

SYLLABUS

FOR

M. SC. IN INFORMATION & COMMUNICATION TECHNOLOGY

SESSION : 2013-14, 2014-15, 2015-16



INSTITUTE OF INFORMATION TECHNOLOGY

Jahangirnagar University

Savar, Dhaka-1342

Bangladesh

M.Sc IN ICT AT A GLANCE:

Duration of Program	:	One academic year consisting of two semesters					
Duration of each Semester	:	Six months					
Total Credit Hour	:	36					
Credit in each Course	:	3					
Credit in Thesis Work	:	3+9=12					
Credit in Project Work	:	3+3=6					
Course Structure	:		Compulsory	Optional	Project	Thesis	Total Credit
		Semester I	03 Courses	02 Course	3 Credit	3 Credit	5×3+3=18 (All Groups)
		Semester II	01 Course	04 for Project 02 for Thesis	3 Credit	9 Credit	5×3+3=18 (Project Group) 3×3+9=18 (Thesis Group)
		Grand Total Credit					18+18=36

COURSES CURRICULUM
FOR
M.Sc. in Information & Communication Technology
(MICT)

	Course Code	Course Title	Credit	
Semester-I	Compulsory Courses		3x3=9	
	MICT-5101	Advanced Database Systems	3	
	MICT-5102	Probability & Stochastic Process	3	
	MICT-5103	Advanced Digital Communication	3	
	Optional Courses (From Option- I) [any TWO for Project or Thesis Group]		2x3=6	
	MICT-51XX	From Option- I	3	
	MICT-51XX	From Option- I	3	
	Project Work or Thesis			
	MICT-5150	Project Work- I	3	
	MICT-5160	Thesis- I	3	
	Total Credit in Semester I [for Project Group]		9+6+3=18	
	Total Credit in Semester I [for Thesis Group]		9+6+3=18	
	Semester-II	Compulsory Courses		1x3=3
MICT-5201		Advanced Mobile & Cellular Communication Technologies	3	

Optional Courses (From Option- II and Option- III) [any FOUR for Project Group / any TWO for Thesis Group]		4x3=12 <small>(Project Group)</small> 2x3=6 <small>(Thesis Group)</small>
MICT-52XX	From Option- II	3
MICT-52XX	From Option- II	3
MICT-52XX	From Option- III	3
MICT-52XX	From Option- III	3
Project Work or Thesis		
MICT-5250	Project Work- II	3
MICT-5260	Thesis- II	9
Total Credit in Semester II [for Project Group]		3+12+3=18
Total Credit in Semester II [for Thesis Group]		3+6+9=18
Grand Total (Both Semesters)		36

Optional Courses:

Option-I

Course Code	Course Title	Credit
MICT-5104	Health Informatics	3
MICT-5105	Information Systems & Securities	3
MICT-5106	Client-Server Technologies & Cloud Computing	3
MICT-5107	Advanced Web Technologies	3
MICT-5108	Information Retrieval	3
MICT-5109	Advanced Optical Communication	3
MICT-5110	Data Mining & Knowledge Discovery	3
MICT-5111	Information System Simulation & Modeling	3
MICT-5112	Computer Graphics and Animation	3
MICT-5113	Interactive Multimedia Design and Development	3

Option-II

Course Code	Course Title	Credit
MICT-5202	Microwave Communication Systems	3
MICT-5203	Telecommunication Network Management	3
MICT-5204	Advanced Mobile Application Development	3
MICT-5205	Software Project Management & Quality Assurance	3
MICT-5206	Digital Signal & Image Processing	3
MICT-5207	High Speed Computer Networks	3
MICT-5208	Geographical Information Systems	3
MICT-5209	Advanced Artificial Intelligence	3
MICT-5210	Computational Biology	3
MICT-5211	Advanced Bioinformatics	3

Option-III

Course Code	Course Title	Credit
MICT-5210	E-Commerce & E-Governance	3
MICT-5211	Advanced Operating Systems	3
MICT-5212	Computer Vision & Image Understanding	3
MICT-5213	Machine Intelligence & Expert Systems	3
MICT-5214	VLSI	3
MICT-5215	Advanced Processor Architecture	3
MICT-5216	Digital Integrated Systems Design	3
MICT-5217	Management Information System	3
MICT-5218	Leadership & Human resources managements	3
MICT-5219	Advanced Software Engineering	3

SEMESTER- WISE DETAIL SYLLABUS
FOR
M.SC. IN INFORMATION & COMMUNICATION TECHNOLOGY
(MICT)

SEMESTER I
(COMPULSORY COURSES)

IT-5101 Advanced Database Systems

Active Databases: Syntax and Semantics of Active Databases, Applications of Active Databases, Distributed Databases: Introduction, Distributed Data Processing, Distributed Database System, Promises of DDBSs, problem areas, Design Issues, Distributed DBMS Architecture. Overview of Relational DBMS: Relational Database Concepts, Normalization, Relational Data Languages. Distributed Database Design: Distribution Design Issues, Fragmentation, Allocation, Overview of Query Processing: Objectives of Query Processing, Characterization of Query Processors, Layers of Query Processing. Optimization of Distributed Queries: Query Optimization, Centralized Query Optimization, Join Ordering in Distributed Queries Distributed Query Optimization. Introduction to Transaction Management: Properties of Transactions, Types of Transactions Distributed Concurrency Control: Serializability Theory, Locking-Based Concurrency Control Algorithms, Timestamp-Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management. Distributed DBMS Reliability: Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Dealing with Site Failures, Network Partitioning. Parallel Database Systems: Parallel Database System Architectures, Parallel Query Processing, Load Balancing, Design of Parallel Systems. Database Security: Introduction to database security, Database Issues in Trust Management and Trust Negotiation, Authenticated Index Structures for Outsourced Databases, Managing and Querying Encrypted Data, Security in Data Warehouses and OLAP Systems, Security for Workflow Systems, Geospatial Database Security.

TEXT & REFERENCE BOOKS:

1. Handbook of Database Security- Application and Trend -M. Gertz, and S. Jajodia, 2008, Springer
2. Database Security - Silvana Castano, ACM Press
3. Principles of Distributed Database Systems, Second Edition - M. Tamer Ozsu, Patrick Valduriez, Prentice Hall, ISBN 0-13-659707-6, 1999
4. Advance Database Management - Thakare, Jadhav, Kedar, Technical Publications Pune

IT-5102 (Probability & Stochastic Process):

Probability space, Random variables and random vectors: Sample Space, Probabilities and Bayes' Formula, Random Variables, Expectation of a Random Variable and Jointly Distributed Random Variables, Conditional Probability and Conditional Expectation, expectation. Inequalities,

Characteristic function. Convergence of random sequences, Types of convergences. Law of large numbers. Central limit theorem. Discussion of the exponential distribution and the Poisson process. General definition of counting processes. Generalizations of the Poisson process. Renewal theory and its application. Queuing theory. Reliability theory and its applications. Brownian motion and stationary processes. Stochastic processes: Classification of stochastic processes. Wide sense stationarity. Point processes. Poisson processes. Markov chains. Linear transformations of stationary processes. Doob decomposition. Stochastic Karhunen-Loeve expansions. Campbell Theorem. Statistical signal processing: Statistical signal processing. Kalman filter. Wiener filter for random sequences. Stochastic simulation.

TEXT & REFERENCE BOOKS:

1. Introduction to Probability Models, 10th ed. AP, - Sheldon M. Ross (2010),
2. Probability and Measure. 3rd edition. Wiley (1995) - Billingsley, P.
3. Intuitive Probability and Random Processes using MATLAB. Springer (2005) - Kay, S.
4. Introduction to Random Processes in Engineering, Wiley (2005) - Balakrishnan, A. V.
5. Probability and Measure. 3rd edition Wiley (1995) - Billingsley, P.
6. Random Processes for Image Signal Processing. Wiley-IEEE Press (1998) - Dougherty, E. R.

IT-5103 (Advanced Digital Communication):

Digital Modulation Techniques: QPSK, DPSK, FQPSK, QAM, m-QAM, OFDM, Optimum receiver for signals corrupted by AWGN, Performance of the optimum receiver for memory less modulation, Optimum receiver for CPM signals, Optimum receiver for signals with random phase in AWGN channel. Coding Techniques: Convolutional codes, Hamming Distance measures for convolutional codes, Various good codes, Maximum likelihood decoding of convolutional codes, Error probability with maximum likelihood decoding of convolutional codes, Sequential decoding and feedback decoding, Trellis coding with expanded signal sets for band limited channels, Viterbi decoding. Communication through band limited linear filter channels: Optimum receiver for channels with ISI and AWGN, Linear equalization, Decision-feedback equalization, reduced complexity ML detectors, Iterative equalization and decoding-turbo equalization. Adaptive equalization: Adaptive linear equalizer, adaptive decision-feedback equalizer, adaptive equalization of Trellis-coded signals, Recursive least-square algorithms for adaptive equalizations, Self recovering (blind) equalization. Spread Spectrum Signals: Model of spread spectrum digital communication system, Direct sequence spread spectrum signals, CDMA, Time hopping SS, Synchronization of SS systems. Digital communication through fading multi-path channels: Characterization of fading multi-path channels, channel mode, Frequency-non selective slowly fading channel

Reference Books:

1. U. Madhoo *Fundamentals of Digital Communication*, Cambridge University Press, 2008.
2. J. G. Proakis, *Digital Communications*, 4th Edition, McGraw-Hill, 2001
3. J. M. Wozencraft and I. M. Jacobs, *Principles of Communication Engineering*, Wiley, 1965.
4. R. E. Blahut, *Digital Transmission of Information*, Addison-Wesley, 1990.
5. Stephen G. Wilson, "Digital Modulation and Coding", Pearson Education (Asia) Pte. Ltd. 2003.
6. Kamilo Feher, "Wireless Digital Communications: Modulation and Spread Spectrum Applications", Prentice-Hall of India, 2004

SEMESTER I

(OPTIONAL COURSES)

Option-I

IT-5104 (Health Informatics):

Basic concepts in Informatics: models, information, information systems, informatics skills: communicating questioning, searching, making decisions. Information Systems in Healthcare: information management systems, the electronic medical record, designing and evaluating information systems. Protocol-based Systems: protocols and evidence-based healthcare, computer-based protocol systems in healthcare, disseminating and applying protocols, designing protocols. Language, Coding and Classification: terms, codes and classification, healthcare terminologies and classification systems, the trouble with coding. Communication Systems in Healthcare: communication system basics, communication technology, clinical communication and telemedicine. Internet: the internet and World Wide Web, web health services, information economics and the internet. Decision Support Systems: clinical decision support systems, intelligent systems, intelligent monitoring and control, biosurveillance, bioinformatics.

TEXT & REFERENCE BOOKS:

1. Guide to health informatics Second edition - Enrico Coiera
2. Health Care - Sheila P. Englebardt, Ramona Nelson, Ramona Nelson

IT-5105 Information Systems and Securities

Overview of Information System: History of Information Systems and its Importance, Basic Concepts and Terminologies, Changing Nature of Information Systems. Principles of Information Security: Security Goals of Information- Confidentiality, Integrity Availability, Information Security Threats and Attacks, Security Services and Mechanisms, Security in Mobile and Wireless Computing, Security Challenges in Mobile Devices, Authentication Service Security, Security Implication for Organizations, Laptops Security Basic, Security Technology- Firewalls and VPNs, Intrusion Detection and Prevention Systems. Access Control: Types and Parts of Access Control, Threats to Access Controls, Effects of Access Control Violations. Malicious Attacks, Threats and Vulnerabilities: Classification of Threats and Assessing Damages, Security Breach, Malicious Software, Countermeasures. Intellectual Property Right (IPR): Concept of Virtual Property, Trademarks, Copyrights, Patents, Data Protection Laws, Plagiarism, Software Piracy, Issues in Data and Software Privacy, Requirements of a Website, E-Marketing, E-Advertising, Online Payment Collection System, Legal, Ethical and Professional Issues in Information Security: Legal Dimensions in Cyber World, IT Acts and Cyber Crime, IT Act, Information Assurance and E-Governance, ICT Act, ICT Policy, Trademark, Copyright and Patent Law of Bangladesh. Cryptography and Steganography: Brief History, Basic Concepts and Terminologies, Business and Security Requirement, Applications and Uses in Information System Security, Cryptographic Hash Functions, Digital Signatures and Certificate Authorities. Integrity, Authentication and Key Management: Message Integrity and Message Authentication; Passwords, Challenge-Response,

Zero-Knowledge and Biometric Authentications; Symmetric and Public-key Distributions; Information Security Standards: NIST, ISO, IEC, W3C, IETF, ITU-T, ANSI

TEXT & REFERENCE BOOKS:

1. Fundamentals of Information Systems Security - David Kim, Michael G Solomon
2. Principles of Information Security - Michael E Whitman, Herbert J Mattord
3. Cryptography and Network Security - Behrouz A Forouzan
4. Cyber Law: The Law of the Internet - Jonathan Rosenoer
5. Cyber Law in Bangladesh - Dr. Zulfiqar Ahmed

IT-5106 Client-Server Technologies and Cloud Computing

Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing. Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system. Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management. Client-server system development: Software, Client-Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware. Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards, Network protection devices, Power Protection Devices, UPS, Surge protectors. Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues. Client/Server System Development: Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training. The future of client server Computing: Enabling Technologies, The transformational system. Concept and Evolution of Cloud Computing, Service Models and Architecture of Cloud Computing, Management Issues in Cloud, Security Issues in Cloud, Exposures to Some Open Source and Commercial Clouds, Exposure to the Research Issues in Cloud Computing, Distributed System Models: Parallel Computing, Virtualization, Cloud Platform Architectures, Amazon AWS, Microsoft Azure, Google App Engine, Google MapReduce, Yahoo Hadoop, Eucalyptus, Nimbus, OpenStack, Service-Oriented Architectures, Cloud Programming, Grid Computing, Peer-to-Peer Computing

References:

1. Client / Server Computing - Patrick Smith & Steave Guengerich,
2. Client/Server Computing - Dawna Travis Dewire
3. Database management System - Majumdar & Bhattacharya
4. Database Concepts - Korth, Silberchatz, Sudarshan,
5. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet - Kai Hwang, Jack Dongarra & Geoffrey C. Fox

6. Fundamentals of Data Base System - Elmasri, Navathe, S.B,

IT-5107 Advanced Web Technologies

Introduction to advanced web technology, XML processing, RDF processing, Taxonomies and ontologies for advanced web applications, Ontology modeling, Languages for representing, ontologies on the web, Rules and inferences, Web services, Design and modelling of web services Technologies for implementing web services, Current applications of advanced web technologies

TEXT & REFERENCE BOOKS:

1. Semantic Web Primer - Grigoris Antoniou and Frank van Harmelen, MIT Press

IT-5108 Information Retrieval

Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation, *Introduction to Data structures and algorithms related to Information Retrieval:* Basic Concepts, Data structures, Algorithms, *Inverted Files:* Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques, *Signature Files:* Introduction, Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning. *New Indices for Text:* PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. *Lexical Analysis and Stop-lists:* Introduction, Lexical Analysis, Stop-lists, *thesaurus Construction:* Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri. *String Searching Algorithms:* Introduction, Preliminaries, the Naive Algorithm, the Knutt – Morris – Pratt Algorithm, the Boyer-Moore Algorithm, the Shift-Or Algorithm, the Karp-Rabin Algorithm.

TEXT & REFERENCE BOOKS:

1. Modern Information Retrieval - Ricardo Baeza-Yates, Neto, PEA, 2007
2. Information Storage and Retrieval Systems: Theory and Implementation - Kowalski, Gerald.
3. Information Retrieval: Algorithms and Heuristics - Grossman, Ophir Frieder.

IT-5109 Advanced Optical Communication

Overview of Optical Fiber Communication: Introduction, single mode fiber, cutoff wave length, mode field diameter. *Optical Fibers:* fiber materials, photonic crystal, fiber optic cables specialty fibers. *Transmission characteristics of optical FIBERS:* Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion. *Optical Sources and Detectors:* Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors, *Fiber Couplers and Connectors:* Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. *Optical Receiver:* Introduction, Optical Receiver Operation, eye diagrams, coherent detection, burst mode receiver operation, Analog receivers. *Analog and Digital Links:* Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics, *WDM Concepts and Components:* WDM concepts, overview of WDM operation principles, WDM standards, Mach-Zehender interferometer, multiplexer, Isolators and circulators, direct thin film filters, active optical components, MEMS technology, optical drop multiplexers, polarization controllers, chromatic dispersion compensators, tunable light sources, *Optical Amplifiers and NETWORKS:* optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. *Optical Networks:* Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides.

TEXT & REFERENCE BOOKS:

1. Optical Fiber Communication - Gerd Keiser, 4th Ed., MGH, 2008
2. Optical Fiber Communications - John M. Senior, Pearson Education. 3rd Ed., 2007
3. Fiber optic communication - Joseph C Palais: 4th Edition, Pearson Education

IT-5110 (Data Mining and Knowledge Discovery):

Introduction to Data Mining: Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi-dimensional data Analysis. Classification: Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction. Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier, Classification-Alternative techniques: Nearest Neighborhood classifier, Bayesian Classifier. Support Vector Machines: Linear SVM, Separable and Non Separable case, Association Analysis: Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FPGrowth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns. Clustering: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN. Cluster Evaluation: Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms. Web Data mining: Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search.

TEXT & REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
2. Introduction to Data Mining with Case Studies, GK Gupta , Prentice Hall.
3. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, PEA, 2008.

IT-5111 Information System Simulation & Modeling:

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, Time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discrete-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random variates; Output analysis.

Simulation languages; Analysis and modeling of some practical systems.

References:

1. Simulation of Communication Systems - MC.Jeruchim, P.Balaban, K.Samshanmugam, Plenum press, New York, 1992.
2. Simulation Modeling and Analysis - Averill.M.Law and W.David Kelton, McGraw-Hill, 1991.
3. System Simulation - Geoffrey Gorden, Prentice Hall of India, 2nd Edition, 1992.
4. Performance Analysis of Digital Communication Systems - W.Turin, Computer Science Press, New York, 1990.
5. Discrete Event System Simulation - Jerry banks and John S.Carson, Prentice Hall of India, 1984.
6. Theory of Modeling and Simulation - Bernard P. Zeigler, Tag Gon Kim, Herbert Praehofer, Academic Press; 2 edition.

IT-5112 Computer Graphics & Animation

Advanced Graphic Techniques: Graphic basics, Three dimensional drawings. Geometric forms and models. Hidden surface, Fractals; Advanced rendering Techniques: Shadow generation techniques, Texture and environment mapping techniques. procedural texture mapping and modeling. Ray tracing, Radiosity methods, Global illumination models. Volume rendering techniques; Advanced animation: animation articulated structures. Soft object animation, procedural animation.

References:

1. *Simulating Humans: Computer Graphics Animation and Control*- Norman I. Badler, Cary B. Phillips, Bonnie Lynn Webber
2. *Computer Graphics & Animation (Computer Guides)*- Asha Kalbag, Russell Punter , Philippa Wingate, Jane Chisholm, Carrie A. Seay, Michael Wheatley, Merrick Brewer, Howard Allman
3. *3D Math Primer for Graphics and Game Development (Wordware Game Math Library)* - Fletcher Dunn
4. *Flash out Of the Box* - Robert Hoekman, Jr.
5. *Dreamweaver CS3 For Dummies (For Dummies (Computer/Tech))* - Janine C. Warner, *For Dummies*

IT-5113 Interactive Multimedia Design & Development

Introduction to multimedia – Image, Sound, Video formats and their different properties, compression, playing and recording techniques, conversions between different formats and their combinations, Multimedia authoring. HTML: Introduction to Web and HTML, Basic HTML tags, Essentials for good design, Uploading Web pages to the Web server, Cascading style sheets, Dynamic HTML. Drawing: Basic Image properties and how to set/change them in PhotoShop, Concepts of layers, color concepts, text, texture, brightness, contrast, filters and effects, PhotoShop Print Production, PhotoShop Web Production, Introduction to Macromedia Director, Illustrator and Premier. Animation creating software (Media studio / Video studio etc), its use, facts to concern while marketing.

References:

1. *Designing Interactive Digital Media*- Nicholas V. Iuppa, Nick Iuppa, Butterworth-Heinemann.
2. *Designing Effective and Usable Multimedia Systems (IFIP International Federation for Information Processing)*- Alistair G. Sutcliffe, Peter Johnson, Jürgen Ziegler.
3. *Web Multimedia Development*- David Miller.
4. *Interactive Multimedia Learning* - Abdulmotaleb El Saddik.
5. *Master VISUALLY Dreamweaver 4 and Flash 5* - Sherry Willard Kinkoph.

SEMESTER II

(COMPULSORY COURSES)

IT-5201 (Advanced Mobile & Cellular Communication Technologies):

Review of mobile communications: GSM and CDMA, Cellular concept and engineering, GPRS and EDGE, 3G mobile communication evolution, Queuing Theory, GSM Channels, Frame Hierarchy & Burst Structures, Source Coding & Speech Processing, Channel Coding & Interleaving, Error Detection & Correction, Authentication & Cipherng, etc. Wireless Communications and Diversity: Fast Fading Wireless Channel Modeling, Rayleigh/Ricean Fading Channels, BER Performance in Fading Channels , Diversity modeling for Wireless Communications, BER Performance Improvement with diversity. Types of Diversity – Frequency, Time, Space, Mobile Radio Propagation, large scale path loss, small scale fading and multipath. Cellular Communications: Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes - Call Setup, Handover etc., Teletraffic Theory, Equalization: Equalizer noise Enhancement, Types, Linear Equalizer, Maximum Likelihood Sequence Estimation, Decision - Feedback Equalization. Multiple Access Techniques for Wireless Communications: CDMA, FDMA, TDMA, MIMO, UWB (Ultrawide Band), Wireless data networks: GSM, GPRS, WCDMA, LTE, WiMAX. Advances in Wireless Communication: Orthogonal Frequency Division Multiplexing, LTE, Mobile ad hoc networks (MANET)

TEXT & REFERENCE BOOKS:

1. Wireless Communications - Theodore S. Rappaport
2. Mobile Communications Design Fundamentals - William C. Y. Lee
3. Fundamentals of Wireless Communication - David Tse and Pramod Viswanath
4. An Introduction to GSM - Redl SM, Weber MK and Oliphant MW

SEMESTER II

(OPTIONAL COURSES)

Option-II

IT-5202 Microwave Communication Systems

Introduction: Microwave frequencies/Bands Applications of Microwaves. Microwave generation: Klystrons, Reflex Klystrons, Magnetrons and other devices, Microwave tubes, Microwave components, Microwave measurements, power, frequency, wavelength, microwave transmission, media, Anisotropy media, impedance, Hollow, surfacewave, dielectric waveguide, waves on a transmissionline, standing wave ration, quarter wave transformers. Micro-strip lines: Wave propagation and micro-strip lines, Dielectricconstants, Characteristic impedance,Attenuation factors. Microwave Engineering for wireless systems: Microwave networks, Active networks, Design of matchingnetworks, Noise, Microwave link, Rectifier and Detector Design, Frequency and Modulation Techniques,Transmitting and Receiving Equipment, Waveguide, Microwave junction- E and H plane waveguide Tees, Hybride Tee, Microwave Antennas. Satellite Communication: Introduction, Orbits, station keeping, satellite altitude,transmission path, pathloss, noise consideration, satellite system, saturation flux density, effective isotropic radiated power, multipleaccess methods, earth station antenna, satellite link design, frequency plan, satellite communicationforInternet, VSAT network, One-way, two-way and open-sky satellite communication, GNSS-GPS and Galileo systems and GIS, Satellite Navigation, DBS-TV. Radar: Basic principles, Radar equation, factors influencing maximum range, effect of noise, power andfrequencies used in Radar, types of Radar, Basic pulsed Radar system, Modulators, receivers, Bandwidthrequirements, factors governing pulse characteristics, Duplexer, moving target indicator (MTI), tracking, Radar systems and search systems.

TEXT & REFERENCE BOOKS:

1. Radio Frequency and Microwave Electronics - Mathew M. Radmanesh, Pearson Education.
2. Electromagnetic Waves and Radiating systems - Zedanand Balmani
3. Foundations for Microwave Engineering - R. E. Collin, McGraw Hill
4. Satellite Communication, Robert M Gagliardi - S. Y. Lao.
5. Satellite Communications - Timothy Pratt, Charles W. Bostian
6. Principle of Radar communication, - Grolsky
7. Microwave engineering - V.L. gupta

IT-5203 (Telecommunication Network Management):

Telecommunications Network Fundamentals: Standards and Architecture, Telecommunications Decision Sequence: Managing Network Design , Network management standards, network management model, organization model, information model abstract syntax notation 1 (ASN.1), encoding structure, macros, functional model. Network management application functional requirements: Configuration management, fault management, performance management, Error correlation technology, security management, accounting management, common management,

report management, polity based management, service level management, management service, community definitions, capturing the requirements, simple and formal approaches, semi formal and formal notations. Telecommunication management network (TMN) architecture: Terminology, functional architecture, information architecture, physical architecture, TNN cube, TMN and OSI. Information Modeling for TMN: Rationale for information modeling, management information model, object oriented modeling paradigm, structure of management information, managed object class definition, management information base (MIB), Common management information service element (CMISE) Simple network management protocol (SNMP): SNMPv1: managed networks, SNMP models, organization model, information model, SNMPv2 communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB, SNMPv2 protocol, compatibility with SNMPv1, SNMPv3, architecture, applications, MIB security, remote monitoring (RMON) SMI and MIB, RMQN1 and RMON2. Network management examples: ATM integrated local management interface, ATM MIB.M1, M2,M3, M4, interfaces, ATM digital exchange interface management, digital subscriber loop (DSL) and asymmetric DSL (ADSL) technologies, ADSL configuration management, performance management of new emerging technologies. Network management tools: Network statistics management, network management system, Trustworthiness: Reliability and Security, Managing the Telecommunications Resource: Security and Network Management

Reference Books:

1. Telecommunication Network Management - Haojin Wang Mc-Graw Hill
2. Network Management - Principles and Practice - Mani Subramanian,
3. Telecommunications network management- Henry Haojin Wang
4. Fundamentals of Telecommunications Network Management - Lakshmi G. Raman

IT-5204 Advanced Mobile Application Development:

Introduction to mobile computing: Android development environment. Factors in developing mobile applications: Mobile software engineering, Frameworks and tools, Generic UI Development, Android users, VUIs and mobile Apps, Text-to Speech techniques, Designing the right UI, Multi-channel and multi-modal UIs Intents and services: Android intents and services, Characteristics of mobile applications, Successful mobile development. Storing and retrieving data: Synchronization and replication of mobile data, Getting the model right, Android storing and retrieving data, Working with a content provider. Communications via network and the web: State machine, Correct communications model, Android networking and web. Telephony: Deciding scope of an application, Wireless connectivity and mobile applications, Android telephony. Notifications and alarms: Performance and memory management, Android notifications and alarms. Graphics: Performance and multi-threading, Graphics and UI performance, Android graphics. Multimedia: Mobile agents and peer-to-peer architecture, Android multimedia. Location: Mobility and location based services, Android Product shaping: Packaging and deploying, Performance best practices, Android field service applications. Security and hacking: Active transactions, hacking Android.

Reference Books:

1. Norman, "The design of everyday things", Basic Books, 2002
2. Beginning iPhone3 development: Exploring the iPhone SDK - Jeff LaMarche and David Mark.
3. iPhone SDK development - Bill Dudney & Chris Adamson.

IT-5205 Software Project Management & Quality Assurance

Role of the Project Manager: Outline, Staff, Introduction, Definition of Project, Classical Engineering Projects and Software Projects, Software Methodologies, Software Project Types, Tasks of a Software Project Manager, The Triple Constraint. Project Startup: The Project's Starting, Negotiating Project Constraints, Cost Benefit Analysis, Startup Deliverables, Other Considerations, System Requirements, The Role of System Requirements, Deliverables, Objectives of the Requirements Specification, Creating the Requirements Specification, Analysis Phase Activities. Methodologies: Methodology, Phases and Activities, Deliverables, Other Lifecycle Models, Estimation, Why Estimate?, When are Estimates Done?, Estimation Methods. Project Framework: Elements of the Framework, Standards and Quality, Framework Activities. Project Monitoring: Purpose of Monitoring, Monitoring Expenditure, Monitoring Work, Cost/ schedule Milestones, Earned value, Managing Deviations and Variations, Technical Audits, Project Progress Reporting. Human Factors: People in the Project, Staff as Individuals, Management, Managing Staff, Change Management, Improving Processes, Risk, The Nature of Risk, Risk Management Plan, Risk Identification, Risk Analysis, Risk Response Planning, Completion Activities. Project Completion and Implementation: Project Team Actions at Completion, What You Have to Do When You Thought You Were Done, Learning Lessons, Professional Ethic.

Suggested Books:

1. Information Technology Project Management - Marchewka, J. T.
2. Software Engineering 7 - Sommerville, I
3. Software Project Management - Hughes, B and Cotterell, M,
4. Managing the Software Process - Humphrey, W,
5. Software Engineering Economics - Boehm, B,
6. Systems Engineering and Analysis - Blanchard, B. S and Fabrycky W.J,
7. Software Project Management - Peterson,

IT-5206 Digital Signal & Image Processing

Introduction: Course overview, Digital signal processing, Basic operations and block diagram, image presentation and image processing devices, visual perception, sampling and quantization. Discrete Time Signal and System: Signals, Systems and signal processing, Classification of signals, Systems, LTI systems, Frequency domain representation of DTS and Signals, Convolution, Correlation etc. Z-Transforms: Introduction, Z-transforms, Inverse Z-transforms, Properties, System Functions, Application of Z-transforms, Unilateral Z-transforms etc. Discrete Fourier Transform: Introduction, DFT and its properties, FFT algorithms-direct, divide and conquer approach, 2-D DFT and FFT. Introduction to Digital Image Processing: Introduction, brightness adoption and discrimination, Image sampling and quantization, Basic relationship between pixels, Morphological operations, Image moments and texture, Template matching, Image analysis and compression tools. Image Transforms: Introduction to Fourier Transforms, Properties of Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Slant Transform, Optimal Transform, Comparison of transforms. Image Enhancement: Image Enhancement in the Spatial Domain, Grey-level Transformation, Median filter, Bit plane slicing, Histogram Processing, Arithmetic and Logic operation, Spatial Filtering, Image Enhancement in the frequency domain, Homomorphic filtering.

Suggested Books:

1. Digital Signals and Image Processing - Tomal Bose
2. Digital Signal and Image Processing using MATLAB - Gerard Blanchet and Maurice Charbit
3. Advances in Signal Transforms, Theory and Application - Jaakko Astola and Leonid Yaroslavsky

4. Digital Image Processing- Rafael C. Gonzalez and Richard E. Woods

IT-5207 High Speed Computer Networks

Introduction: A Brief Networking History, The Need for Speed and Quality of Service, Advanced TCP/IP and ATM Networks. Protocols and Network Fundamentals: Protocols and TCP/IP Suite: The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Protocol Architecture, Internetworking, Data Networks: Packet-Switching Networks, Frame Relay Networks, Congestion in Data Networks and Internets. High Speed Networks: Asynchronous Transfer Mode, ATM Protocol Architecture, ATM Logical Connections, ATM Cells, ATM Service Categories, ATM Adaptation Layer, High-Speed LANs; Fast Ethernet and Gigabit Ethernet, ATM LANs. Performance Modeling and Estimation: Overview of Probability and Stochastic Processes: Probability, Random Variables, Stochastic Processes, Queuing Analysis, Self-similar Traffic. End-System Traffic Management: Link-level Flow and Error Control: The Need for Flow and Error Control, Link Control Mechanisms, ARQ Performance, Transport-level Traffic Control: Transmission Control Protocol(TCP), TCP Congestion Control, Performance of TCP over ATM, Real-time Transport Protocol. Network-Traffic Management: Internetwork traffic management: The Internet Protocol(IP), IPv6, Integrated Services Architecture(ISA), Queueing Discipline, Random Early Detection. Internet Routing: Overview of graph theory and least-cost path: Elementary Concepts of Graph Theory, Shortest Path Length Determination, Routing Protocols: Internetwork Routing Principles, Distance-Vector Protocol: RIP, Link-State Protocol: OSPF, Path-Vector Protocols: BGP and IDRP, Routing for High-Speed and Multimedia Traffic: Multicasting, Resource Reservation: RSVP, IP Switching

Suggested Books:

1. HIGH-SPEED NETWORKS : TCP/IP and ATM Design Principles: William Stallings
2. High-Speed Networks and Internet: performance and quality of service: William Stallings
3. Architecture and Protocols for High Speed Networks: Otto Spaniol
4. Traffic Management for High-Speed Networks: H. T. Kung

IT-5208 Geographical Information Systems

An introduction to GIS: The purpose of GIS, Some fundamental observations. A first definition of GIS, Spatial data and geo-information, Applications of GIS, The real world and representations of it, Modelling, Maps, Databases, Spatial databases. Geographic information and Spatial data types: Geographic phenomenon, types of phenomenon, Geographical fields, Objects and boundaries, Computer representations of geographic information, Organizing one's spatial data, The temporal dimension. Data processing systems: Hardware and software trends, Geographic information systems, Database management systems. Data entry and preparation: Spatial data input, Spatial referencing, Data preparation, Point data transformation, Advanced operations on continuous field rasters. Spatial data analysis: Classification of analytic GIS capabilities, Retrieval, classification and measurement, Overlay functions, Neighbourhood functions, Network analysis. Data visualization: GIS and maps, The visualization process, Visualization strategies: present or explore, The cartographic toolbox, How to map, Map cosmetics, Map output. Data quality and metadata: Basic concepts and definitions, Measures of location error on maps, Error propagation in spatial data processing, Metadata and data sharing.

Suggested Books:

1. The Design And Implementation Of Geographic Information Systems, Wiley, 2004
2. Principles Of Geographic Information Systems, Editor –Rolf A. de by, 2001

IT-5209 (Advance Artificial Intelligence):

Brief History of AI, Cognitive Issues of AI, Hierarchical Model of Thought, Symbolic Intelligence, Research Approaches of Artificial Intelligence. Automated Reasoning, Machine Learning, Distributed Artificial Intelligence, Artificial Thought Model, Knowledge Based Systems Logic Foundation of Artificial Intelligence, Constraint Reasoning, Qualitative Reasoning, Case-Based Reasoning, Probabilistic Reasoning, Inductive Learning, Support Vector Machine, Explanation-Based Learning, Reinforcement Learning, Rough Set, Association Rules, Evolutionary Computation, Distributed Intelligence, Artificial Life: Exploration of Artificial Life, Artificial Life Model, Research Approach of Artificial Life, Cellular Automata, Morphogenesis Theory, Chaos Theories

Reference Books:

1. Advanced Artificial Intelligence, Zhongzhi SHI, World Scientific
2. Artificial Intelligence: Foundations of Computational Agents, David L. Poole and Alan K. Mackworth, Cambridge University Press

IT-5210 (Computational Biology):

Introduction to Computational Genomics, A Spectrum of Computing Issues, Programming and Languages, Operating Systems, Computer Architecture, Computer Networks, Algorithms, Data Structures, Databases, Bio-Computing Technologies, Introduction to UNIX, Introduction to Perl, Introduction to BioPerl, Sequence similarity: local and global alignment, brute-force approach, Needleman-Wunsch algorithm, global alignment, Smith-Waterman algorithm and their complexity analysis, Multiple sequence alignment(MSA): dynamic-programming solution for MSA, center star method, Genome rearrangement: genome rearrangement problem, 4-approximation algorithm, 2-approximation algorithm, Phylogeny reconstruction: Different parsimony problems, Fitch's algorithm, approximation algorithm for the large parsimony problem ultrametric tree UPGMA, Genome Modeling, Gene Prediction Concepts and Techniques, Coding, non-coding, Intron/Exon Boundaries, Promoters, TF Binding sites, UTR Identification, Hidden Markov Models and Domain Finding, Protein Structure Prediction and Analysis, Map Building Methods, Linkage Analysis Algorithms, Tools and Applications, Micro-Arrays and Expression Analysis Methods, Pathway Elucidation Techniques and Tools.

TEXT & REFERENCE BOOKS:

1. Statistical Methods in Bioinformatics : An Introduction - Warren J. Ewens, Gregory R.
2. Bio Informatics Methods and Applications- Rastogi, Mendiratta, Rastogi, PHI
3. Introduction to Bio Informatics- Attwood, Smith, Longman, 1999
4. Bio Informatics Computing - Bryan Bergeron, PHI, 2003

IT-5211 (Advanced Bio-informatics):

Modern Homology Search Techniques: Importance and market needs of homology search. Smith-Waterman, Blast, history, Optimized spaced seeds. PatternHunter, Complexity of finding optimized spaced seeds, Computing spaced seeds, Spaced seeds for coding region and HMM models, Multiple optimized spaced seeds. Approximating Smith-Waterman sensitivity, Protein Identification from MS/MS Data: Proteomics, protein identification, post-translation modification, de novo peptide sequencing. The Sandwich algorithm, Peptide sequencing via database search, Dealing with PTMs, Biomarkers from the mass spec data. Protein 3D Structure Prediction: The needs of protein 3D structure prediction in the pharmaceutical industry, Protein 3D structure prediction is difficult. NP hardness, Protein threading by linear programming.

Gene Finding: Background: gene finding approaches (dynamic programming, HMMs), incorporating homology search (Twinscan, GenomeScan, Exonhunter), comparative gene finding with pair HMMs, alternative splicing, signal finding, length distributions.

Cancer Biomarkers, Inadequate Data, Multiple Explanations: Protein biomarkers via SELDI-TOF technology (covered), When there are too many relevant attributes, too little data, new learning theory to deal with this situation.

Computational Drug Discovery: Modern Drug Discovery, Protein-ligand Interaction, Predictive Modelling, in silico ADMET, Library Design.

Introduction to Genetics, Principles of Population Genetics, Linkage and Recombination, Models for linkage, Genehunter, Superlink, Non-parametric linkage, Hardness results, Approximate Inference, Learning Bayesian networks, HaploBlock.

References:

1. Pavel Pevzner, "Computational Molecular Biology -- an algorithmic approach". J. Setubal and J. Meidanis, "Introduction to computational molecular biology".
2. M. Waterman, "Introduction to computational biology", Chapman & Hall, 1995.
3. Dan Gusfield, "Algorithms on strings, trees and sequences", Cambridge Univ. Press.
4. T. Jiang, Y. Xu, M. Zhang, "Current topics in computational molecular biology",

Option-III

IT-5210 (E-Commerce & E-Governance):

Overview of E-Commerce; Various modes of E-Commerce: B2B, B2C, C2C, B2G; Features, merits and demerits of E-Commerce; E-Commerce business models and concepts, Technology or Tools for enabling E-Commerce; B2B Commerce: Customer support, Supply Chain Management, Electronic Data Interchange; JIT Manufacturing; Online Auction; E-Commerce Business Life Cycle; Security, Legal and Taxation Issues in E-Commerce; Electronic Payment Systems; Ethical, social, and political issues in E-Commerce; Careers and future prospects in E-Commerce.

Introduction to E-Governance; Governance Vs. E-Governance; E-Government at work: e-administration and e-services; e-Democracy; Local e-government. Joined-up Government, National Land & Property Gazetteer (NLPG) - meta-frameworks and interoperability in action- GIS systems, Pathfinder-Beacon councils, Consortia approach - East Lancs Portal, Greater Manchester Fire Service – eFire, Salford City Council - One Stop Shop, eEnvoy, International Perspectives on eGovernment - Focus on Malaysia, US Perspectives on eGovernment, Mayor-led Cities - Evaluation of City in Philippines. e-Governance and democratic governance via the Internet; e-Governance and information systems in public administration and services; Information security and privacy protection; Future directions of e-governance.

References:

TEXT & REFERENCE BOOKS:

1. Douglas E. Comer- *Electronic Commerce*
2. Turban , Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
3. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How to Programe, Prentice hall, 2001
4. Principles of Internet Marketing by Ward Hanson, SouthWestern Publishing, 2000
5. E-Commerce By J. Botha, revised edition, 2004

IT-5211 Advanced Operating Systems

Process Synchronization: Overview, Synchronization Mechanism, Process Deadlocks. Distributed Operating System: Architecture of Distributed System, Theoretical Foundation, Distributed Mutual Exclusion, Distributed Deadlock Detection, Agreement Protocols. Distributed Resource Management: Distributed File System, Distributed Shared Memory, Distributed Scheduling. File Recovery and Fault Tolerance: Recovery, Fault Tolerance. Protection and Security: Resource Security and Protection, Data Security. Multiprocessor Operating System: Multiprocessor System Architecture, Multiprocessor Operating System. Database Operating System: Introduction to Database Operating System, Concurrency Control, Concurrency Control Algorithm.

Suggested Books:

1. Advanced concepts in operating systems - Mukesh Singhal and Niranjan G. Shivaratri,
2. Distributed Systems - Principles and Paradigms, - Andrew S. Tannenbaum and Maarten van Steen
3. Principles of Computer Systems Design by Saltzer and Kaashoek. Morgan Kaufmann.

IT-5212 Computer Vision & Image Understanding

Introduction to Computer Vision: Human and Computer vision, Human vision Systems, Computer vision Systems, mathematical Systems, An Optimization Algorithms for Computer Vision, Basic Methods in Computer Vision, *Image, Sampling and Frequency Domain Processing*: Sensors and Image formation, The sampling criterion, Discrete Fourier Transform, *Transformations*: 2D-2D Transformations, 3D-3D Transformations, 3D-2D Transformations, *Basic Image Processing operations*: Point Operators, Group Operations, Mathematical Morphology, *Low Level Feature Extraction*: Edge detection, Phase Congruency, Localized Feature Extraction, Describing image motion, *High Level Feature Extraction*: Thresholding and Sutraction, Template Matching, Feature Extraction by Low Level Features, Hough Trasform, Deformable Shape Analysis, Active Contours(Snakes), Shape Skeletonization, *Object Description*: Boundary Descriptions, Region Descriptors, *Moving Object Detection and Description*: Moving Object Detection, Tracking Moving Features, Moving Features Extraction and Description, *Object recognition*: SIFT-based object recognition, Model based object recognition, Pose estimation, Pose estimation from lines, SVD, Linear pose estimation, Camera calibration, Stereo vision, Motion segmentation, Deformable models, *Inspection and Robotics Application*.

TEXT & REFERENCE BOOKS:

1. **Feature Extraction & Image Processing for Computer Vision-** Mark Nixon, Alberto S Aguado
2. Computer Vision for Visual Effects - Richard J Radke, Richard J. Radke
3. Fundametal of Machine Vision - Harley R. Myler
4. Foundations of Image Understanding - Larry S. Davis
5. Machine Learning for Audio, Image and Video Analysis: Theory and Applications - Francesco Camastra, Alessandro Vinciarelli

IT-5213 Machine Intelligence & Expert Systems

Machine Intelligence: Definition, Historical background, Implications, Lisp history, Language overview, Getting started with Lisp programming, Lisp lists and other data structures, Lisp control, Advanced function features, Closures, Lisp I/O, Symbols, Numbers, Macros, Common Lisp Object System (CLOS), Advanced Lisp topics, Role of AI and Expert Systems in Engineering. Expert systems: Characteristics, Knowledge representation and reasoning, Knowledge based system, Structured representation of knowledge, Inference techniques, Rule-based expert systems, Monotonic Reasoning, Reasoning Based on Certainty Factors, Knowledge acquisition,

Applications. Engineering Design Synthesis: Decomposition Model for Synthesis, Role of a Synthesizer in KBES Environment, An Architecture for a Synthesizer - A Generic Tool, Generic Synthesis Tool – GENSYNT. Criticism and Evaluation: Methodologies Used in a Knowledge-Based Environment, A Framework for Critiquing and Evaluation, Knowledge Representation Framework, Inference Mechanism, Algorithm for Overall Rating of a Hierarchical Solution, Generic Critiquing Tool – Generic. Case-Based Reasoning: Applications of Case-Based Reasoning, Case-Based Reasoning Process, A Framework for CBR in Engineering Design (CASETOOL), Architecture of CASETOOL. Process Models and Knowledge-Based Systems: Expert Systems for Diagnosis, Blackboard Model of Problem Solving, Conceptual Design of a Car Body Shape, SETHU - An Integrated KBES for Concrete Road Bridge Design, Genetic Algorithms, Artificial Neural Networks. Search Techniques: Problem Definition and Solution Process, Breadth-First Search, Depth-First Search, Heuristic Search, Generate and Test, Best-First Search, Agenda-Driven Search, Problem Decomposition and AND-OR Graphs. Advanced Topics: Support Vector Machines, Clustering, Manifold Learning, Transductions, Ensembles, Recurrent Neural Networks, Spiking Neural Networks.

Suggested Books:

1. "Advanced Paradigms in Artificial Intelligence" by Raymond S. T. Lee, Advanced Knowledge International (May 1, 2006)
2. "Artificial Intelligence and Neural Networks: Steps Toward Principled Integration" (Neural Networks, Foundations to Applications), by Vasant Honavar (Editor), Leonard Uhr (Editor), Academic Press (October 1994)
3. Artificial Intelligence: A new synthesis, Nils J. Nilsson.
4. Artificial Intelligence, Elaine Rich
5. Neural Networks: Algorithms, Applications and Programming techniques, James. A Freeman and David M. Skapura, Pearson Education, 2001
6. Fuzzy Neural Control Principles, Algorithms and Applications, Junhong Nie and Darek A. Limkems.

IT-5214 VLSI

VLSI technology: introduction, Technology trends and design styles. Moore's law, Families of Integration. MOS transistor theory: Introduction to MOSFET, Threshold voltage, Body effect, I-V equations and characteristics, Latch-up problems, PMOS and NMOS inverters, CMOS inverter, Pass-transistor and Transmission gates. CMOS circuit characteristics and performance estimation: Resistance, Capacitance, Rise and fall times, Delay, Gate transistor sizing and power consumption, Noise figure calculation. CMOS subsystem design: Adders, multiplier and memory system, arithmetic logic unit. Programmable logic arrays. I/O systems. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. CMOS Fabrication: Introduction, Fabrication stages, Technology limitations. VLSI verification and Testing: Binary Decision Diagram: Introduction and construction, Reduction rules and Algorithms, ROBDDs, Operation on BDDs and its Algorithms, Representation of Sequential Circuits, Post Silicon debug, Functional vs. Structural Testing Defects, Errors, Faults and Fault Modeling, Fault Equivalence, Fault Dominance, Fault Collapsing and Checkpoint Theorem.

Recommended Books:

1. Basic VLSI Design – Douglas A. Pucknell, Kamram Eshraghian
2. Principles of CMOS VLSI Design – Neil H.E. Weste, Kamram Eshraghian
3. Introduction to VLSI Systems – Carver Mead, Lynn Conway.

4. Essentials of Electronic Testing: For Digital, Memory and Mixed-Signal VLSI Circuits – Michael I. Bushnell, Vishwani D. Agarwal

IT-5215 Advanced Processor Architecture

Parallelism: Instruction level parallelism (ILP) and Machine Parallelism, Thread parallelism and Data Parallelism, A quantitative and qualitative understanding of superscalar and super pipelined architectures, Design Constraints, Dataflow; EPIC, EDGE and VLIW processors; Available parallelism in programs; Out of order instruction execution; Reservation stations; Reorder buffers; Exception handling in out of order processors; Branch prediction techniques; Memory systems for superscalar processors; Performance evaluation of superscalar processors. Vector Processors: Vector Processing Principles, Vector Processor Model, Vector Instruction Types. Advanced Cache Memory: Organization, Memory disambiguation and load/store reordering. Multicore processors and Multi-processor systems: Definition and differences, general architecture, Multiprocessor Interconnection networks: System Interconnect architecture, Network Properties, Interconnection Network Topologies, Static Connection Network, Dynamic Connection Network, Composable distributed processors. Multiprocessor Memory Architectures: Interleaved Memory Organization, Shared-Memory Multiprocessors, Distributed-Memory Multiprocessors. Accelerated Processing Unit (APU): Definition, Graphics Processing unit (GPU), Study of example systems: AMD Accelerated Processing Unit, Intel HD Graphics etc.

Recommended Books:

1. Modern Processor Design: Fundamentals of Superscalar Processors, John P. Shen and Mikko Lipasti, McGraw Hill Publishers.
2. Superscalar Microprocessor Design, by Mike Johnson, Prentice Hall Publishers
3. Computer Architecture: A Quantitative Approach, by Hennessy and Patterson, Morgan Kaufman
4. Computer Organization and Design, Fourth Edition, Fourth Edition: The Hardware/Software Interface, by Patterson and Hennessy, Morgan Kaufman
5. Parallel Computer Architecture: A Hardware/Software Approach by David Culler, J.P. Singh, and Anoop Gupta, Morgan Kaufman

IT-5216 Digital Integrated Systems Design

MOS technology and device fabrication overview: Review of MOSFET transistor device, static and dynamic behavior via analysis and SPICE circuit models and simulations, Review of the CMOS inverter, Designing Combinational Logic Gates, with Layout Design Rules and CMOS Layout Techniques, Scaling and submicron technology issues. Designing Sequential Logic Circuits: Timing Metrics for Sequential Circuits, Classification of Memory Elements, Static Latches and Registers, Dynamic Latches and Registers, Pulse Registers, Sense-Amplifier Based Registers, Pipelining: An Approach to Optimize Sequential Circuits, Non-Bistable Sequential Circuits, Implementation. strategies for Digital ICs: From Custom to Semicustom and Structured-Array Design Approaches, Custom Circuit Design, Cell-Based Design Methodology, Array-Based Implementation Approaches Coping with Interconnect: Capacitive Parasitic, Resistive Parasitic, Inductive Parasitic, Advanced Interconnect Techniques, Introduction to Networks-on-a-Chip (NoC). Timing Issues in Digital Circuits: Timing Classification of Digital Systems, Synchronous Design-An In-Depth Perspective, Self-Timed Circuit Design, Synchronizers and Arbiters, Clock Synthesis and Synchronization Using a Phased-Locked Loop (PLL). Designing Arithmetic Building Blocks: Datapaths in Digital Processor Architectures, The Adder, The Multiplier, The Shifter, Other Arithmetic Operators, Power and Speed Trade-Offs in Datapath Structures. Designing Memory and Array Structures: The Memory

Core, Memory Peripheral Circuitry, Memory Reliability and Yield, Power Dissipation in Memories, Case Studies in Memory Design.

Reference Books:

1. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits, A Design Perspective online", 2nd Edition, Pearson Higher Education
2. W. Wolf, "Modern VLSI Design: Systems on Silicon", Prentice, 2nd Edition, 1998.
3. G.De Micheli, "Synthesis and Optimization of Digital Circuits", McGraw-Hill, 1994.
4. G. Hachtel and F. Somenzi, "Logic Synthesis and Verification Algorithms", Kluwer, 1998.

IT-5217 (Management Information System):

Nature of information systems: nature & type, key characteristics; Nature of organization: nature & type, key characteristics. Two way relationship between is and organization: IS's influence on organization, organization's influence on IS; Introduction to e-business, e-business transformation: models, opportunities and challenges; Defining the organization's need for IS: determining the information need, drawing up a IS plan, IS design alternative, in-house development vs. outsourcing, Enterprise system vs. Functional modules, system lifecycle vs. other methodologies, automation, process improvement, BPR vs. paradigm shift; Cost, benefit, nature of IS investment: determining the cost and benefit of IS, determining the Risk factors, business value of IS investment. Managing the transformation: change management issues, prerequisites for successful change management. Social, Political, and Ethical Issues in the Information Age, Computer Hardware, Computer Software, Managing Data Resources, Telecommunications and Networks, Systems Development, Information Systems Quality, Security, and Control, Decision Support Systems, Artificial Intelligence.

References:

1. "Management Information System: Managing the Digital Firm" , by Kenneth C. Laudon, Jane P. Laudon, Prentice Hall; 8 edition (February 20, 2003)
2. "Management Information System", by Raymond McLeod, Jr. and George Schell, Prentice Hall; 10 edition (May 6, 2006).
3. "Management Information Systems" by James A. O'Brien, George Marakas, McGraw-Hill/Irwin; 7 edition (January 14, 2005).
4. "Introduction to Information Systems Project Management", by David L. Olson, David Olson, McGraw-Hill/Irwin; 2 edition (May 8, 2003).
5. "Management Information Systems for the Information Age with CDROM" by Stephen Haag, Maeve Cummings, Irwin/McGraw-Hill (November 2007).

IT-5218 Leadership & Human resources managements

Introduction to effective leadership - Definitions, Team - developments, monitoring, managements, Training; Choosing the appropriate - leadership style, Nature of Leadership, Major Goals , The Follower, Situational Leadership; Developing a Vision & a Mission - Definition, Purpose, Direction and Destination, Passion, Values, Guidelines or Standards, Vision Plan, Goal, Objectives, Mission plan, Guidelines For Developing A Mission Plan, Communication and Vision, Developing a clear vision, Vision culture; Effective Decision Making - Criteria, Problem - identification, analysis, resolution, implementation; Team Building for Leaders - Group Vs. Team, Team Leader - Leading a team of leaders, Responsibilities, Mission, Goals and Objectives, Team member selection criteria, Communicate team member's responsibilities, Team needs, Motivation, Accountability, Team building benefits, Collective approach to success and failure, Team selection, The team member's function, Identifying training needs, The Benefits Of Diversity, Size, Team communication, Coaching Teams; Motivation - Definition, Action, Desires and needs, Encouraging performance, Morale.

Perspectives in human resource management - Evolution of human resource management, The importance of the human factor, Objectives and role of human resource management, Human resource policies, Computer applications in human resource management; The concept of best fit employee - Importance of human resource planning, Forecasting human

resource requirement, Internal and external sources, Selection process-screening – tests, validation, interview, medical examination, recruitment introduction, importance, practices, socialization benefits; Training and executive development - Types of training, methods, purpose, benefits and resistance. Executive development programmes – common practices, benefits, self development, knowledge management; Sustaining employee interest - Compensation plan, reward, motivation, theories of motivation, career management, development, mentor, protege relationships; Performance evaluation and control process - Methods, feedback, industry practices, Promotion, demotion, transfer and separation, Implication of job change; The control process – importance, methods, Requirement of effective control systems grievances, causes, implications, redressal methods.

References:

1. Decenzo and Robbins, "Human Resource Management", Wilsey, 6th edition,
2. "Dessler Human Resource Management", Pearson Education Limited, 2002.
3. "Mamoria C.B. and Mamoria S. Personnel Management",
4. Wayne Cascio, "Managing Human Resource", McGraw Hill, 1998.
5. Ivancevich, "Human Resource Management", McGraw Hill 2002.

IT-5219 Advanced Software Engineering

Software Development Model: Waterfall Model, Spiral (Incremental) Model, the Unified Development Process, Best Practices. The Universal Modeling Language: UML, Domain and Problem Modeling: Summary, UML Overview, Use Cases, Object Model, Interaction Diagrams, Sequence Diagrams, Collaboration Diagrams: Packages, State Diagrams, Activities. Mapping UML to Code: The Unified Development Process- Model Dynamics, Architecture-Centric Process, Use Case Driven Process, Iterative and Incremental Process, Workflows: Project management Workflow, Inception Workflow, Requirements Workflow, Use cases and Requirements Specifications, Analysis Workflow, Design Workflow, Implementation Workflow, Iteration Workflow, Other Workflows

TEXT & REFERENCE BOOKS:

1. Craig Larman: Applying UML and Patterns, Prentice-Hall.
2. Terry Quatrani: Visual Modeling with Rational Rose 2000 and UML, Addison Wesley.
3. CT Arrington: Enterprise Java with UML, John Wiley.