SCHEME OF EXAMINATION

&

SYLLABI

for

Master of Technology
(Information Technology)
Regular

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

Guru Gobind Singh Indraprastha University
Kashmere Gate, Delhi – 110403 [INDIA]
www.ipu.ac.in

Eligibility Condition

B. Tech / B.E in Electronics & Communication / Electronics / Computer Science / Information Technology or equivalent degree with 60% marks.

M Sc. in Electronics/Informatics with 60% marks.

Admission Procedure

Admission will be made on the basis of GATE score in the relevant field.

If seats remain vacant after admitting the students with valid GATE score, then the admission will be made on the basis of merit of the qualifying marks subject to minimum 60% marks in the qualifying degree.

SCHEME OF EXAMINATION
M.Tech. - Information Technology

FIRST SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
Theory Papers				
***ITR-601**	**Algorithm Analysis & Design**	**4**	**-**	**4**
ITR-603	Software Engineering	4	-	4
ITR-605	Advanced Computer Architecture	4	-	4
***ITR-607**	**Advanced Computer Networks**	**4**	**-**	**4**
Electives (chose any one)				
***ITR-609**	**DSD using VHDL**	**4**	**-**	**4**
***ITR-611**	**Data Base Management systems**	**4**	**-**	**4**
ITR-613	Communication Systems	4	-	4
***ITR-615**	**Advanced Computer Graphics**	**4**	**-**	**4**
***ITR-617**	**Programming Language**	**4**	**-**	**4**
Practical				
ITR-651	Algorithm Analysis Lab	-	2	1
ITR-653	Software Engineering Lab	-	2	1
ITR-655	Advanced Computer Networks Lab	-	2	1
ITR-657	Lab based on Elective	-	2	1
	Total	**20**	**8**	**24**

NOTE: The subject marked with (*) have been coded uniformly across M. Tech (IT) and M. Tech (CSE). Minor modifications have been done in the course contents and syllabi of these subjects.

SCHEME OF EXAMINATION
M.Tech. - Information Technology

SECOND SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
Theory Papers				
***ITR-602**	**Object Oriented Software Engineering**	**4**	**-**	**4**
***ITR-604**	**Embedded System Design using 8051**	**4**	**-**	**4**
***ITR-606**	**Wireless Mobile Networks**	**4**		**4**
Electives (Choose any Two)				
***ITR-608**	**VLSI Design**	**4**	**-**	**4**
***ITR-610**	**Digital Signal Processing**	**4**	**-**	**4**
***ITR-612**	**Real Time Systems & Software**	**4**	**-**	**4**
***ITR-614**	**Advanced Database Management System**	**4**	**-**	**4**
ITR-616	Software Metrics	4	-	4
ITR-618	Software Requirement & Estimation	4	-	4
ITR-620	Neural Networks	4	-	4
***ITR-622**	**Network Programming**	**4**	**-**	**4**
***ITR-624**	**Fuzzy Logic & Design**	**4**	**-**	**4**
***ITR-626**	**Genetic Algorithms**	**4**	**-**	**4**
ITR-628	Information Theory & Coding	4	-	4
***ITR-630**	**Enterprise Computing in JAVA**	**4**	**-**	**4**
ITR-632	Project Work	4	-	4
Practical/Viva Voce				
ITR-652	OOSE Lab	-	2	1
ITR-654	ESD Lab	-	2	1
ITR-656	Wireless Mobile Lab	-	2	1
ITR-658	Lab based on elective	-	2	1
Total		**20**	**8**	**24**

SCHEME OF EXAMINATION
M.Tech. - Information Technology

THIRD SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
Theory Papers				
Electives (Select any FOUR)				
***ITR-701**	**Multimedia Technology**	**4**	**-**	**4**
ITR-703	Reliability Engineering	4	-	4
***ITR-705**	**Software Reusability**	**4**	**-**	**4**
ITR-707	Network Management & Security	4	-	4
ITR-709	Software Quality Management	4	-	4
***ITR-711**	**Design Patterns**	**4**	**-**	**4**
ITR-713	Software Testing	4	-	4
ITR-715	Robotics Engineering	4	-	4
ITR-717	Telecommunication Switching System & Networks	4	-	4
***ITR-719**	**Cellular & Mobile Communication**	**4**	**-**	**4**
ITR-721	Satellite Communication	4	-	4
***ITR-723**	**Distributed Computing**	**4**	**-**	**4**
ITR-725	Pattern Recognition	4	-	4
ITR-727	Digital Image Processing	4	-	4
***ITR-729**	**Information Storage & Management**	**4**	**-**	**4**
ITR – 741	Bluetooth Technology	4	**-**	4
ITR-743	Cyber Crime Investigations and Cyber Forensics	4	**-**	4
Practical/Viva Voce				
ITR-751	Lab based on Elective –I	-	4	2
ITR-753	Lab based on Elective –II	-	4	2
ITR-755	Lab based on Elective – III	-	4	2
ITR-757	Minor Project		-	6
Total		**16**	**8**	**28**

SCHEME OF EXAMINATION
M.Tech. - Information Technology

FOURTH SEMESTER EXAMINATION

Code No.	Paper	L	T/ P	Credits
ITR-752	Dissertation	-	-	24
ITR-754*	Seminar & Progress Report	-	-	4
Total		**-**	**-**	**28**

***Non University Exam System**

NOTE:

1. The total number of credits of the Programme M. Tech. = 104.
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 credits.

ITR-601	Algorithm Analysis & Design	L	T/P	C
		4	0	4

Unit 1- Introduction to Algorithm, The role of algorithms in computing, Asymptotic notation, asymptotic analysis of recurrence relations, probabilistic analysis and randomized algorithm, the hiring problem, indicator random variables
Divide and conquer paradigm – Merge sort, Inversion counting
Dynamic Programming – Matrix Chain multiplication, Longest Common subsequence, optimal binary search trees
Greedy Algorithm –Activity Selection problem, Theoretical foundation of greedy algorithm, Task Scheduling problem, Comparison of dynamic programming and Greedy algorithm with Knapsack as case study

Unit 2- Graphs: Review of Graphs (Representation, Depth First Search, Breath First search, Kruskal and Prim Algorithm, Dijkstra's Algorithm)
Flow networks: Ford-Fulkerson method, comparison Networks, Zero-one Principle, Bitonic Sorting Network, Merging Network, Sorting Network

Unit 3 : Matrix Operation (Properties, Strassen's Algorithm, Solution of linear equation, Matrix inversion)
Polynomial and FFT, Representation of polynomials, The DFT and FFT, efficient FFT implementation
Number–Theoretic Algorithm, Elementary number-theoretic notion, Greatest common divisor, modular arithmetic, solving modular linear equation, the Chinese remainder theorem

Unit 4 - NP-Completeness, Polynomial time, Polynomial time verification, NP-completeness and reducibility, NP-Completeness proofs
Approximation Algorithms- the vertex-cover problem, The Traveling-Salesman Problem, The set covering problem

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.

ITR-603	Software Engineering	L	T/P	C
		4	0	4

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, Requirements 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 Books:

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 Books:

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., 1999
5. I. Sommerville, "Software Engineering", Addison. Wesley, 1999

ITR-605	Advanced Computer Architecture	L	T/P	C
		4	0	4

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 BOOKS:

1. Kai Hwang, "Advanced computer architecture"; TMH. 2000
2. D. A. Patterson and J. L. Hennessey, "Computer organization and design", Morgan Kaufmann, 2nd Ed. 2002

REFERENCES:

1. J.P.Hayes, "computer Architecture and organization"; MGH. 1998
2. Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication. 1998
3. V.Rajaranam & C.S.R.Murthy, "Parallel computer"; PHI. 2002
4. R.K.Ghose, Rajan Moona & Phalguni Gupta, "Foundation of Parallel Processing", Narosa Publications, 2003
5. Kai Hwang and Zu, "Scalable Parallel Computers Architecture", MGH. 2001
6. Stalling W, "Computer Organisation & Architecture", PHI. 2000
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. 1998
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. 1999

ITR- 607	Advanced Computer Networks	L	T/P	C
		4	0	4

Introduction:
Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

Network layer
ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

Transport layer
Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

Application layer
WWW, DNS, e-mail, SNMP, RMON

Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

Case study

Study of various network simulators, Network performance analysis using NS2

TEXT BOOKS:

1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
2. Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

REFERENCES:

1. Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
2. Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
3. Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
3. Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

ITR-609	DSD using VHDL	L	T/P	C
		4	0	4

Gajski's 'Y' chart, Introduction to HDL languages, VHDL, Verilog, key differences, structural, sequential construct, concurrent construct.
VHDL Overview and concept: VHDL object classes, VHDL Design Unit, identifier, operators, Data types, behavioral, and data flow modeling, Concurrent and sequential statements

VHDL for combinational circuits: Assignment statement, selected signal statement, conditional signal assignment, Designing of basic combinational circuit: Multiplexer, Decoders, Encoders, Code converter, Comparator, Structural modeling: component declaration & instantiation, Signal and Variables, Attributes, Block statements, Generics, Generate statement, VHDL Timing: WAIT statements, simulation engine, modeling with delta time delays,

Sequential Circuits: process, if, case, Loop, Designing FF, Mealy state model, Design of FSM using VHDL, VHDL code of moore-type FSMs, synthesis of VHDL code, Specifying the state assignment in VHDL code, Specification in Mealy FSM using VHDL, Mealy-type FSM for serial adder, Moore type FSM for serial adder, State minimization, Design of Counters using sequential circuit approach, Algorithm state Machine,

Testbenches: Testbench modeling, Testbench architecture,
Register Transfer Level Design: RTL Design Method, Organization of system, specification of RTL System, Data Subsystem, Control Subsystem, Microprogrammed controller: structure and format, Microinstruction timing, study of FIR filter Design Example

Textbooks:

1. Circuit Design with VHDL by Volnei A. Pedroni, PHI, 2005
2. Digital Logic Design with VHDL by Stephen Brown and Zvonko Vranesic, TMH, 2007

References:

1. A VHDL Primer by J. Bhaskar, Pearson Education, 1999.
2. Digital Design by Frank Vahid, Wiley, 2006
3. VHDL Coding Styles and Methodology by Ben Cohen, Springer India, 2005
4. Digital System Design with VHDL and synthesis by K.C. Chang, Wiley, 2005
5. Introduction to Digital Systems by M. Ercegovac, T. Lang and L.J. Moreno, Wiley,2000
6. Digital System Design using VHDL by C. H. Roth, Thomson Learning, 2006

ITR-611	Data Base Management Systems	L	T/P	C
		4	0	4

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.

Oracle 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 Books:

1. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
2. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007

Reference Books:

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education,2006
3. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
4. Rob, Coronell, "Database Systems Design, Implementation and Management", 5th edition, Thomson Course Technology, 2003.
5. Oracle Reference Manual.
6. Michael J. Donahoo, Gregory D. Speegle,"SQL practical guide for developers", Elsevier Inc., 2005

7. Sams Teach yourself MySQL in 21 days, 2nd edition, Pearson Education, 2004.

ITR-613	Communication Systems	L	T/P	C
		4	0	4

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 Books:

1. Taub and Schiling, "Principles of Communication Systems", TMH, 2nd Edition, 2001
2. S. Haykin, "Analog and Digital Communication", Wiley., 2002

Reference Books:

1. Hancocok J. C., "An Introduction to the Principles of Communication Theory", TMH, 2002
2. Tomasi, "Electronic Communication Systems", 4th ed., Pearson Education, 2001
3. William Stallings – Data & Computer Communications, PHI (6th Ed.,),
4. Forouzan – Data Communication & Networking, McGraw Hill, 2nd Edition, 1999

ITR – 615	Advanced Computer Graphics	L	T/P	C
		4	0	4

Line Drawing and transformation:
Basic raster graphical algorithm for 2D primitives, Line drawing algorithm, 2D and 3D transformation

Clipping:
Window, Viewport, Clipping algorithm,

Curves and Surfaces:
Circle drawing algorithm, Ellipse drawing algorithm, Bezier curve, b-spline curve, surfaces, Solid modelling

Projection:
Parallel projection, Perspective projection , Computation of vanishing point

Visible surface determination:
Z-buffer algorithm, Scan line algorithm, Area subdivision algorithm, Raytracing algorithm

Shading:
Illumination mode, Specular reflection model, Shading models for curve surfaces, Radiosity method, Rendering, Recursive ray tracing, Texture mapping

Advanced Modelling Techniques
Procedural Models,Fractal Models,Grammar based models,particle systems.

Animation
3D animation, morphing, simulation of key frames

Text Books:

1. Foley - Computer Graphics Principles & Practice, 2nd ed. Pearson Education., 2000
2. Hearn & Baker - Computer Graphics C version, 2nd ed. Pearson Education., 1986

References:

1. Roger and Adams - Mathematical Element for Computer Graphics, 2nd ed., Tata McGraw Hill, 1989
2. David F. Rogers, "Procedural Element for computer graphics", McGraw Hill Book Company, 1985.

ITR-617	Programming Languages	L	T/P	C
		4	0	4

Programming Domains. Language evaluation. Evolution of major programming languages. Describing Syntax and Semantics. Formal methods of Describing Syntax and semantics. Backus Naur Form. Attribute grammars. Describing semantics - Denotational semantics. Data types and ariables - Names - variables . Scope and lifetime. Expression and assignment Statements.

Control structures. Subprograms - parameter passing - overloading - generic subprograms, Data abstraction and Encapsulation. Polymorphism and inheritance. Features of object oriented Languages. Smalltalk, C++ and JAVA. Design and implementation issues. Exception handling. Constructs for concurrency

Functional programming languages - Lambda calculus- Introduction to pure LISP. Applications of functional programming languages.

Logic programming languages- a brief introduction to predicate calculus - Horn clauses - Logic programming. Introduction to prolog. Applications of Logic programming.

Text Books:

1. Terence W. Pratt, "Programming Languages", Prentice Hall, Ninth edition 1996
2. Ravi Sethi, "Programming Languages-concepts and constructs", Addison Wesely, Second Edition, 1996

References:

1. Bjarn Stroustrup, "Design and Evolution of C++", Addison Wesley, 1991
2. Michael J.Gordon, "Programming language Theory and its implementation", Prentice Hall, 1991

ITR-651	Algorithm Analysis Lab	**L**	**P**	**C**
		0	**2**	**1**
ITR-653	Software Engineering Lab	**L**	**P**	**C**
		0	**2**	**1**
ITR-655	Advanced Computer Network Lab	**L**	**P**	**C**
		0	**2**	**1**
ITR-657	Lab based on Elective	**L**	**P**	**C**
		0	2	1

ITR 602	Object Oriented Software Engineering	L	T/P	C
		4	0	4

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, State Based testing and Data flow testing for Classes.
Component Based Computing
Fundamentals: Definition and nature of components, components and interfaces, Interfaces as contracts, the benefits of components.
Basic Techniques: component design and assembly, Relationship with the client-server model and with patterns, Use of objects and object lifecycle services, use of object brokers

Case Studies

Text Books:

1. Ivar Jacobson "Object Oriented Software Engineering: A Use Case Driven Approach", Addison-Wesley, 2002
2. Grady Booch "Object-Oriented Analysis and Design with Applications", 2/E, Addison-Wesley Professional, 2005

References:

1. Stephen R. Scach, "Object Oriented and Classical Software Engineering" 7/E Tata McGraw Hill, 1999
2. Booch, Rumbaugh & Jacobson "The Unified Modeling Language User Guide", 2/E Addison-Wesley 2005
3. Bernd Bruegge, Allen H. Dutoit "Object Oriented Software Engineering: Using UML, Patterns and Java" 2/E Pearson Education.
4. Timothy C. Lethbridge, Robert Laganiere "Object oriented Software Engineering: Practical Software development using UML and Java" McGraw Hill
5. Edwards Yourdon, Carl Argila "Case Studies in Object Oriented Analysis and Design" Prentice Hall.

ITR-604	Embedded System Design using 8051	L	T/P	C
		4	0	4

Introduction to Embedded Realtime Systems: Fundamental components of ESD, Preprocessing, Compiling, cross compiling, Linking, Locating, compiler driver, Linker script, Program segments, Type of memory, Memory Management in Embedded realtime systems, Interrupt and ISR

Introduction to Real-time theory: Scheduling theory, Rate Monotonic Scheduling, Utilization bound theorem, RTOS, Task Management, Task management, Race condition, Priority inversion, ISRs and scheduling, Inter-Task communication, Timers

Microcontrollers: Role of processor selection in Embedded System (microprocessor vs microcontroller), 8051 microcontroller: architecture, assembly language programming, instruction set, addressing mode, logical operation, arithmetic operation, interrupt handling, Timing subroutines

Serial data communication, RS-232, USB, I^2C, Interfacing with ADC & sensors, Interfacing with DAC, Interfacing with external ROM, Interfacing with 8255
IEEE 1149.1 (JTAG) testability: Boundary Scan Architecture

Textbook:

1. Sriram V Iyer and Pankaj Gupta, "Embedded Real-time Systems Programming", TMH 2006
2. Mazidi and Mazidi, "The 8051 Microcontroller", PHI, 2006

References:

1. Embedded System by Raj Kamal, TMH, 2004
2. The 8051 Microcontroller by Kennth J. Ayala, Thomson DelMar Learning, 2006
3. Microcontrollers by Deshmukh, TMH, 2006
4. 8051 Microcontroller & Embedded systems by Rajiv Kapadia, Jaico, 2006
5. Computer as components by wayne wolf, Harcourt India Pvt. Ltd, 2002
6. Real time System and Analysis by Philip A. Laplante, Wiley, 2006
7. Microcontrollers and microcomputers by F. M. Cady, Oxford Press, 2006
8. An Embedded Software Primer by David E. Simon, Pearson Education, 2005
9. Designing Embedded Hardware by John Catsoulis, O'reily 2005
10. Real time System & Software by Alan c. Shaw, Wiley, 2005
11. Programming Embedded System by Michael Barr, O'reilly, 2005
12. Networking and Internetworking with microcontrollers by Fred Eady, elsevier, 2005

ITR-606	Wireless Mobile Networks	L	T/P	C
		4	0	4

Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signaling.

Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signaling.

General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes.

Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Markup Languages (WML)

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Wireless local Loop (WLL): Introduction to WLL architecture, WLL technologies.

Global Mobile Satellite Systems: Case studies of IRIDIUM and GLOBALSTAR systems.

Bluetooth technology and Wi-Max

Text Books:

1. "Wireless and mobile Networks Architecture," by Yi –Bing Lin & Imrich Chlamatac, John Wiley & Sons, 2001.
2. "Mobile & Personnel communication Systems and Services", By Raj Pandya, Prentice Hall India, 2001.
3. "Wireless Communication- Principles and practices," 2nd Ed., Theodore S. Rappaport, Pearson Education Pvt. Ltd, 2003.
4. "Mobile communications," Jochen Schiller, Pearson Education Pvt. Ltd., 2002.
5. " The Wireless Application Protocol," Singhal & Bridgman et. al., Pearson Education, 2004.

References:

1. "Principles of Mobile Computing," 2nd Ed., Hensmann, Merk, & Stober, Springer International Edition, 2003.
2. "Mobile Computing," Talukdar & Yaragal, TMH, 2005.
3. "3G Wireless Networks," Smith & Collins, TMH, 2007.

ITR-608	VLSI Design	L	T/P	C
		4	0	4

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 BOOKS:

1. Neil H E Weste and Kamran Esraghian, "Principles of digital VLSI design – A system perspective", Addison Wesley, 2004

REFERENCES:

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

ITR-610	Digital Signal Processing	L	T/P	C
		4	0	4

Introduction
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, Linear shift-invariant systems, Stability and Causality, Linear constant coefficient difference equations, Frequency domain representation of discrete-time systems, symmetry properties of the Fourier transform, Sampling of continuous-time systems.
Transforms
Z-transforms, Inverse Z-transform, properties of Z-transform, & its applications in system analysis & design. Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences, Linear Convolution using the DFT.
Digital Filter Structure
Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, Basic FIR Digital Filter Structures: Direct forms, Transposed forms, Cascaded forms, Poly phase realization and Linear phase FIR structures. Basic IIR Filter Structures: Direct forms, Transposed forms, Cascaded realizations and Parallel realizations. All pass filters, Digital Sine-Cosine Generator.
Digital Filter Design
Design of IIR Digital filters from analog filters, Properties of FIR digital filters, Desgin of FIR filters using Windows, Computer aided design of FIR filters, Comparison of IIR and FIR digital filters.

Computation of Discrete Fourier Transform

Complexity of the DFT computation by direct method, Goertzel algorithm, Decimation – in-time FFT algorithms, Decimation-in frequency FFT algorithms.

Text Books:

1. Alan V. Oppenheim & Ronald W. Schafer, " Digital Signal Processing" PHI, 2002
2. Sanjit K. Mitra, " Digital Signal Processing: A computer based approach" TMH, Second Edition, 2003

References:

1. Chi-Tsong Chen, " Digital Signal Processing, Spectral Computation and Filter Design" Oxford University Press, 2001.
2. Monson H. Hayes, " Schaum's Outline of Digital Signal Processing", Mcgraw Hill, 1999.
3. Richard W. Hammming, "Digital Filters", Dover Pubns, 1998.
4. Lars Wanhammar, " DSP Integrated Circuits", Academic Press, First edition, 1999.
5. Simon S. Haykin, " Adaptive Filter Theory, " Prentice Hall, 3rd Edition.

ITR-612	Real time Systems & Software	L	T/P	C
		4	0	4

Real time system: Hard vs Soft, Reference model of RTS, Periodic task model, Resource parameters of Jobs

Scheduling: clock driven, weighted RR approach, Priority approach, Dynamic vs static, EDF and LST algorithm, Clock Driven scheduling in detail

Priority driven scheduling of periodic task in detail: RM and DM algorithm, Scheduling aperiodic and sporadic jobs in priority driven systems in detail

Resource and resource Access Control, Multiprocessor scheduling, Resource access control and synchronization, Real Time Communication, OS

Text Book:

1. Alan C. Shaw, "Real – Time Systems and software", John Wiley & Sons Inc,2001

References:

1. Jane W. S. Liu, "Real Time Systems", Pearson Education, 2006
2. Phillip a. Laplante, "Real-Time systems: Design and analysis" Wiley, 2006

ITR-614	Advanced Database Management Systems	L	T/P	C
		4	0	4

Relational Databases
Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Query Processing and Optimization
Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

Deductive Databases
Datalog and Recursion, Evaluation of Datalog program, Recursive queries with negation.

Objected Oriented and Object Relational Databases
Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Parallel and Distributed Databases
Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

Advanced Transaction Processing
Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Active Database and Real Time Databases
Triggers in SQL, Event Constraint and Action: ECA Rules, Query Processing and Concurrency Control, Compensation and Databases Recovery

Image and Multimedia Databases
Modeling and Storage of Image and Multimedia Data, Data Structures – R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS)

WEB Database
Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems.

Data Mining

Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery

Data Warehousing
Data Warehousing Architecture, Multidimensional Data Model, Update Propagation OLAP Queries.

Case Study: Oracle Xi

Text Books:

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

References:

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
5. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
6. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
7. Oracle Xi Reference Manual

ITR-616	Software Metrics	L	T/P	C
		4	0	4

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 Book:

1. Norman E. Fenton & Shari Lawrence Pfeiffer, "Software Metrics", Thomson Computer Press, 1996.
2. Norman E. Fenton, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press, 1996.
3. B. Henderson-Sellers, "Object-Oriented Metrics, Measures of Complexity", Prentice Hall, 1996.
4. Kishore, Swapna, "Software Requirement and Estimation", Tata McGraw Hill, 2001

ITR - 618	Software Requirement & Estimation	L	T/P	C
		4	0	4

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. Kishore, Swapna, "Software Requirements and Estimation", Tata McGraw Hill, 2001
2. Norman E. Fenton, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press, 1996.
3. B. Henderson-Sellers, "Object-Oriented Metrics, Measures of Complexity", Prentice Hall, 1996.

ITR-620	Neural Network	L	T/P	C
		4	0	4

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 Book:

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

References:

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.

ITR–622	Network Programming	L	T/P	C
		4	0	4

Introduction to Systems Programming: Files, System Files, File Formats, Buffered I/O, Directories, File System, Inodes, links, fcntl, links, locks, Device I/O, Terminal I/O, ioctl(), Files and Devices ,Signals, video I/O ,Multi-Tasking

Processes and Inter-Process Communication: timers, polling vs interrupts, environment, fork, exec, wait, environment, exit and wait, pipe, fifos, message queues, semaphore

Network Programming: Sockets, Operation, Socket types, Domains Name Binding, Closing Sockets, I/O Multiplexing, Client/Server Models, Connection Based Services, Handling Out of Band Data, Connectionless Services, Design issues of Concurrent and iterative servers, Socket options

XDR and Remote Procedure Calls, Network Programming at the level of Programming Language (can use Java or Python as case study)

Text Book:

1. Unix Network Programming, W. Richard Stevens, Prentice Hall, 1998

References:

1. Internetworking with TCP/IP, Volume3, Douglas Comer, Prentice Hall, 2000
2. Internetworking with TCP/IP, Volume1, Douglas Comer, Prentice Hall, 2000

ITR-624	Fuzzy Logic & Design	L	T/P	C
		4	0	4

Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, α-cuts, Properties of α-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.

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

Applications of Fuzzy Logic:

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.

Reference Books:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.

ITR-626	Genetic Algorithms	L	T/P	C
		4	0	4

Introduction
A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms

Genetic Algorithms in Scientific models
Evolving computer programs, data analysis & prediction, evolving neural networks, Modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

Theoretical Foundation of genetic algorithm
Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical- Mechanics Approaches.

Computer Implementation of Genetic Algorithm
Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

Some applications of genetic algorithms
The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms

Advanced operators & techniques in genetic search
Dominance, duplicity, & abeyance, inversion & other reordering operators. Other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

Text Book:
1. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006

Reference Books:
1. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.
2. Michael D. Vose, "The simple genetic algorithm foundations and theory, Prentice Hall India, 1999
3. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", Kluwer Academic Publisher, 2001
4. D. Quagliarella, J Periaux, C Poloni & G Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997
5. Pinaki Mzumder, Elizabeth M. Raudnick, "Genetic Algorithms for VLSI design, layout and test automation", Pearson Education, 2006

ITR - 628	Information Theory & Coding	L	T/P	C
		4	0	4

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

Text Books:

1. T M Gover, J M Thomos, "Elements of Information Theory", Wiley , 1991
4. S. Haykin, "Digital Communication", Wiley. 2002
3. J.G.Proakis,"Digital Communications", Mc Graw Hill, 2002

ITR - 630	Enterprise Computing in JAVA	L	T/P	C
		4	0	4

J2EE: Introduction to J2EE, Building J2EE Applications, JDBC, Servlets and Web Applications, Java Server Pages and Model/View/Controller, J2EE Web Services Overview, Introduction to EJB, Session EJBs, Entity EJBs, JMS and message driven Beans, Transactions and Security, Application Servers (Case Study of any one of IBM Websphere, BEA Weblogic, JBoss)

Hibernate: Principles of Object Relational Mapping, Hibernate configuration, HQL making objects persistent, Hibernate semantics, Session management, flushing, concurrency and Hibernate, Optimistic and Pessimistic Locking, Object mapping Mapping simple properties, Single and multi valued associations, Bi-directional associations, Indexed collections, Using Hibernate Template, Querying, Session management, Transaction integration and demarcation.

Spring: Introduction of Spring Framework: Spring Architecture, Spring Framework definition, Spring & MVC, Factory Pattern, BeanFactory, Spring Context definition, Inversion of Control (IoC), Spring AOP, Application Context and BeanFactory, Spring ORM, Mapping API for JDO, Hibernate, Hibernate Mapping, JDO Mapping, iBATIS, Spring Abstract Transaction layer, Employing Spring transaction, Using EJB declarative transactions, Integration process, integrating Spring MVC in web application, MVC in web application, MVC Framework.

Web Services: Introduction to XML, Service-Oriented Architectures SOAP, SOAP message structure, handling errors WSDL, UDDI, Java Web Service implementations JAX-RPC, Web service clients in Java, Introduction to Ajax.

Text Books:

1. Jim Farley, William Crawford, O'Reilly and Associates, "Java Enterprise in a Nutshell", 2005
2. Brett McLaughlin, O'Reilly, "Java and XML, 2nd Edition, 2001

Reference Books:

3. Elliott Rusty Harold and W. Scott Means, O'Reilly, "XML in a Nutshell", 2001
4. James Cooper, "Java Design Patternsn: A Tutorial", Addison Wesley
5. Govind Sesadri, "Enterprise java Computing: Application and Architectures", Cambridge University Publications, 1999

ITR - 632	Project Work	L	T/P	C
		4	0	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.

ITR-652	**OOSE Lab**	**L**	**P**	**C**
		0	**2**	**1**
ITR-654	**Embedded System Lab**	**L**	**P**	**C**
		0	**2**	**1**
ITR-656	**Wireless Mobile Lab**	**L**	**P**	**C**
		0	**2**	**1**
ITR-658	**Lab based on Elective**	**L**	**P**	**C**
		0	2	1

ITR – 701 Multimedia Technology

L	T/P	C
4	0	4

Introduction:
Concept of Multimedia ,Media & data stream, main properties of multimedia system , Data stream characteristics &for continuous media Multimedia Applications, Hardware Software requirements, Storage Technologies: RAID, Optical Media.

Components of multimedia and file formats:
Text, Basic sound concepts , MIDI , Speech ,Basic concept of Images, Graphics format ,Basic concepts of Video & animation, Conventional system,Computer based animation, Authoring Tools, Categories of Authoring Tools.

Compression Techniques
Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffmann Technique, Arithmetic Technique.

Animation:

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

Introduction to MAYA(Animating Tool):

Fundamentals, Modeling: NURBS, Polygon, Organic,
Animation:Key frame animation,reactive animation,path animation,Skelton animationetc., deformers..
Dynamics: soft bodies, Rigid bodies and its usages in the scene etc.,
Rendering: soft,Hard renering. IPR rendering, Line and box rendering etc.,
Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.
Working with MEL: Basics & Programming

Text Book:

1. David Hillman, "Multimedia Technology & Applications", Galgotia Publications, 2000

Reference Books:

1. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications, 2000
2. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI, 2001
3. Maya manuals.

ITR-703	Reliability Engineering	L	T/P	C
		4	0	4

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. K. K. Aggarwal, "Reliability Engineering", Kluwer Academic Publishers, 1993

Reference Books:

1. L.S.Srinath, "Reliability Engineering", Affiliated East-West Press Ltd., 2001
2. E. Balaguruswamy, "Reliability Engineering", Tata McGraw Hill Publishing Co., 2003

ITR- 705	Software Reusability	L	T/P	C
		4	0	4

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

Component based software development: component definition, component metamodel, component engineering vs application engineering

Component based and Model driven development using UML: Component specification, context realization, component realization

Text Books:

1. Ivan Jacobson, Griss Jacobson, Patrick Johnsson, "Software Reuse: Architecture, Process and Organization for business Success, ACM press books, 1997

Reference Books:

2. Joffrey S. Poutin, "Measuring Software Reuse: Principles Practices, Economic Models", Addison Wesley, 2001
3. Hans-Gerhard Gross, "Component based Software testing with UML", Springer-Verlag, Berlin, 2005

ITR – 707	Network Management and Security	L	T/P	C
		4	0	4

Introduction
Classical security Techniques and Computer Network Security Concepts. Confidentiality and Security, Security Policy and Operations Life Cycle, Security System Development and Operations

Secure Networking Threats
The Attack Process. Attacker Types. Vulnerability Types. Attack Results. Attack Taxonomy. Threats to Security: Physical security, Biometric systems, monitoring controls, and Data security and intrusion and detection systems.

Encryption Techniques
Conventional techniques, Modern techniques, DES, DES chaining, Triple DES, RSA algorithm, Key management. Message Authentication and Hash Algorithm, Authentication requirements and functions secure Hash Algorithm, Message digest algorithm, digital signatures. AES Algorithms.

Designing Secure Networks
Components of a Hardening Strategy. Network Devices. Host Operating Systems. Applications. Appliance-Based Network Services. Rogue Device Detection, Network Security Technologies The Difficulties of Secure Networking. Security Technologies. Emerging Security Technologies General Design Considerations, Layer 2 Security Considerations. IP Addressing Design Considerations. ICMP Design Considerations. Routing Considerations. Transport Protocol Design Considerations

Network Security Platform Options
Network Security Platform Options. Network Security Device Best Practices, Common Application Design Considerations. E-Mail. DNS. HTTP/HTTPS. FTP. Instant Messaging.

IPsec VPN Design Considerations
VPN Basics. Types of IPsec VPNs. IPsec Modes of Operation and Security Options. Topology Considerations. Design Considerations. Site-to-Site Deployment Examples.

Secure Network Management and Network Security Management
Organizational Realities. Protocol Capabilities. Tool Capabilities. Secure Management Design Options. Network Security Management, Firewalls, Trusted systems, IT act and cyber laws.

Text Books:

1. Sean Convery, " Network Security Architectures, Published by Cisco Press, First Ed. 2004
2. William Stalling "Cryptography and Network Security" Fourth Ed., Prentice Hall, 2006

Reference Books:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing" 3rd Edition, Prentice Hall, 2003
2. Jeff Crume "Inside Internet Security" Addison Wesley, 2003

ITR – 709	Subject: Software Quality Management	L	T/P	C
		4	0	4

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, 2003.
2. Alan Gillies, "Software Quality, Theory and Management", Chapman and Hall, 2004.

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.

ITR-711	Design Patterns	L	T/P	C
		4	0	4

Introduction to design patterns, introduction to java, review of Object Oriented design principles including UML, observer pattern and applying observer ,template pattern and refactoring to template method ,factory patterns, factory method and abstract factory , iterator pattern

Facade pattern, refactoring to façade, utilities, and demos, state and strategy patterns, modeling states, refactoring to state, making states constant, refactoring to strategy, comparing strategy and state. Comparing strategy and template method, singleton pattern and the composite pattern: singleton mechanics singletons and threads, recognizing singleton an ordinary composite, recursive behavior in composites.

Command pattern, using command to supply a service, command in relation to other patterns, adapter pattern, adapting in the presence of foresight class and object adapters , Unforeseen adaptation , recognizing adapter , proxy pattern , rmi , dynamic proxies in java ,the chain of responsibility pattern , varieties of lookup , refactoring to chain of responsibility , anchoring a chain , chain of responsibility without composite

Decorator pattern: function decorators , decorating without decorator ,bridge pattern , refactoring to bridge , bridge using the list interface , visitor pattern supporting visitor , extending with visitor , visitor cycles , visitor controversy , java idl , jini concurrency patterns

Text Books:

1. Erich Gamma, "Design Patterns - Elements Of Reusable Object-Oriented Software" Addison-Wesley, 2007
2. James W. Cooper, "Java Design Patterns - A Tutorial", Addison-Wesley, 2001

ITR-713	Software Testing	L	T/P	C
		4	0	4

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, 2005
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.

ITR-715	Robotics Engineering	L	T/P	C
		4	0	4

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, 2003
2. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication, 2001
3. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication, 2003

ITR - 717	Telecommunication Switching Systems and Networks	L	T/P	C
		4	0	4

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.

Text Book:

1. J.E.Flood, "Telecommunications switching, traffic and networks", Pearson education, first Indian reprint 2001

Reference Book:

1. T.Viswanathan, "Telecommunication switching systems and networks" PHI, India, 17th Indian reprint 2003,

ITR-719	Cellular & Mobile Communication	L	T/P	C
		4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Objective: The objective of the course is to introduce basic architecture of mobile and cellular services starting from 1G through to 2G(GSM). The prerequisites are Data communication, Antennas and wave propagation.

Unit I

Introduction to Cellular Mobile Systems

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems.

Elements of Cellular Radio Systems Design and interference

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. Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects,

Unit II

Cell Coverage for Signal & antenna structures

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. Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

Frequency Management & Channel Assignment, Hand Off & Dropped Calls

Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment. Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Unit III

Modulation methods and coding for error detection and correction

Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM. Block coding, convolution coding and Turbo coding. Multiple access techniques: FDMA, TDMA, CDMA; Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA.

Unit IV

Second generation, digital, wireless systems

GSM, IS_136 (D-AMPS), IS-95, mobile management, voice signal processing and coding.

Text Books:

[1] Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill

[2] Mobile wireless communications; Mischa Schwartz, Cambridge University press,UK,2005

Reference Books

[1] Mobile Communication Hand Book; 2nd Ed.; IEEE Press

[2] Wireless communiation principles and practice, 2nd ed,Theodore S rappaport, pearson Education.

[3] 3G wireless Demystified; Lawrence Harte, Mc. Graw Hill pub.

[4] Principles of Wireless Networks, Kaveh Pahlavan and Prashant Krishnamurthy: PHI

[5] Wireless communication theory, Blake, pub: Thomson Delmar 2004

ITR – 721 Satellite Communication

L	T/P	C
4	0	4

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, 2003
2. J.J. Spilker, "Digital Communication by satellite , PHI Publication, 1997
3. J. Martin, "Communication satellite systems", PHI publication, 2001

ITR-723	Distributed Computing	L	T/P	C
		4	0	4

Fundamentals of Distributed Computing:
Architectural models for distributed and mobile computing systems. Basic concepts in distributed computing such as clocks, message ordering, consistent global states, and consensus.

Basic Algorithms in Message:
Passing Systems, Leader Election in Rings, and Mutual Exclusion in Shared Memory, Fault-Tolerant Consensus, Causality and Time. Message Passing: PVM and MPI.

Distributed Operating Systems:
OS and network operating systems, Distributed File systems. Middleware, client/server model for computing, common layer application protocols (RPC, RMI, streams), distributed processes, network naming, distributed synchronization and distributed object-based systems.

Simulation:
A Formal Model for Simulations, Broadcast and Multicast, Distributed Shared Memory, Fault-Tolerant Simulations of Read/Write Objects Simulating Synchrony, Improving the Fault Tolerance of Algorithms, Fault-Tolerant Clock Synchronization.
Distributed Environments:
Current systems and developments (DCE, CORBA, JAVA).
Advanced Topics:
Randomization, Wait-Free Simulations of Arbitrary Objects, Problems Solvable in Asynchronous Systems, Solving Consensus in Eventually Stable Systems, High Performance Computing-HPF, Distributed and mobile multimedia systems. Adaptability in Mobile Computing. Grid Computing and applications. Fault tolerant Computing Systems.
Parallel Processing:
Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Books:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm, Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006
3. Attiya, Welch, "Distributed Computing", Wiley India, 2006

Reference Books:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to parallel computing", 2nd Edition, Pearson Education, 2007
2. Cameron Hughes, Tracey Hughes, "Parallel and distributed programming using C++", Pearson Education, 2005
3. Tanenbaum, A, "Modern Operating Systems", 2nd Edition, Prentice Hall India, 2001.
4. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
5. Michael J. Quinn, "Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994

ITR – 725	Pattern Recognition	L	T/P	C

4 0 4

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.

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.

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.

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 Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification" 2nd Edition, John Wiley, 2003
2. John Hertz, Andres Krogh & Richard G. Palmer, "Introduction to the theory of Neural Computation", Addison Wesley, 2001

ITR - 727	Digital Image Processing	L	T/P	C
		4	0	4

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, 2004
2. A.K. Jain, "Fundamental of Digital Image Processing", PHI, 2003

Reference Books:

1. Rosefield Kak, "Digital Picture Processing", 1999
2. W.K. Pratt, "Digital Image Processing", 2000

ITR – 729	Information Storage & Management	L	T/P	C
		4	0	4

Complexity of Information Management: Proliferation of Data, Data Center Evolution, Managing Complexity, I/O and the five pillars of technology, Storage Infrastructure, Evolution of Storage

Storage Systems Architecture: Modern Storage Systems, Storage Systems, Intelligent Disk Subsystems , Physical Disks , Back End ,Cache ,Front End , Host Environment

Introduction to Networked Storage: Storage Networking Overview, Direct Attached Storage, Storage Area Networks, Case study – Applying SAN concepts, Network Attached Storage, Case study – Applying NAS concepts, IP SAN, CAS, Hybrid Network Storage Based Solutions/ Emerging Technologies, Case study – Applying SAN, NAS, IP SAN concepts

Introduction to Information Availability: Business Continuity Overview, Data Availability, Business Continuity – Local, Case study – Applying local information availability strategies, Business Continuity – Remote, Case study – Applying remote information availability strategies, Disaster Recovery

Managing and Monitoring: Monitoring in the Data Center, Case study – Monitoring exercise, Management in the Data Center, Case study – Managing exercise

Case Studies must be supported by laboratory

Text Book:

1. Marc Farley Osborne, "Building Storage Networks", Tata McGrawHill, 2001
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill, 2003
3. NIIT, "Introduction to Information Security Risk Management" , Prentice-Hall of India, 2000

Code No. ITR – 741	**L**	**P**	**C**
Subject: Bluetooth Technology	**4**	**0**	**4**

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 Books:

1. "Bluetooth Technology", C.S.R. Prabhu and A.P. Reddi; PHI
2. "Bluetooth Demystified", Nathan J. Muller, Tata McGraw Hill, 2001

Reference Book:

1. "Mobile Communications", Jochen Schiller, Pearson Education, 5th Edition, 2002

Code No. ITR – 743	**L**	**P**	**C**
Subject: Cyber Crime Investigations and Cyber Forensics	**4**	**0**	**4**

Unit 1 : Introduction : Review of TCP/IP and TCP, IP Header analysis , Introduction to Cyber World, Cyber attacks and cyber security , Information warfare and cyber terrorism, Types of cyber attacks, Cyber Crime and Digital Fraud ,
Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)
Unit 2 : Live Data collection and investigating windows environment : windows Registry analysis , Gathering Tools to create a response toolkit (Built in tools like *netstat* , *cmd.exe* , *nbtstat* , *arp* , *md5sum* ,*regdmp* etc and tools available as freeware like *Fport* , *Pslist* etc) , Obtaining volatile Data (tools like *coffee* , *Helix* can be used)
Computer forensics in windows environment, Log analysis and event viewer, File auditing, identifying rogue machines, hidden files and unauthorized access points
Unit 3: Live Data collection and investigating Unix/Linux environment : /Proc file system overview , Gathering Tools to create a response toolkit (Built in tools like l*osetup* , *Vnode* , *netstat* , *df* , *md5sum* , *strace* etc and tools available as freeware like *Encase* , *Carbonite* etc)
Handling Investigations in Unix/Linux Environment: Log Analysis (Network, host, user logging details), Recording incident time/date stamps, Identifying rogue processes, unauthorized access points, unauthorized user/group accounts,

Unit 4 : Forensic tools and report generation: Recovery of Deleted files in windows and Unix , Analyzing network traffic , sniffers , Ethical Hacking , Hardware forensic tools like Port scanning and vulnerability assessment tools like *Nmap* , *Netscan* etc . Password recovery (tools like *John the ripper*, *L0phtcrack*, *and THC-Hydra*), Mobile forensic tools and analysis of called data record Template for computer forensic reports

Text Books:

1. Incident Response & Computer Forensics. Mandia, k., Prosise, c., Pepe, m. 2nd edition. Tata-McGraw Hill, 2003.
2. Guide to Computer Forensics and Investigations, 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart , Thomson Learning

References:

1. Digital Evidence and Computer Crime, 2nd Edition , Eoghan Casey , academic Press File System Forensic Analysis by Brian Carrier , addition Wesley
2. Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, syngress Publication
3 EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition , Steve Bunting , sybex Publication

ITR-751	**Lab based on Elective – I**	**L**	**P**	**C**
		0	**4**	**2**
ITR-753	**Lab based on Elective – II**	**L**	**P**	**C**
		0	**4**	**2**
ITR-755	**Lab based on Elective – III**	**L**	**P**	**C**
		0	**4**	**2**
ITR – 757	**Minor Project**	**L**	**P**	**C**
		0	**8**	**6**

The student will submit a synopsis at the beginning of the semester for approval to the 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 project committee for evaluation purpose at the end of the semester in a specified format.

ITR – 752	**Dissertation**	**L**	**T/P**	**C**
		0	**0**	**24**

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

ITR – 754	**Seminar & Progress Report**	**L**	**T/P**	**C**
		0	**0**	**4**

Seminar is required to be given by the student on the topic of the dissertation. Progress of the dissertation will be evaluated based on the seminar given by the student during the semester. Evaluation will be done two times during the semester. Marks will be given based on the performance of the student during the seminar.