

**DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY**

**SYLLABI OF COURSES**

**FOR**

**BACHELOR OF  
COMPUTER SCIENCE AND INFORMATION TECHNOLOGY**

**BATCHES: 2007-2008  
2008-2009  
2009-2010**

**NED UNIVERSITY OF ENGINEERING & TECHNOLOGY,  
KARACHI-75270, PAKISTAN**

# BACHELOR OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY SCHEME OF STUDIES

Subject to changes and modifications by the University, the courses of studies for the present batch are as follows:

## SECOND YEAR – Spring Term

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CS - 251	Logic Design & Switching Theory	100	50
2	CT - 251	Object Oriented Programming	100	50
3	CT - 255	Assembly Language Programming	100	50
4	EL - 238	Digital Electronics	100	50
5	HS - 207	Financial Accounting & Management	100	50
6	MS - 271	Ordinary Differential Equations & Complex Variables	100	-

## SECOND YEAR – Fall Term

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CS - 252	Computer Architecture & Organization	100	50
2	CT - 254	System Analysis & Design	100	50
3	CT - 257	Database Management Systems	100	50
4	HS - 208	Business Communications & Ethics	100	-
5	MS - 272	Linear Algebra & Geometry	100	-

## THIRD YEAR – Spring Term

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CS - 352	Digital Communication Systems	100	50
2	CS - 353	Microprocessors & Their Applications	100	50
3	CT - 352	Computer Graphics	100	50
4	CT - 353	Operating Systems	100	50
5	MS - 331	Probability & Statistics	100	50

## THIRD YEAR – Fall Term

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CS - 351	Computer Communication Networks	100	50
2	CT - 354	Software Engineering	100	50
3	CT - 360	Visual Programming	100	50
4	CT - 361	Artificial Intelligence & Expert Systems	100	50
5	CT - 362	Web Engineering	100	50

**FINAL YEAR – Spring Term**

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CT - 452	Modeling & Simulation	100	50
2	CT - 455	Distributed Database Client Server Programming	100	50
3	CT - 456	Data Warehouse Methods	100	50
4	CT - 460	Network & Information Security	100	50
5	CT - 499	*Software Based Project	-	-
6	MS - 471	Applied Numerical Methods	100	50

\* Duration one academic year: Literature survey and preliminary work to be done during this Term.

**FINAL YEAR – Fall Term**

S. No.	Course Code	Title	Marks	
			Theory	Practical
1	CS - 451	Parallel Processing	100	50
2	CT - 454	Compiler Design	100	-
3	CT - 461	E-Commerce	100	50
4	CT - ###	Elective Course	100	50
5	CT - 499	Software Based Project	-	200
		<b>Elective Courses:</b> CT - 481 Wireless Network & Mobile Computing CT - 482 Bio-Informatics CT - 483 System Administration		

## SECOND YEAR

### CT-251 OBJECT ORIENTED PROGRAMMING

(100, 50)

What is an Object, Benefits of OOP; Object Oriented Environment; Class Object; Approach to Object Oriented Programming (from C to C++); Constructor; Destructor; Program Style; Functions; Inheritance, I/O streams, Overloading operations, Programming Examples.

#### Recommended Books:

1. “*Understanding Object Oriented Programming*”, Timothy Budd, Addison Wesley, 3<sup>rd</sup> Edition, 1998.
2. “*C++: How to Program*”, Paul Deitel and Harvey Deitel, Pearson, 7<sup>th</sup> Edition, 2010.
3. “*Object Oriented Programming in C++*”, Robert Lafore, Sams Publishing, 4<sup>th</sup> Edition, 2002.
4. “*C++ Programming: From Problem Analysis to Program Design*”, D.S. Malik, Course Technology, 5<sup>th</sup> Edition, 2010.

### CT-254 SYSTEM ANALYSIS & DESIGN

(100, 50)

Study of conventional and structured techniques, Objectives, investigations, system models, etc. Physical models; Data models; Project dictionary. System design and implementation; tools and techniques; Prototyping; Preparation and handling of data, File organization design, documentation; Implementation and evaluation of information systems, Problems of systems analysis and design; Project management tools and techniques: A case study as assignment.

#### Recommended Books:

1. “*Modern Systems Analysis & Design*”, Jeffrey A. Hoffer, Joey F. George and Joseph S. Valacich, Prentice Hall, 5<sup>th</sup> edition, 2007.
2. “*Systems Analysis & Design*”, Allan Dennis, Barbara H. Wixom and Roberta M. Roth, Wiley, 4<sup>th</sup> Edition, 2008.

### CT-255 ASSEMBLY LANGUAGE PROGRAMMING

(100, 50)

Digital computer organization, machine language, instruction execution, addressing techniques, digital representation of data, symbolic coding and assembly systems; Macros; I/O control; subroutine linkage: System and utility programs, programming techniques; Facilities of operating system; Large number of programming assignments on 80 X 86 based personal computers.

**Recommended Books:**

1. *“Assembly Language Programming and Organization of IBM PC”*, Ytha Yu, 1<sup>st</sup> Edition, McGraw Hill, 1992.
2. *“Assembly Language for Intel Based Computers”*, Kip Irvine, 5<sup>th</sup> Edition, Prentice Hall, 2006.

**CT-257 DATABASE MANAGEMENT SYSTEMS****(100, 50)**

File structures and file testing methods sequential, random and indexed sequential methods. Relational, Networks and Hierarchical data models, Organization, storage and retrieval methods. Functional dependency and normalization of database. Query processing and manipulation. Practical assignments and a project.

**Recommended Books:**

1. *“Database Systems”*, Thomas M. Connolly, Addison Wesley, 4<sup>th</sup> Edition, 2004.
2. *“An Introduction to Database Systems”*, C. J. Date, Addison Wesley, 8<sup>th</sup> Edition, 2003.

**CS-251 LOGIC DESIGN & SWITCHING THEORY****(100, 50)**

Truth Functions: Binary connectives, Evaluation of Truth Functions, Physical realisations, Sufficient set of connectives. Truth Functional calculus. Boolean Algebra, Duality, Fundamental Theorems of Boolean Algebra, Switches and Relays, Logic Circuits, Speed and Delays in Logic Circuits. Minimization of Boolean Functions: Minterm and Maxterm, Karnaugh map, Simplification of Boolean Functions, POS and SOP expressions. Tabular Minimization: Prime Implicants. Sequential Networks: Latches, Fundamental Mode, Synthesis of Sequential Networks, Minimization of the number of states, Clocked networks, Special realizations and codes: Binary adders, Coding of numbers, Decoders and code conversion. ROMS, NAND and NOR Implementation, Parity Checkers.

**Recommended Books:**

1. *“Digital Logic and Computer Design”*, Morris M. Mano, Prentice Hall, 3<sup>rd</sup> Edition, 2003.
2. *“Digital Fundamentals”*, Thomas Floyd, Prentice Hall, 10<sup>th</sup> Edition, 2008.

**CS-252 COMPUTER ARCHITECTURE & ORGANIZATION****(100, 50)**

Computer Evolution, Historical developments, System Buses, RAM, Access Methods, Performance Parameters, Cache Memory, Replacement Algorithms, Mapping Functions, Input & Output, I/O Modules. DMA, Computer Automatic Instruction sets: Characteristics and *Function*, *RISC* Control Unit Operation.

**Recommended Books:**

1. “*Computer Organization & Architecture*”, William Stallings, Prentice Hall, 8<sup>th</sup> Edition, 2009.

**EL-238 DIGITAL ELECTRONICS****(100, 50)**

RTL and DTL circuits, Transistor-Transistor logic, Integrated Injection Logic, MOS & CMOS, Fan-in and Fan-out, Open-collector TTL, gates, three-states, TTL gates, Schottky TTL and Emitter coupled logic, Combinational Logic, Combinational Circuit Design, Analog to Digital and Digital to Analog conversion.

**Recommended Books:**

1. “*Micro Electronics Circuits*”, Adel S. Sedra and Kenneth C. Smith, Oxford University Press, USA, 6<sup>th</sup> Edition, 2009.
2. “*Electronic Devices*”, Thomas L. Floyd, Prentice Hall, 8<sup>th</sup> Edition, 2007.

**MS-271 ORDINARY DIFFERENTIAL EQUATIONS & COMPLEX VARIABLE****(100, \_)**

**Ordinary Differential Equation:** Definitions (differential equation, general solution, particular solution, initial condition, boundary condition, initial homogenous and non-homogenous and non-homogenous differential equations), First order & first degree D.E., solution of non-homogenous linear differential equations with constant coefficients, solution of Euler differential equation, computation of particular integral of non-homogenous differential equations with model problems.

**Partial Differential Equation:** Formation of partial differential equations. Solutions of first order linear and special types of second and higher order differential equations. Homogenous partial differential equations of order one, Lagrange multipliers.

**The Laplace Transforms:** Definitions of Laplace Transforms: Motivation and Examples; Properties and Important Theorems of Laplace Transforms: Computations of Laplace Transforms of Important Functions; Inverse Laplace Transforms and Their Properties; Applications of Laplace Transforms to ODEs.

**Infinite Series:** Application of convergence tests such as comparison, Root, Ratio, Raabe’s and Gauss tests on the behavior of series.

**Fourier Series:** Introduction to Fourier series, Euler Fourier formulae, even and odd functions, application of Fourier series, Fourier transform and fast Fourier transform and properties with applications.

**Complex Variable:** Limit, continuity, zeros and poles of a complex function. Cauchy-Reimann equations, conformal transformation, contour integration.

**Recommended Books:**

1. “*Advanced Engineering Mathematics*”, Erwin Kreyszig, John Wiley & Sons, 9<sup>th</sup> Edition, 2006.
2. “*Differential Equations with Boundary Value Problems*”, Dennis G. Zill and Michael R. Cullen, Thomson Brooks/Cole Publishing, 7<sup>th</sup> Edition, 2009.
3. “*Differential Equations: A modeling Perspective*”, Robert L. Borelli and Courtney S. Coleman, Wiley, 2<sup>nd</sup> Edition, 2004.

**MS-272 LINEAR ALGEBRA & GEOMETRY**

**(100, \_)**

**Linear Algebra:** Linearity and linear dependence of vectors, basis, dimension of a vector space, field matrix and type of matrices (singular, non-singular, symmetric, non-symmetric, upper, lower, diagonal tri-diagonal matrix), Rank of a matrix using row operations and special method, echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, transitions matrix.

**Euclidean Spaces and Transformation:** Geometric representation of vector, norm of vector, Euclidean inner product, projections and orthogonal projections, Euclidean n spaces n properties Cauchy-Schwarz inequality, Euclidean transformations apply geometric transformations to plane figure, composition of transformations.

**Application of Linear Algebra:** Leontief Economic models, Electrical Networks, Scaling, translation, rotation, and projection etc.

**Eigen Values & Eigen Spaces:** Interpret eigen vectors and eigen values of a matrix in terms of transformation it represents, convert a transformation into a matrix eigen value problem, find the eigen values and eigen vectors of order not more than 3x3 matrices algebraically, determine the modal matrix for a given matrix, reduce a matrix to diagonal form and Jordan form, state the Cayley-Hamilton theorem and use it to find powers and the inverse of a matrix, use appropriate software to compute the eigen values and eigen vectors of a matrix, Define quadratic form and determine its nature using eigen values.

**Solid Geometry:** Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions, Transformations (Cartesian to polar)

**Recommended Books:**

1. “*Elementary Linear Algebra: Applications Version*”, Howard Anton and Chris Rorres, John Wiley & Sons Wiley, 10<sup>th</sup> Edition, 2010.
2. “*Advanced Engineering Mathematics*”, Erwin Kreyszig, John Wiley & Sons, 9<sup>th</sup> Edition, 2006.
3. “*Elementary Linear Algebra with Applications*”, Bernard Kolman and David Hill, Prentice Hall, 9<sup>th</sup> Edition, 2007.
4. “*Calculus with Analytic Geometry*”, Howard Anton, John Wiley & Sons, 5<sup>th</sup> Edition, 1995.

## **HS-207 FINANCIAL ACCOUNTING & MANAGEMENT**

**(100, 50)**

Structure of accounting, classification of accounting frame work and its impact on day to day recording events and financial statements. Use of work sheet, the concept and procedures of adjusting and reversing entries, preparation of classified and incorporated income statements, problems of consolidation of financial statements and special procedures of partnerships and corporate according.

### **Recommended Books:**

1. “*Accounting: The Basis for Business Decisions*”, Robert Meigs and Mary Meigs, McGraw-Hill Co., 10<sup>th</sup> Edition, 1996.
2. “*Engineering Economy*”, William G. Sullivan, Elin M. Wicks and C. Patrick Koelling, Prentice hall, 15<sup>th</sup> Edition, 2011.

## **HS-208 BUSINESS COMMUNICATION & ETHICS**

**(100, \_)**

Writing formal and business letters; Writing formal memos; Drafting notices and minutes of meetings; Drafting tender notice; Theoretical knowledge and comprehension of contracts and agreements; Preparing proposals and technical reports; Conducting and writing a project report on a mini research (sessional work); Conducting seminars and interviews; Writing and presenting conference papers; Solving IELTS type papers.

### **Communication Skills**

Ways and means communicating; Using English for describing objects, procedures etc. oral and written language; Importance and elements of effective communication in business (oral and written communication);

Practice in report writing (business reports, documentation related to software engineering); Practice in conducting meetings and writing minutes; Practice in making effective presentations; Writing business letters and memos.

### **Ethics**



Introduction: Objectives of the course; Definitions of (i) a code, (ii) ethics; Defining needs for a code of ethics.

**Need for a Code of Ethics:** For who and why; Review of Code of Ethics of other professional bodies of Pakistan. Summative analysis of ethics for professionals in general.

**Recommended Books:**

1. *“Business Communication”*, Mary Ellen Guffey, South-Western College Pub, 6th edition, 2007.
2. *“Business Communication”*, Kitty Locker, McGraw-Hill/Irwin, 4<sup>th</sup> Edition, 2008.

## THIRD YEAR

### CT-352 COMPUTER GRAPHICS

(100, 50)

Architecture and implementation of display interactive devices; Functional capabilities of graphics package. 2D and 3D viewing , clipping and transformation, human factors; Raster graphics scan conversion algorithms; Hidden surface and edges removal algorithms; Shading and texturing techniques; Application using commercial packages.

**Recommended Books:**

1. *“Computer Graphics using OpenGL”*, Francis S. Hill and Stephen M. Kelley, Prentice Hall, 3<sup>rd</sup> Edition, 2006.
2. *“Schaum’s Outline Series of Computer Graphics”*, Zhigiang Kiang and Roy A. Plastock, McGraw-Hill, 2<sup>nd</sup> Edition, 2000.
3. *“Computer Graphics”*, Francis S. Hill, Prentice Hall, 3<sup>rd</sup> Edition, 2006.
4. *“Computer Graphics”*, Roy A. Plastock, McGraw-Hill, 2<sup>nd</sup> Edition, 2000.

### CT-353 OPERATING SYSTEMS

(100, 50)

Introduction to Operating System, Operating System Structure; Concurrent Processes; CPU Scheduling; Deadlocks, Memory Management; Virtual Memory; File System; Emphasis on Character Base OS (i.e., Dos and UNIX).

**Recommended Books:**

1. *“Operating Systems Concepts”*, Abraham Silberschatz, Peter B. Galvin and Greg Gagne, John Wiley & Sons, 8<sup>th</sup> Edition, 2008.

2. “*Operating Systems: Internals and Design principles*”, William Stallings, Prentice Hall, 6<sup>th</sup> Edition, 2008.
3. “*Modern Operating Systems*”, Andrew S. Tanenbaum, Prentice Hall, 3<sup>rd</sup> Edition, 2007.

## **CT-354 SOFTWARE ENGINEERING**

**(100, 50)**

Evolving role of Software, Definition and need of Software Engineering, Software Development Process, Software Process Models, Project Management concepts – People, Problem and Process, Software project estimations concepts & techniques. Metrics concepts types & their role, Software Quality Assurance, Introduction to Software testing concepts, Brief comparison of conventional methods for Software Engineering and new methods such as Object Oriented Software Engineering.

### **Recommended Books:**

1. “*Software Engineering: A Practitioner’s Approach*”, Roger S. Pressman, McGraw-Hill, 7<sup>th</sup> Edition, 2009.
2. “*Software engineering*”, Ian Sommerville, Addison Wesley, 9<sup>th</sup> Edition, 2010.
3. “*Software Engineering*”, Gregory W. Jones, Wiley, 1990.

## **CT-360 VISUAL PROGRAMMING**

**(100, 50)**

**Prerequisites:** Data Structure, Data and Network Security

**Objectives:** To develop applications using various tools and APIs in visual programming.

Introduction to Windows programming, Use of Windows API, MFC Class hierarchy, Class wizard, Application wizard and Application Studio, Graphics Device Interface, Menus, document view architecture, Multiple Views, files and archiving mechanisms, converting windows programmes to MFC, Sub-classing controls.

### **Recommended Books:**

1. “*Professional C# 2008*”, Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner and Karli Watson, Wrox, 2008.
2. “*C# 3.0: The Complete Reference*”, Herbert Schildt, McGraw-Hill Osborne Media, 3<sup>rd</sup> Edition, 2008.

## **CT-361 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS**

**(100, 50)**

Introduction to Artificial Intelligence, Branches of A.I. Application of A.I. knowledge, types of knowledge, acquisition of knowledge, Knowledge engineering. Problem representation and problem solving strategic, state spaces, searching techniques. Blind search techniques. Informed

search techniques. Knowledge representation techniques. Frames, Scripts, Semantic networks. Implementation of knowledge representation using PROLOG. Fundamental of Expert System. Component of Expert System Developments, Cycle of Expert System. Case studies Elize, Mycin. Natural language processing, Speech processing, Introduction to Robotics, Computer vision, Neural Networks, and Machine learning.

**Recommended Books:**

1. “*Artificial Intelligence: Structures and Strategies for Complex Problem Solving*”, George F. Luger, Addison Wesley, 5 Edition, 2004.
2. “*Artificial Intelligence: A Modern Approach*”, Stuart Russel and Peter Norvig, Prentice Hall, 3<sup>rd</sup> Edition, 2009.

**CT-362 WEB ENGINEERING**

**(100, 50)**

**WWW Technology:** Internet and WWW History; The Internet and Intranets; Web Browsers & Web Servers; Web Application; URLs and navigation; TCP/IP and ports; HTTP Interaction; Client Request and Server Response; MIME; The Dynamic HTTP Protocol; Static vs. Dynamic Content; 3-Tier / n-Applications.

**Web Site - Planning and Development:** Web-site Goals; Planning Stages; Content Development; Site Map Development; Web-Site Design Principles; Making the site easy to navigate; Style Guides; Web-Site Hosting; Web-Site Design Tools; Web Page Programming Tools; Data Processing Tools; Maintaining and Monitoring the Web-Site.

**Client Side Programming:** HTML and DHTML – Tags, Linking, Forms, Event, Dynamic Style, Positioning; Document Object Model; Client Side Scripting Language - Data, Loops, Objects, Methods, Events; Java Script / VBScript; Browsers Variations; Java Script / VBScript Samples; Embedding Multimedia in Web Pages; Using ActiveX in Web.

**Server Side Programming:** Server Side Scripting Language; Web Server Configuration; Java / Active Server – Page Processing, Cookies, Built-in Objects; Web database access; ODBC and JDBC; Active Data Objects; Database Queries – SQL; Data Exchange and Interoperability – XML.

**Concepts of Multimedia:** Multimedia Hardware – Input and Capturing Devices, Output Devices Communication Devices; Multimedia Elements- Text Image Animation, Sound and Video; Text in Multimedia – Fonts. Its Attributes, Character Set, Mapping, Fonts Files: TTF, OTF; Image in Multimedia – Color Types, Compression File Formats: BMP, JPEG, GIF; Sound in Multimedia – Recording Sound, Quality, MIDI, Digital Sound, File Formats: WAV, MP3; Video in Multimedia – Broadcast Standards, Digital Video, Compression, Recording Formats, File Format: AVI, MPEG, MOV.

**Web Tools:** Site Builders- Dreamweaver: Introduction, Working with Layers, Tables, Images, Forms and Frames, CSS, Site Navigation, Working with Layers, Behaviour; Web Animation – Flash: Drawing and Coloring tool, Animation in Flash, Treeing, Getting Interactive, Flash Scripting; File Transference – Cute FTP: Configuring web-site, Logs, Searching Transferring files, Stopping and Resuming, Scheduling.

### **Multimedia Tools**

**Font Editing Tools** – Fontlab: Creating Font, Encoding Glyphs, Transformation, Hinting, Editing Font Metrics, Exporting.

**Image Drawing and Editing Tools** - Photoshop: Layers in Photoshop, Image Modifying and Adjusting, Using Channels, Masks and Action, Working with Filters.

**Sound Editing Tools** – Sound Forge: Sampling, Features, Mixing Sound Files, Recording, Filters.

**Video Editing Tools** – Premier: Video Clipping Joining, Slicing, Manage Time Line.

### **Recommended Books:**

1. “*Web Enabled Commercial Application Development Using, HTML, DHTML, Java Script, Perl, CGI*”, Ivan Bayross, BPB Publications, 2009.
2. “*Principles of Web Design*”, Joel Sklar, Course Technology, 1<sup>st</sup> Edition, 2000.
3. “*Web Engineering: The Discipline of Systematic Development of Web Applications*”, Gerti Kappel, Birgit Proll and Seigfried Reich, John Wiley & Sons, 2006.

## **CS-351 COMPUTER COMMUNICATION NETWORKS**

**(100, 50)**

Introduction to Networking. Networks ISO/OSI reference Model. Performance Models of communication Networks. Design Protocols, Virtual circuit/ datagram. Routing congestion control. Flow control local Networks satellite protocols, Broadcast Networks.

### **Recommended Books:**

1. “*Computer Networks*”, Andrew S. Tanenbaum and David J. Wetherall, Prentice Hall, 5<sup>th</sup> Edition, 2010.

## **CS-352 DIGITAL COMMUNICATION SYSTEMS**

**(100, 50)**

Elements of Modern Digital Communications. Channels, Fundamentals Limitations, Electromagnetic spectrum.

Signal Analysis: Classification, representation of signals. Fourier transform Theory. Baseband systems, filtering, random signal analysis. Probability models of random process.

Analog communication systems. Sampling Theory, Pulse code modulation, time division multiplexing Satellite communication.

Digital communication, Baseband digital transmission. Digital modulation techniques. Data communications. Computer Networks.

Error-control and Coding.

Error correction and detection techniques. Hamming code and Huffman encoding. Linear Block Encoding.

Information Theory.

Entropy, channel capacity. Discrete channels. Hartely Shannon's Law.

**Recommended Books:**

1. "*Communication Systems*", Simon Haykin, Wiley, 5<sup>th</sup> Edition, 2009.
2. "*Digital & Analog Communication Systems*", Leon W. Couch, Prentice Hall, 7<sup>th</sup> Edition, 2006.

**CS-353 MICROPROCESSORS & THEIR APPLICATIONS (100, 50)**

**MPU Architecture and Instrumentation Set:** Introduction, MPU Architecture, Control Signals Instruction set.

**The Instruction Set:** Introduction, Instruction set coding schemes, Addressing Modes, Various Institution Groups.

**System Capabilities:** Interrupt Structure Pooling, Vectoring, Memory Mapped and Isolated I/O, Interrupt Handling and Considerations in the implementation of interrupts Address Decoding DMA & DMA chips, Parallel & Serial I/O.

**Interfacing:** Programmable Parallel Ports & Hand shake I/O D/A Converter operation. Interfacing & Application, A/D converter Specification, types and interfacing.

**Application:** Process control systems, Instrumentation, Robotics, DSP & Digital Filters, Introduction to current generation of Microprocessors.

**Recommended Books:**

1. "*Intel Microprocessors*", Bary B. Brey, Prentice Hall, 8<sup>th</sup> Edition, 2008.
2. "*The Intel Family of Microprocessors: Hardware and Software Principles and Applications*", James L. Antonakos, Delmar Cengage Learning, 1<sup>st</sup> Edition, 2006.

## **MS-331 PROBABILITY & STATISTICS**

**(100, 50)**

Basic concepts of statistics; Sample space, events, classical and axiomatic definition of probability; Conditional probability and Bayes theorem; Binomial, Poisson and Normal distributions; Moment generating functions; Central limit theorem; Sampling theory; Estimation methods; Points and interval estimations; Estimating proportions and difference of two proportions; Test of hypothesis; Type I and II errors; One and two tails tests; Linear regression Correlation and regression analysis.

### **Recommended Books:**

1. *“Probability & Statistics for Engineers and Scientists”*, Ronald E. Walpole and Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall, 8<sup>th</sup> Edition, 2006.
2. *“Applied Statistics & Probability for Engineers”*, Douglas C. Montgomery, 4<sup>th</sup> Edition, 2006.

## **FINAL YEAR**

### **CT-452 MODELING AND SIMULATION**

**(100, 50)**

Performance Modeling and Evaluation, Bench Marking, Performance Evaluation of High Parallel Systems Architecture. Application of Performance Evaluation.

Measurement Techniques, Hardware Monitoring, Software Monitoring, Hybrid Monitoring

Fundamentals of Queuing Models.

Structure and performance parameters. Operational Analysis of Queuing Models. General features of Queuing Models. Birth and Death process M/M/1 and M/G/1 systems. Dependability Modeling.

Analysis of Reliable, Available and High Assurance systems. Fault-tolerant Techniques. Software Reliability Modeling.

Petri Net-Based Performance Modeling. Classical Petri Nets. Discrete, Timed Petri Nets. Generalised Stochastic Petri Nets. Modeling of multiprocessors systems.

### **Recommended Books:**

1. “*Theory of Modeling and Simulation*”, Bernard P. Ziegler, Herbert Praehofer and Tag Gon Kim, Academic Press, 2<sup>nd</sup> Edition, 2000.
2. “*A First Course in Mathematical Modeling*”, Frank R. Giordano, Cengage/Brooks Publishing, 3<sup>rd</sup> Edition, 2003.
3. “*Simulation Modeling and Analysis*”, A. M. Law and W. D. Kelton,
4. “*Mathematical Modeling and Simulation: An Introduction for Scientists and Engineers*”, Kai Velten, Wiley-VCH, 2009.
5. “*Distributed Simulation*”, John A. Hamilton, David A. Nash and Udo W. Pooch, CRC Press, 1<sup>st</sup> Edition, 1997.

#### **CT-454 COMPILER DESIGN**

**(100, \_)**

Basic Concept; Input and Lexical Analysis; Context Free Grammar; Top-Down Parsing; Bottom-Up Parsing; Code Generation; Automata theory; Optimization Strategies, Support Functions, Working Problem in Compiler Design.

##### **Recommended Books:**

1. “*Compilers: Principles, Techniques and Tools*”, Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, Addison Wesley, 2<sup>nd</sup> Edition, 2007.
2. “*Modern Compiler Design*”, Dick Grune, Henri E. Bal, Criel J. H. Jacobs and Koen G. Langendoen, Wiley & Sons, 2<sup>nd</sup> Edition, 2010.

#### **CT-455 DISTRIBUTED DATABASE CLIENT SERVER PROGRAMMING**

**(100, 50)**

Advantages and disadvantages of Distributed Database (DDB); Database Security Issue; Design Approach of DDB; Internet Addressing, Low-level Communication using UDP; Connecting to Server using TCP; Connecting to an SMTP Mail Server; Connecting to an HTTP Web Server; WWW support via Class URL; Writing Server Programs using Server Socket.

##### **Recommended Books:**

1. “*Principles of Distributed Database Systems*”, M. Tamer Ozsu, Brooks/Cole Cengage Learning, 3<sup>rd</sup> Edition, 2003.
2. “*Distributed Database Management Systems: A Practical Approach*”, Saeed K. Rahimi and Frank S. Haug, Wiley- IEEE Computer Society, 2010.

#### **CT-456 DATA WAREHOUSE METHODS**

**(100, 50)**

Introducing the Data warehouse; The Data warehouse Methods; Quality Data warehouse process; Data warehouse Methodology; Data warehouse Administration; Performance Management, Managing the Data warehouse, Data warehouse Project Management; Data Handling: Distribution and Transformation; Data Integration and Data Semantics; Data Warehouse Architecture; Meta data, Types of Meta data, control change control in the Data warehouse

### **Recommended Books:**

1. *“Data Warehousing Fundamentals”*, M. Tamer Ozsu, Brooks/Cole Cengage Learning, 3<sup>rd</sup> Edition, 2003.
2. *“Data Mining Concepts and Techniques”*, Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufman Publishers, 2<sup>nd</sup> Edition, 2005.

## **CT-460 NETWORK & INFORMATION SECURITY**

**(100, 50)**

Introduction to simple Cryptosystems and their Cryptanalysis

Shift, Substitution, Affine, Vigenere, Hill, Permutation and stream ciphers.

Shannon’s Theory

Elementary Probability theory, entropy, perfect secrecy, unicity distance.

Block Ciphers and Advance Encryption Standard

Chaining; Substitution-permutation networks, Feistel networks; Linear cryptanalysis of an SPN.

Cryptographic hash functions

Security requirements, collisions; Security uses: passwords, message and data integrity, notaries; MD5, SHA; Message authentication codes; Birthday attack.

The RSA Cryptosystems

Primes, GCDs and the Extended Euclidean Algorithm, modular exponentiation and inverses, Euler totient function, Euler’s theorem, Introduction to public-key cryptography; RAS: basic implementation details.

Digital signature schemes

E1Gamal, DSA; Elliptic Curve DSA; One-time Signatures, Undeniable Signatures Zero-Knowledge proofs, Bit communication; Pseudorandom number generation.

Network communication concepts.

Network overview, specific networking protocols, transmission media and networking hardware.



Optimizing and fine tuning for performance

Ways to speed up an existing server, Stress testing techniques. Threat of computer crimes.

Network security issues

Techniques to increase security, Internet related security issues.

Trouble shooting and preventive maintenance

Basic element of troubleshooting, hardware troubleshooting tools, Software troubleshooting tools, Diagnosing real world problems, Troubleshooting the physical network, Troubleshooting WANS.

### **Recommended Books:**

1. "*Cryptography Theory & Practice*", Douglas R. Stinson, Chapman & Hall/CRC, 2<sup>nd</sup> Edition, 2002.
2. "*Network Security Fundamentals*", Peter Norton and Mike Stockman, Sams, 1<sup>st</sup> Edition, 1999.
3. "*Network Security: A Beginners Guide*", Eric Maiwald, McGraw-Hill Osbourne, 2<sup>nd</sup> Edition, 2003.
4. "*Network Security Bible*", Eric Cole, John Wiley & Sons, 2<sup>nd</sup> Edition, 2009.

## **CT-461 E-COMMERCE**

**(100, 50)**

**Introducing E-Commerce:** E-Commerce and E-Business Overview; Internet History and E-Commerce Development; Business-to-Business E-Commerce; Business-to-Consumer E-Commerce; E-Commerce Stages and Processes; E-Commerce Challenges and Opportunities

### **Internet Hardware, Software and Communication**

Hardware - Servers, Communications Media, Storage Area Networks (SANs).

Connecting to the Internet - DSL, Broadband, ISDN, T-1 and T-3 Lines.

Software - Application Service Providers (ASPs), Databases.

Operating Systems - UNIX, Microsoft Windows, Linux, Mac OS X.

Enhancing Business Communication - Intranets and Extranets, Streaming Audio and Video, Internet Telephony, Web Casting and Web Conferencing.

### **E-Commerce Technologies**

Generic trade cycles.

Electronic Markets- Electronic markets, the trade cycle Advantages and Disadvantages.

Electronic Data Interchange - EDI trade cycle, Benefits of EDI, EDI standards, EDI communications, EDI implementation, EDI privacy and security, EDI and business, EDI trading patterns.

Internet Commerce.

## **E-Commerce with Business Perspective**

The Value Chain - The supply chain, e-commerce in the value chain.

Competitive advantage - IT and competitive advantage, IT and competitive advantage cases.

Business strategy - Corporate strategy, Strategy formulation, Business environment, e-Commerce implementation, e-Commerce facilities for business.

Inter-Organisational Transactions - Inter-organisational transactions, Credit transaction trade cycle, variety of transactions, Inter-organizational e-Commerce.

Consumer Trade Transactions - Internet e-Commerce, the e-Shop, Internet Shopping, the Trade Cycle e-Commerce sales.

## **The Elements of E-Commerce**

E-Visibility - Site Name, Conventional Advertising, Portals, Malls, Search Engines.

E-Shop - Online information, customer registration, site navigation, product database

Order Processing.

Online Payment - Credit Cards, e-Cash and other.

Security - encryption, SSL, digital signatures.

Delivery System - E-fulfillment.

After-Sales Services.

**Internet Marketing:** Online and Offline Market Refresh; Data Collection; Domain Names; Advertising Option; E-Mail Marketing; Search Engines; Web-Site Monitoring.

**Online Monetary Transaction:** Electronic Payment Issues; E-Cash; E-Wallets; Credit Card Issues; Merchant Accounts; Online Payment Services; Transaction Processing; Taxation Issues; Developing Payment Standards

**Internet Security:** Security Issues and Threats; Security Procedures; Encryption; Digital Certificates; Digital Signature; Security Protocol - SSL and SET Technologies; Authentication and Identification; Security Providers; Privacy Policies; Legal Issues.

**Customer Service:** Customer Service Issues; Frequently Asked Question (FAQ) Pages; E-Mail Support; Telephone Support; Live Help Service; Customer Discussion Forums; Value-Added Options.

## **Legal, Social and Global Issues**

Legal Issues - Privacy on the Internet, Tracking Devices, Employer and Employee, Protecting your Business, Intellectual Property: Patents and Copyright, Trademark and Domain Name Registration, Children and the Internet.

Social Issues - Online Communities, Online Activism, Disabilities and the Web.

Global Issues - Intent Taxation, Creating an e-Business with Global Capabilities.

## **Recommended Books:**

1. “*e-Business and e-Commerce How to Program*”, Harvey M. Deitel, Paul J. Deitel and Tem R. Neito, Prentice Hall, 2000.
2. “*The Complete E-Commerce Book*”, Janice Reynolds, CMP Books, 2<sup>nd</sup> Edition, 2004.

**CT-499 SOFTWARE-BASED PROJECT ( , 200)**

Market oriented Software Project, spread over two semesters.

**CS-451 PARALLEL PROCESSING (100, 50)**

Parallelism in microprocessor, Architectural classification schemes, Principles of pipelining and vector processing, Array Processors, Multiprocessor Architecture and Parallel algorithms, Introduction to Dataflow computers.

**Recommended Books:**

1. “*Advanced Computer Architecture: a Design Space Approach*”, Dezsó Sima, Terrence Fountain and Peter Karsuk, Pearson Education, 1<sup>st</sup> Edition, 1997.
2. “*Introduction to Parallel Computing*”, Ananth Grama, George Karipis, Vipin Kumar and Anshul Gupta, Addison Wesley, 2<sup>nd</sup> Edition, 2003.

**MS-471 APPLIED NUMERICAL METHODS (100, 50)**

**Error Analysis:** Types of errors (relative, absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any Computational tools to Analyse the Numerical problems.

**Linear Operators:** Functions of operators, difference operators and the derivative operators, identities.

**Difference Equations:** Linear homogeneous and non homogeneous difference equations.

**Solution of Non-Linear Equation:** Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton-Raphson Chebyshev and Graeffe’s root squaring methods), rate of convergence and stability of an iterative method.

**Solution of Linear Equation:** Numerical methods for finding the solutions of system of linear equations (Gauss- Elimination, Gauss-Jordan Elimination, triangularization, Cholesky, Jacobi and Gauss – Seidel).

**Interpolation & Curve Fitting:** Lagrange's, Newton, Hermit, Spline, least squares approximation (linear and non-linear curves).

**Numerical Integration & Differentiation:** Computation of integrals using simple Trapezoidal Rule  $\frac{1}{3}$ rd, Simpson's Rule  $\frac{3}{8}$ th, Simpson's rule, Composite Simpson's and Trapezoidal Rules, computation of solutions of differential equations using ( Euler method, Euler modified method, Runge Kutta Method of order 4).

**Linear Programming:** Formulating problems, linear programming models, graphical methods, simplex method.

**Improper Integrals:** Definitions, types of improper integrals and their convergence.

**Elliptic Integrals:** Introduction and identification of elementary elliptic integrals of first, second and third kinds, Simple applications.

**Recommended Books:**

1. "Applied Numerical Analysis", Curtis F. Gerald and Patrick O. Wheatley, Pearson Education, 7<sup>th</sup> Edition, 2003.
2. "Numerical Methods for Engineers", Steven C. Chapra and Raymond P. Canale, McGraw-Hill Higher Education, 6<sup>th</sup> Edition, 2010.
3. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley & Sons, 9<sup>th</sup> Edition, 2005.

**ELECTIVE COURSES**

Choice of one of the following three courses: CT-481, CT-482 or CT-483.

**CT- 481 WIRELESS NETWORKS & MOBILE COMPUTING (100, 50)**

- Introduction to wireless communication system
- First, second and third generation wireless networks (AMPS, IS-95, IS-136, GSM,GPRS,WCDMA, etc)
- Network layer issues and protocols-Mobile IP, addressing & routing for mobile system.
- Wireless LANs: safety, security, cost IEEE802.11 and ETSI Hyper LAN Physical layer: spread spectrum and infrared. High speed wireless LAN developments. Bluetooth technology and applications.
- Transport and Application layer protocols: WAP and beyond
- Mobile agents, architectures and configurations.
- OS for mobile devices (such as WinCE, Palm OS, Symbian, MS Smartphone....etc).
- APIs for mobile devices, (such as J2ME, .NET, MIDlets). APIs for mobile communications.
- UML design and patterns for mobile applications.

- Software architectures and middleware for mobile enabled distribution systems.
- Project management and testing strategies.
- Security and maintenance of mobile computing system.

#### **Recommended Books:**

1. “*Wireless Communication: Principles and Practice*”, Theodore S. Rappaport, Prentice Hall, 2<sup>nd</sup> Edition, 2002.
2. “*Mobile Communications*”, Jochen Schiller, Addison Wesley, 2<sup>nd</sup> Edition, 2003.

### **CT-482 BIO-INFORMATICS**

**(100, 50)**

#### **Pre-requisites**

Biological knowledge: Biochemistry, Molecular Biology.

Mathematical: Single Variable Calculus, Probability and Statistics.

Computing Knowledge: Basic Programming Skills (Java, SQL) Database, Windows and Unix operating systems.

#### **Fundamentals of Bioinformatics**

Aim: To provide an overview of bioinformatics (what it is, why it is needed, and what it promises to deliver).

- Information to bioinformatics.
- Biological database – developing, implementing and querying database system, mining data using SQL.
- Protein structure – 3D structure, sequence patterns and characteristics, protein structure prediction and comparison.
- Analysis of gene sequence.

#### **Statistical methods in bioinformatics**

Aim: To provide students with the mathematical knowledge and skills required to understand and implement bioinformatics algorithms.

- Revision of basic mathematics.
- Vectors and matrices.
- Multivariate statistics – particularly exploratory methods and pattern recognition.

#### **Bioinformatics Algorithms and Tools**

Aim: To introduce the most important bioinformatics software tools, and explain the algorithms that underpins them.

- Visualisation of sequence data
- Pair wise and Multiple sequence alignment.

- Homology searching – including BLAST.
- Gene expression informatics.
- Introduction to gene finding.

### **Applications and Commercial Aspects of Bioinformatics**

Aim: to outline the current and potential applications of bioinformatics and the legal, ethical and commercial aspects of using biological data.

- Visualisation of sequenced data.
- Drug discovery.
- Genetic basis of disease.
- Personalised medicine and gene-based diagnostic.
- Legal, ethical and commercial ramification of bioinformatics.

### **PERL Programming**

Aim: To provide students with the ability to program in PERL, the most popular programming language in the bioinformatics community.

PERL Programming for:

- Data manipulation.
- File maintenance.
- Pipelining.
- Packaging and interfacing system facilities.

### **Analysis of Microarray Data**

Aim: Massive amounts of data are generated from Microarray data. Analytical and Statistical methods required to explore the relationship between genes and to reveal patterns of expression.

- Experimental design and normalization.
- Differential Expression, Filtering and Clustering.
- Functional Analysis and Visualisation.

### **Recommended Books:**

1. *“Introduction to Bioinformatics”*, Arthur M. Lesk, Oxford University Press, 3<sup>rd</sup> Edition, 2008.
2. *“Bioinformatics”*, T. Charlie Hodgman, Andrew French and David R. Westhead, T & F Books, UK, 2<sup>nd</sup> Edition, 2010.
3. *“Bioinformatics for Dummies”*, John Wiley & Sons, Inc., 2007.
4. *“Bioinformatics: The Machine Learning Approach”*, Pierre Baldi and Soren Brunak, MIT Press, 2001.

## **CT-483 SYSTEM ADMINISTRATION**

**(100, 50)**

Course outline: A survey of the tools and techniques used in the administration of computing system, System installation, booting and halting the system, file systems and directory permission structures, print and disk quotas, device configuration and management, user account administration, security, client administration, disk maintenance, remote access, remote administration, the use of schedulers, and the use of advanced scripting to ease system administration tasks.

### **Recommended Books:**

1. *"The Practice of System and Network Administration"*, Thomas S. Limoncelli, Christina J. Hogan and Strata R. Chalup, Addison Wesley, 2<sup>nd</sup> Edition, 2007.
2. *"Principles of Network and System Administration"*, Mark Burgess, John Wiley & Sons Ltd., 2<sup>nd</sup> Edition, 2004.
3. *"Handbook of Network and System Administration"*, Jan Bergstra and Mark Burgess, Elsevier, 1<sup>st</sup> Edition, 2007.