Addison Wesley Pub. Co. Inc., Massachusetts, 1989.
7. Boris Beizer, “Software System Testing and Quality Assurance”, Van Nostrand Reinhold, New York, 1984.
8. Glenford Myers, “The Art of Software Testing”, John Wiley & Sons Inc., New York, 1979.

**Code No.:ITR-719** **L C**
**Paper :Robotics Engineering** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Matrix algebra, Inversion of Matrices, Rotational groups, matrix representation of co-ordinate transformation.

Manipulator kinematics: kinematics: Introduction, solvability, algebraic solution by reduction to polynomial, standard frames, repeatability and accuracy, computational considerations.

Manipulator dynamics: introduction, acceleration of rigid body, mass distribution, Newton's equation, Euler's equation, Iterative Newton-Euler dynamic formulation, closed dynamic equation, Lagrangian formulation of manipulator dynamics, dynamic simulation, computational consideration.

Trajectory Generation: Introduction, general considerations in path description and generation, joint space schemes, Cartesian space schemes, Path generation in runtime, Planning path using dynamic model.

Linear control of manipulators: Introduction, feedback and closed loop control, second order linear systems, control of second-order systems, Trajectory following control, modeling and control of a single joint.

Robot Programming languages & systems: Introduction, the three level of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Off-line programming systems: Introduction, central issues in OLP system, cimstation, automating subtasks in OLP systems.

**Text Books:**

1. John J. Craig, "Introduction to Robotics", Addison Wesley publication
2. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication
3. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication

**Code No.: ITR - 721** **L C**
**Paper: Telecommunication Switching Systems and Networks** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

**Telecommunications transmission :** Basic Switching System, Simple Tele-phone Communication, evolution of switching systems -Stroger swithching systems, cross bar switching , Electronic Switching – Space Division Switching, Time Division Switching – Time Division space switching, Time Division Time Switching, Time multiplexed space switching, Time multiplexed Time Switching, Combination Switching.

**Speech Digitization and transmission :** Quantization Noise, Companding, Differential Coding, Vocodors, Pulse Transmission,, Line Coding, NRZ and RZ Codes, Manchester Coding, AMI Coding, Walsh Codes, TDM,

**Traffic Engineering:** Grade of Service and Blocking Probabity – Telephone Networks, Subscriber Loops, Switching Hierchy and Routing, Transmission Plans and Systems, Signaling Techniques, In Channel, Common Channel.

**Control of switching systems :** call processing functions, common control, stored program control.

**Telephone networks and signaling :** introduction, subscriber loop systems, switching hierarchy, transmission and numbering plans,common channel signaling principles, CCITT signaling systems 6&7.

**Reference Books:**


1. J.E.Flood, "Telecommunications switching, traffic and networks" first Indian reprint 2001, Pearson education asia.
2. T.Viswanathan, "Telecommunication switching systems and networks" 17th Indian reprint 2003, PHI, India.

**Code No.: ITR - 723** **L C**

**Paper: Multimedia Communication and System Design** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Multimedia Communication :** Introduction**,** Network requirements, multimedia terminals, multimedia processing in communications, distributed multimedia systems, a standards, communication across networks.

**Multimedia Systems Design :** Introduction, compression and decompression data file format standards, multimedia input/output technologies, multimedia application design

**Reference Books:**


1. Rao, Bojkovic, Milovanovic, "Multimedia Communication Systems", PHI
2. Andleigh, Thakrar, "Multimedia System Design", PHI
3. Sharda, "Multimedia Information Networking", PHI
4. Vaughan, "Multimedia Making it work",Tata Mc Graw Hill

**Code No. ITR – 725** **L C**
**Subject: CDMA Technology** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Direct sequence and frequency hopped spread spectrum, spreading sequences and their correlation functions, acquisition and tracking of spread spectrum signals, error probability for DS-CDMA on AWGN channels, DS-CDMA on frequency selective fading channels, performance analysis of cellular DS-CDMA, capacity estimation, power control effect of imperfect power control on DS-CDMA performance, softhand offs, spreading/coding tradeoffs, multi carrier CDMA, IS95A CDMA systems, 3rd Generation CDMA systems, multi user detection, optimum receivers, SIC, PIC receivers and performance.

**Reference Books:**


1. Andrew J Viterbi, " CDMA Principles of spread spectrum communications, Addition Wesley, 1995
2. J S Lee and L E Miller, "CDMA systems engineering handbook", Artech House 1998
3. Marvin K Simon, Jim K Omura, Robert A Scholtz, Bary Klevit, "Spread Spectrum Communications", 1995
4. Sergio Verdu, "Multiuser Detection", Cambridge University Press, 1998, Research Papers in Journals and conferences

**Code No. ITR – 727** **L C**

**Subject: Microwave and Radar Engineering** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Introduction to microwave region, Radar frequencies and microwave bands, Microwave transmission lines and modes of wave propagation, smith chart measurements.

Microwave Components: Scallering parameters and S matrix representation of waveguide components and their characterization study of waveguide attenduator, isolator and circulator, directional couplers, magic T, phase shifter, filters, cavity resonators (wavemeters); crystal detectors and their design measurements

Microwave power source (tubes): High frequency limitation, linear beam tubes and crossed field tubes

Microwave solid state sources: Gp III-V binary,ternary and quaternary semiconductor, study of tunnel diode, gunn diodes, avalanche devices (Impatts and Trapatt); Varactor diode and parametric amplifier; Microwave field effect transistor (MESFET, HEMT and Pseudo HEMT, GaAS MM.IC (Monolithic microwave Integrated circuits), Their fabrication and application, Masers

Radar Systems:

Pulsed Radar systems, Radar range equation, Antenna noise figure and noise temperature of radar antenna. Radar receiver sensitivity and low noise amplifier (LNA), Block diagram of radar transmitter and receiver. Radar displays, attribute of targets, target detection, scanning and tracking, electronic scanning and acquisition systems, monopulse radar technique, MTI Doppler radar, Application of radars.

**Text/Reference Books:**


1. Samuel Y Liao, " Microwave devices and Circuits", PHI
2. R.E. Colins, "Foundations of microwave engineering", TMH
3. Skolink, " Introduction to radar Systems", TMH

**Code No. ITR – 729** **L C**

**Subject: Satellite Communication** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction:**

Origin and brief history of satellite communications, An overview of satellite system engineering, satellite frequency bands for communication.

**Orbital theory:**

Orbital mechanics, locating the satellite in the orbit w.r.t. earth look angle determination. Azimuth & elevation calculations.

**Spacecraft systems:**

Attitude and orbit control system, telemetry , tracking and command (TT&C), communications subsystems, transponders, spacecraft antennas.

**Satellite link design:**

Basic transmission theory, noise figure and noise temperature, C/N ratio, satellite down link design, satellite uplink design.

**Modulation, Multiplexing, Multiple access Techniques:**

Analog telephone transmission, Fm theory, FM Detector theory, analog TV transmission, S/N ratio Calculation for satellite TV linking, Digital transmission, baseband and bandpass transmission of digital data, BPSK, QPSK , FDM, TDM,
Access techniques : FDMA, TDMA, CDMA.

**Encoding & FEC for Digital satellite links:**

Channel capacity, error detection coding, linear block, binary cyclic codes, convolution codes.

**Satellite Systems:**

Satellite Earth station Technology,satellite mobile communication, VSAT technology, Direct Broadcast by satellite (DBS).

**Reference Books:**


1. Timothy Pratt , Charles W. Bostian, Satellite communication John Wiley &sons publication
2. J.J. Spilker , Digital Communication by satellite , PH Publication
3. J. Martin, Communication satellite systems, PH publication

**Code No: ITR - 731** **L C**

**Subject: Mobile & Personal Communication Systems** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Review of Personal Communications systems Services (PCS):-** PCS Architecture, Mobility management, Networks signalling.

**Multiple access techniques for wireless communication** :- Introduction, FDMA, TDMA, Spread spectrum multiple access: FHMA &CDMA, Pure ALOHA and Slotted ALOHA, Demand assigned multiple acces(DAMA).

**Mobile systems and standards :**2G cellular networks: Global systems for mobile(GSM), GSM architecture, services, protocol model, mobility management, SMS, security aspects. AMPS: IS-136 North American TDMA standard.CDMA: IS95 Digital cellular standard.

**2.5G TDMA standards** : GPRS architecture, network, interfaces and procedures, EDGE architecture and features.

**3G mobile services:** UMTS architecture and W-CDMA, Cdma 2000, quality of service in 3G.

**Wireless Local Area Networks(WLAN) : C**omponents and working of WLAN, transmission media for WLAN, Modulation techniques for WLAN(DSSS,FHSS), IEEE 802.11 standards and protocols for WLAN(MACA,MACAW).

Mobile Network and Transport layer : Mobile IP, Mobile TCP, traffic routing in wireless networks, wire less ATM.

Wireless Local Loop(WLL) : WLL Architecture, WLL Technologies and frequency spectrum, LMDS.

**Future trends :** Blue tooth technology, 4G mobile techniques.

**Text / Reference Books**


1. Raj Pandya, "Mobile and Personal Communication systems and services", Prentice Hall of India, 2001.
2. Theodore S.Rappaport, "Wireless communications:Principles and practice", third Indian reprint Pearson Education Asia 2003.
3. C.Y.William Lee, "Mobile cellular telecommunications", 2nd edition Mc.Graw Hill Inc.1995.
4. Jochen Schiller, "Mobile communications", fifth Indian reprint, Pearson Education Ltd. 2000.
5. Yi-Bing Lin and Imrich Chlamtac, "Wireless and Mobile Network Architectures"' 2001, John Wiley &Sons.
6. Garg.V.K "IS-95 CDMA and cdma 2000", first Indian reprint 2002, Pearson Education ltd.
7. Stallings.W "Wireless communications and networks", second Indian reprint 2002, Pearson Education Ltd.

**Code No. ITR – 733** **L C**
**Subject: Digital Design for Testability and Fault Tolerance** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

## Introduction

Modeling: Basic Concept, Functional modeling at the logic level, Functional models at the register level, Structural models, Level of modeling.

## Logic Simulation

Problems in simulation based design verification, Type of simulation, The unknown logic value, compiled simulation, Event-driven simulation, Delay models, Elements evaluation, Haazard detection, Gate level event driven simulation, Transition-Independent nominal transport delays simulation engines.

## Fault Modeling

Logical fault models, Fault detection and redundancy, Fault equivalence and fault location, Fault Dominance, Single stuck-fault models, multiple stuck fault model, stuck RTL variables, Fault variables.

## Fault Simulation

General fault simulation techniques,Serial Fault simulation, Parallel fault simulation, Deductive fault simulation, Concurrent fault simulation, Fault simulation for combinational circuits, Fault sampling, Statistical fault analysis.

## Testing for Single Stuck Faults

ATG for SSFs in combinational circuits, Fault oriented ATG, Fault independent ATG, Random test generation.

## Design for testability

Testability, Ad-hoc design for testability techniques, controllability and obseravility by means of scan registers, Generic scan-based design, Storage cells for scan designs, Classical scan designs, Board level and system level DFT approaches, Muliple test session, Partial scan using I-paths, Ballast A structural partial scan design, Boundary scan standards test bus circuitry.

## Text/References:

1. Digital systems testing and testable design by M.Abramovici, M.A. Breuer, A.D. Fredman; Jaico Publishing House

**Code No. ITR – 735** **L C**
**Subject: Distributed Computing** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Basic Concepts: Introduction to parallel processing, parallel processing terminology, decomposition, complexity, throughout, speedup, measures, data dependence, resource dependence, Bernstein's conditions levels of parallelism in programs. Program flow-control flow, data flow, Distributed systems – Introduction, advantages, tightly-coupled loosely-coupled systems. Hardware and software requirements, design issues.

Distributed Systems: Review of networks, layered protocols – Physical, data link network, transport, application, Network operating system, Distributed Operating System, Resource sharing, Message passing, example system, Synchronization aspects, clocks, algorithms, Mutual exclusion, coroutines, CSP, DP, Deadlocks, Distributed deadlock detection, Modelling – Petri Nets.

Parallel & Distributed Programming: Parallel Programming environments, models, synchronous asynchronous programming, modulla-2, occamm, FORTRAN, DAP FORTRAN, Actus, data flow programming, VAL.

**Text / Reference Books:**


1. Michael J. Quinn, "Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994
2. Kai Hwang, "Advanced Computer Architecture – Parallelism, Scalability, Programmability", McGraw Hill Inc, 1993
3. S. G. Akl, "The Design and Analysis of parallel algorithms", Englewood Cliffs, NJ, 1989
4. A. S. Tanenbaum, "Modern Operating System", PHI, 1996.
5. R. H. Perrott, "Parallel Programming", Addison Wesley, 1987.
6. T. G. Lewie and H. Ele-Revini, "Introduction to Parallel computing", PHI, NJ, 1992.
7. S. Lakshmivardhan and S.K. Dhall, "Analysis and design of parallel algorithm – arithmetic and matrix problems", McGraw Hill, 1990
8. J. M. Crichlow, "An introduction to distributed and parallel computing", PHI, 1988

**Code No. ITR – 737** **L C**
**Subject: Computer Aided VLSI Design** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.<br>Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Hardware description languages; Verifying behaviour prior to system construction simulation and logic verification; Logic Synthesis PLA based synthesis and multilevel logic synthesis; Logic optimization; Logic Simulation Compiled and event simulators; Relative advantages and disadvantages; Layout Algorithms Circuit partitioning, placement, and routing algorithms; Design rule verification; Circuit Compaction; Circuit extraction and post-layout simulation; Automatic Test Program Generation; Combinational testing D-Algorithm and PODEM algorithm; Scan-based testing of sequential circuits; Testability measures for circuits

**Text / Reference:**

1. "Algorithm and Data Structures for VLSI Design", Christophn Meinel & Throsten Theobold
2. "Evolutionary Algorithm for VLSI", Rolf Drechsheler

**Code No. ITR – 739** **L C**
**Subject: Pattern Recognition** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Unit 1: Introduction and Bayerian Decision Theory
Introduction to pattern recognition, Systems, design cycles, learning and adoptation, Bayerian decision theory, minimum error-rate classification, classifiers, discriminant functions and decisions surfaces.

Unit II: Maximum – Likelihood and bayerian parameter estimation

Maximum – Likelihood estimation, bayerian estimation, bayerian parameter estimation, Guarian case and general theory, problems of dimeusability, Hidden marker models.

Unit III: Nonparameter Techniques
Density estimation, parazen windows, Kn – Nearest neighbour, estimation, The nearest neghlaur, rode, metris and nearest – neghron, classification, fuzzy classification, approximation by series expansions.

Unit IV: Linear Discriminant functions:
Linear discriminant functions and decision surfaces, generadized linear discrminant functions, The two category unicorly separate case, minimizing the perception criterion function, relaxation procedures, nonrepersable behaviour, Minimum squared-error procedures, The Ho – Kashyap Procedures, support vexter machines, multicategory generatization.

Unit V: Multilayer Neural Networks
Feed forward operations and classifications, back propagation algorithm, error factors, back propagation as feature & mapping, back propagation, bayer theory and probability, practical techniques for improving back propagation, regularization, complexity adjustment and pruning.

Unit VI: Stochastic methods: Stochastic search, Boltzman learning, boltzman networks of graphical models, evolutionary methods, genetic progrances.

Unit VII: Unsuperversed learning and clustering mixture densities and identificability, maximum, likelihood estimation, application to normal mixtures, unemperouses, Bayerian Learning, Data descriptions and controls, criterion function for clusterian, interface, optimization, hierarchical clustering, component analysis, low dimensial representation and multidimensional scaling.

**Text / References:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification" 2nd Edition, John Wiley
2. John Hertz, Andres Krogh & Richard G. Palmer, "Introduction to the theory of Neural Computation", Addison Wesley

**Code No. ITR – 741** **L C**
**Subject: Bluetooth Technology** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**
There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.
Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

Introduction to wireless technologies: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM,TDM, TFM, Spread spectrum technology

Introduction to Bluetooth: Specification, Core protocols, Cable replacement protocol

Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hoping

Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatternet

Connection establishement procedure, notable aspects of connection establishement, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary bluetooth profile

Hardware: Bluetooth Implementation, Baseband overview, packet format, Transmission buffers, Protocol Implementation: Link Manager Protocol, Logical Link Control Adaptation Protocol, Host control Interface, Protocol Interaction with layers

Programming with Java: Java Programming, J2ME architecture, Javax.bluetooth package Interface, classes, exceptions, Javax.obex Package: interfaces, classes

Bluetooth services registration and search application, bluetooth client and server application.
Overview of IrDA, HomeRF, Wireless LANs, JINI

**Text Book:**

1. Bluetooth Technology by C.S.R. Prabhu and A.P. Reddi; PHI

**Code No: ITR - 743** **L C**

**Paper : Digital Image Processing** **4 4**

**INSTRUCTIONS TO PAPER SETTERS:** **MAXIMUM MARKS: 60**

There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.

Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each.

**Introduction And Digital Image Fundamentals**

The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

**Image Enhancement in the Spatial Domain**

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

**Image Enhancement in the Frequency Domain**

Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering.

**Image Restoration**

A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Pereodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invarient Dedradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

**Image Compression**

Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards.

**Image Segmentation**

Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

**Representation and Description**

Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

**Object Recoginition**

Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

**Text Books:**


1. Rafael C. Conzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
2. A.K. Jain, "Fundamental of Digital Image Processing", PHI.


**Reference Books:**


1. Rosefield Kak, "Digital Picture Processing",
2. W.K. Pratt, "Digital Image Processing",

**Code No: ITR - 745** **L C**
**Paper : MEMS and IC Integration** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks. | |
| Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

Overview of CMOS process in IC fabrication, MEMS system-level design methodology, Equivalent Circuit representation of MEMS, signal-conditioning circuits, and sensor noise calculation.

Pressure sensors with embedded electronics(Analog/Mixed signal): Accelerometer with transducer,Gyroscope,RF MEMS switch with electronics,Bolo meter design.

RF MEMS, and Optical MEMS

**Text/References Books:**


1. Gregory T.A. Kovacs, Micromachined Transducers Sourecbook, The McGraw-Hill, Inc. 1998
2. Stephen D. Senturia, Microsystem Design, Kluar Publishers, 2001
3. Nadim Maluf, An Introduction to Microelectromechanical Systems Engineering, Artech House, 2000.
4. M.H. Bao, Micro Mechanical Transducers, Volume 8, Handbook of Sensors and Actuators, Elsevier, 2000.
5. Masood Tabib-Azar, Microactuators, Kluwer, 1998.
6. Ljubisa Ristic, Editor, Sensor Technology and Devices, Artech House, 1994
7. D. S. Ballantine, et. al., Acoustic Wave Sensors, Academic Press, 1997
8. H. J. De Los Santos, Introduction to Microelectromechanical (MEM) Microwave Systems, Artech, 1999.
9. James M.Gere and Stephen P. Timoshenko, Mechanics of Materials, 2nd Edition, Brooks/Cole Engineering Division, 1984

**Code No: ITR - 747** **L C**
**Paper : Multimedia Technology** **4 4**

| **INSTRUCTIONS TO PAPER SETTERS:** | **MAXIMUM MARKS: 60** |
|---|---|
| There should be 7 questions in all. Question no. 1 should be compulsory & cover the entire syllabus. This question should have atleast 10 objective or short answer type questions. It should be of 20 marks.<br>Student may be asked to attempt 4 questions out of remaining 6 questions of 10 marks each. | |

## Introduction:

Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation.

Components of multimedia: Text, Graphics, Audio, Video.

Design & Authoring Tools, Categories of Authority Tools, Types of products.

Animation:

Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation.

Introduction to MAYA(Animating Tool):

Fundamentals, Modeling: NURBS, Polygon, Organic, animation, paths & boxes, deformers.

Working with MEL: Basics & Programming

Rendering & Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.

## Text/References Books:


1. David Hillman, "Multimedia Technology & Applications", Galgotia Publications.
2. Rajneesh Agrawal, "Multimedia Systems", Excel Books.
3. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications.
4. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.

| **Code No: ITR-751** | **P** | **C** |
|---|---|---|
| **Lab: Lab. – VI** | **4** | **2** |

The experiments will be based on the following papers:

1) Elective - I
2) Elective - II

| **Code No: ITR-753** | **P** | **C** |
|---|---|---|
| **Lab: Lab. VII** | **4** | **2** |

The experiments will be based on the following Papers:

1) Elective – III
2) Elective - IV

| **Code No: ITR-755*** | **P** | **C** |
|---|---|---|
| **Lab: Minor Project** | **4** | **2** |

The student will submit a synopsis at the beginning of the semester for approval to the school project committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the school for evaluation purpose at the end of the semester in a specified format.

| **Code No: ITR-752** | **P** | **C** |
|---|---|---|
| **Subject: Dissertation** | **30** | **25** |

The student will submit a synopsis at the beginning of the semester for the approval from the school project committee in a specified format. Synopsis must be submitted within a two weeks. The first defense, for the dissertation work, should be held with in a one month. Dissertation Report must be submitted in a specified format to the school for evaluation purpose.

| **Code No: ITR-754** | **P** | **C** |
|---|---|---|
| **Subject: Seminar & Progress Report** | **10** | **3** |

The student will have to present the progress of the project work through seminars and progress reports at the interval of four weeks.

| **Code No: ITR-756** | **P** | **C** |
|---|---|---|
| **Subject: Comprehensive Viva** | **-** | **2** |

**w.e.f. 2004-2005**