

University of Peshawar
Department of Computer Science
UNDERGRADUATE CURRICULUM
BCS

A Student majoring in Bachelor in Computer Science (BCS) must complete minimum of 120 Credit Hours courses. The courses list is as follows:

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Semester I		
Course #	Title	Cred.Hrs.
BCS111	Fundamentals of Computers.	3
BCS112	Mathematics-I	3
BCS113	Probability and Statistics	3
BCS114	Functional English	3
BCS115	Programming Concepts	4
		16
Semester II		
Course #	Title	Cred.Hrs.
BCS121	Programming Languages-IC	4
BCS122	Mathematics-II	3
BCS123	Physics	3
BCS124	Discrete Mathematics	4
BCS125	Pakistan Studies/Islamic studies	3
		17
Semester III		
Course #	Title	Cred.Hrs.
BCS231	Digital Logic Design	3
BCS232	Database-I	4
BCS233	Data Structures	3
BCS234	Business Communication	3
BCS235	Electronics	3
		16
Semester IV		
Course #	Title	Cred.Hrs.
BCS241	Database-II	3
BCS242	Programming Languages-II	4
BCS243	Operating Systems	4
BCS244	Computer Organization and Assembly Language Programming	3
BCS245	Data Communications and Networking	4
		18
Semester V		
Course #	Title	Cred.Hrs.
BCS 351	Internet Programming	3
BCS352	Artificial Intelligence	3
BCS353	Analysis of Algorithms	3
BCS354	Programming Languages-III	4
BCS355	Software Engineering-I	3
BCS356	Network Strategies	3

		19
SemesterVI		
Course #	Title	Cred.Hrs.
BCS361	Computer Architecture	3
BCS362	Numerical Analysis	3
BCS363	Automata Theory	3
BCS364	Computer Graphics	4
BCS365	Software Engineering-II	3
		16
SemesterVII		
Course #	Title	Cred Hrs
Compulsory		
BCS471	Compiler Construction	3
BCS472	Wireless and Mobile Communications	3
BCS473	Software Project-I	3
Elective (any two)		
BCS474	Digital Signal Processing	3
BCS475	E-Commerce Applications & Technologies	3
BCS476	Expert Systems	3
BCS477	Data Mining and Data Warehousing	3
BCS478	Management Information System	3
BCS479	Distributed Computing	3
Total Semester Cred Hrs		15
SemesterVIII		
Course #	Title	Cred Hrs
Compulsory		
BCS481	Software Project Management	3
BCS482	Natural Language Processing	3
BCS483	Software Project-II	3
Elective (any two)		
BCS484	Digital Image Processing	3
BCS485	Network Security	3
BCS486	Modeling and Simulation	3
BCS487	Database Administration	3
BCS488	Telecommunication systems	3
BCS489	Multimedia Technologies	3
Total Semester Cred Hrs		15

Note:

1. Only those elective courses will be offered whose teaching staff will be available.
2. Students can select any of the two offered elective courses of their choice.
3. Only those elective courses will be offered whose students' strength will be 10 or above.

(The courses and semester plan can be modified subject to the decision of board of studies.)

Computer Science Courses

Compulsory subjects			
S.No.	Title	T/Credits	
1.	Fundamentals of Computers	3	
2.	Programming Concepts	4	
3.	Programming Languages-I	4	
4.	Digital Logic Design	3	
5.	Database-I	4	
6.	Data Structures	3	
7.	Database-II	3	
8.	Programming Languages-II	4	
9.	Operating Systems	4	
10.	Computer Organization and Assembly language Programming	3	
11.	Data Communications and Networking	4	
12.	Internet Programming	3	
13.	Artificial Intelligence	3	
14.	Analysis of Algorithms	3	
15.	Programming Languages-III	4	
16.	Software Engineering –I	3	
17.	Network Strategies	3	
18.	Computer Architecture	3	
19.	Automata Theory	3	
20.	Computer Graphics	4	
21.	Software Engineering –II	3	
22.	Compiler construction	3	
23.	Wireless and Mobile communication	3	
24.	Software Project Management	3	
25.	Natural Language Processing	3	
26.	Software Project-I	3	
27.	SoftwareProject-II	3	
	Cred Hrs of Compulsory Courses	89	
Elective subjects (6 credit hours in semester 7 and 6 credit hours in semester 8)			
	Digital Signal Processing		
	E-Commerce Applications & Technologies		
	Expert Systems		
	Data Mining and Data Warehousing		
	Management Information System		
	Distributed Computing		
	Digital Image Processing		
	Network Security		
	Modeling and Simulation		
	Database Administration		
	Telecommunication System		
	Multimedia Technologies		
	Cred Hrs of Elective Courses (four to be chosen)		12
	Total Cred. Hrs of Computer Science courses		101

Mathematics Courses

S.NO.	Title	T/Credits
1.	Mathematics-I	3
2.	Discrete Mathematics	4
3.	Mathematics-II	3
4.	Statistics & Probability	3
5.	Numerical Analysis	3
	Total Cred. Hrs of Mathematics courses	16

Natural Sciences Courses

S.NO.	Title	T/Credits
1.	Physics	3
2.	Electronics	3
	Total Cred. Hrs of Natural Sciences courses	6

Social Sciences Courses

S.NO.	Title	T/Credits
1.	Functional English	3
2.	Pakistan Study/ Islamic Studies	3
3.	Business Communication	3
	Total Cred. Hrs of Social Sciences courses	9

**Department of Computer Science
University of Peshawar**

UNDERGRADUATE CURRICULUM

BCS

Code: BCS111

Credit Hours:3

Fundamentals of Computers

Basic of Computer

- a) Introduction and history of Computers.
- b) Types of Computer
- c) Computer Organization

Computer Software

- a) Software Introduction
- b) Types of Software
- c) PC Platform.
- d) Computer Virus.

Data Processing and Storage

- a) Data Processing Techniques
- b) Data Storage (Bit, Byte, RAM, ROM, cache Memory, Secondary Storage (FDD, HDD, Tape, CD).

The Processor

- a) Bus, Port
- b) Computer Motherboard.
 - 1. Microprocessor
 - 2. Math Co-processor
 - 3. Memory Chip
 - 4. Support Chips
 - 5. Built-in programs
 - 6. Expansion Slots

Input and Output Devices.

- a) Input Devices
 - 1. Keyboard and its types
 - 2. Point and Draw devices
 - 3. Scanner, Digital Camera, Speech recognition system and multimedia
- b) Output Devices
 - 1. Monitor(Graphic Adopter, Size, Resolution and Types of Monitors)
 - 2. Printers and Types (Dot matrix, inkjet and laser)
 - 3. Plotters (Raster and Pen)
 - 4. Presentation Graphics and special function terminals (ATMs POSs)

Windows

- a) Windows Introduction
- b) Finding Files, Installing Printers
- c) The Desktop and types of windows(application, document, dialog)
- d) Elements of an application window

- e) Understanding folders, copying, detecting and moving files

Word Processing (MS Word)

- a) Basic concepts and features
- b) Creating, saving, editing, formatting and printing documents
- c) Working with Tables

Electronic Spreadsheet (MS Excel)

- a) Basic concepts and features
- b) Creating, saving Excel sheet, editing the sheet
- c) Managing formula, formatting the sheet and printing the sheet
- d) Working on workbook

Basics of Internet usage

- a) Introduction
- b) World Wide Web and Web sites
- c) Introduction to Internet based services and use of E-mail.

Books:

1. Sawyer, William, Hutchinson, *Using Information Technology*, 2nd Edition, McGraw Hill, 2000.
2. J. Glenn Brookshear, *Computer Science: An Overview*, 8th Edition, Addison-Wesley, 2005.
3. Timothy J. O'Leary, Linda I. O'Leary, *Computing Essentials*, 15th Edition, McGraw-Hill's Primitives Custom Publishing, 2004

Code: BCS112

Credit Hours: 3

Mathematics-1(Calculus-1)

Real and Complex Numbers

- a) Real Numbers
- b) Complex numbers

Functions, Limit and Continuity of a function.

- a) Functions
- b) Graphs
- c) Sequences
- d) Limit and Continuity of a function of one variable

Differentiation-I

- a) Differentiation
- b) Product and Quotient Rules
- c) Tangent
- d) Normal

Differentiation-II

- a) Chain Rule
- b) Implicit differentiation

Application of Differentiation-1

- a) Roll's and Mean Value Theorem
- b) Taylor's Theorem
- c) Maclaurin's Theorem

Application of Differentiation-II

- a) Newton's and Picard's method and its application
- b) Maxima
- c) Minima

Indeterminate forms

- a) L'Hospital's Rule
- b) Application of L'Hospital's Rule

Integration

- a) Basic Integration
- b) Integration by identities
- c) Integration by substitutions
- d) Integration of trigonometric functions
- e) Integration by parts

Application of Integration

- a) Area and Volume by integration
- b) Differential Equations (Separable variables techniques)

Books:

1. Anton Howard, *Calculus*, John Wiley & Sons Inc, 1999.
2. George B. Thomas, Ross L. Finney, Maurice D. Weir, Frank R. Giordano, *CALCULUS*, 10th Edition, Addison Wesley Publishing Company, 2002.

Code: BCS113

Credit Hours: 3

Probability and Statistics**Introduction**

- a) Meaning of statistics
- b) Importance of statistics in various fields
- c) Population and Sample
- d) Variables
- e) Statistical data

Statistical Measures of Data

- a) Measures of Central Tendency, Mean, Median, Mode and quartiles
- b) Measures of Variation: Range, Standard Deviation, Variance and Coefficient of Variation.

Sets and Probability

- a) The concept of a Set
- b) Set Operations and Algebra of Sets
- c) Permutations and Combinations
- d) The Concept of Probability
- e) Theorems of Probability
- f) Conditional Probability

Random Variables and Probability Distribution

- a) Concepts of a Random Variable
- b) Discrete Probability Distributions
- c) Continuous Probability Distributions
- d) Joint Distribution of two random variables
- e) Mathematical Expectations

Special Probability Distributions

- a) Binomial Distribution
- b) Poisson Distribution
- c) Hypergeometric Distribution
- d) Uniform Distribution

- e) Normal distribution

Sampling Theory

- a) Sampling Distribution
- b) Sampling Distribution of the Mean
- c) Sampling Distribution of the differences of means
- d) Sampling Distribution of Proportions
- e) Sampling Distribution of the Difference of Proportions

Statistical Inference

- a) Point estimation
- b) Properties of a good estimator
- c) Confidence Intervals
- d) Statistical Hypothesis
- e) Testing a Statistical Hypotheses Tests Concerning Means
- f) Tests Concerning Means
- g) Tests Concerning Difference between two Means
- h) Goodness of Fit Test and Test for Independence

Simple Linear Regression and Correlation

- a) Simple Linear Regression
- b) Least Squares estimation of the Regression Parameters
- c) Inference concerning the Regression Coefficients
- d) Linear Correlation
- e) The coefficient of correlation
- f) Properties of the coefficient of correlation

Books:

1. *Ronald E. Walpole, Introduction to Statistics, Latest edition, Macmillan Publishing Co. Inc. New York, 1999.*
2. *I. Miller and J.E Freund, Probability and Statistics for Engineers, 4th Edition, Prentice Hall, 1990.*

Code: BCS114

Credit Hours:3

Functional English

Function Asking and answering questions

- a) Structure The Present perfect
- b) Reading Guessing the meanings of words
- c) Writing Informal letters: beginning and ending
- d) Listening Understanding directions

Function Seeking Agreement and Confirmation

- a) Structure The Present Perfect and simple past tense
- b) Reading Guessing the meanings of words
- c) Writing Joining Sentences
- d) Listening Listening to a narrative account

Function Agreeing and Disagreeing

- a) Structure Reported Speech
- b) Reading Predicting
- c) Writing Informal letters
- d) Listening Giving advice

Function **Possibility/Impossibility**

- a) Structure Conditionals
- b) Reading Skimming and Scanning
- c) Writing Formal letters
- d) Listening Listening to talk/lecture

Function **Certainty/Uncertainty: obligations**

- a) Structure The Passive
- b) Reading Function in a text
- c) Writing Formal letters
- d) Listening Listening to an interview

Function **Preferences/Interactions**

- a) Structure The ing form
- b) Reading Reading the main idea and supporting details in text
- c) Writing Formal letters
- d) Listening Listening to a talk/lecture

Function **Permission**

- a) Structure The Past Perfect and future perfect tense
- b) Reading Classification
- c) Writing Applying for a job
- d) Listening Listening to a radio broadcast

Function **Appreciation, regret and indifference**

- a) Structure Relative Clauses
- b) Reading Thematization
- c) Writing Note Taking
- d) Listening to an argument

Function **Suggesting/Warning**

- a) Structure Relative Clauses
- b) Reading Facts and Opinion
- c) Writing Summarizing
- d) Listening Listening to a story.

Books:

CA Exams Study Text: Modular Foundation Examination Module-A Paper A1 Functional English, 3rd Edition, Professional Business Publications, Lahore, Pakistan, 2000.

Code: BCS115

Credit Hours: 4

Programming Concepts**Introduction to Computer Program**

- a) Computer program concepts, High level languages, 4 GL
- b) Editor, Compiler, Source Program, Object Program

Computer Program Engineering

- a) Introduction, problem solving techniques, qualities of a good program
- b) Program life cycle

Computer Program Basics

- a) Basic program structure, (Input, Output, process)
- b) Constant, Variable, data types, operators, expression, statement

I/O and Debugging

Input/Output statements, debugging procedures, errors logical, syntax

Transfer of control structures

- a) Conditional/Conditional
- b) Simple decision (if-then-else)
- c) Complex decision(case structure/nested decision)

Repetition

For structure, while structure, repeat structure Recursion

Arrays

Arrays (introduction, single, multidimensional)

Functions and Subprograms, Recursion

Storage Classes

Memory Management Model

String Handling

Character testing and Data Conversion

Far pointer and VDU (Video Display Unit)

Bit wise operators

Union

Preprocessor. Commands

Files (All access modes,) character I/O on file, line oriented I/O on file, file

Management, Non-Text file I/O

Command Line Arguments (hard coding vs flexible coding)

Calling interrupt

Re-direction Request

Books:

1. *Robert Lafore, C programming Using Turbo C++, SAMS Publishing, 1997.*
2. *Mian Altafullah, C Theory & Practice.*
3. *Deitel & Deitel, C How to Program, 3rd Edition, Prentice Hall, 2000.*

Code: BCS121

Credit hours: 4

Programming Language-I(C++)**Overview of Arrays and Functions**

- a) Arrays (Fundamentals, Arrays as Class member data, as Objects, Strings)
- b) Function (Declaration, Calling, passing arguments, returning values)
- c) Function overloading inline functions.

Structures and Unions

Structures (Structure specification & definition, Accessing structure elements)

Enumerated Data Type and Storage Classes

Enumerated data declaration and use, Automatic, External and Static variables, Registers

Introduction to Objects Oriented programming

- a) Advantages of Object Oriented approach, Objects
- b) Classes, Inheritance, Reusability, creating new data types
- c) Polymorphism, overloading.

Dealing with Classes and Objects in C++

- a) Specifying and using Classes and Objects, Constructors and Destructors
- b) Objects and function argument, Returning objects from functions

Operator overloading, Inheritance, pointer, special functions, and Files & Streams

Operator overloading (Unary operators, Binary operators, Data Conversion, pitfalls)

- a) Inheritance
 - 1. Derived and Base Classes, Derived Class Constructors
 - 2. Overriding member functions, class hierarchies, Public & Private Inheritance.
 - 3. Levels of Inheritance, Multiple inheritance.
- b) Pointers
 - 1. Address and Pointers, Pointers and Arrays
 - 2. Pointers and Functions, Pointers and Strings, Memory allocation and de allocation
- c) Some Special Types of Functions
 - 1. Virtual Functions, friend functions, static functions.
- d) Files and Streams
 - 1. Streams, String I/O, Character I/O Object I/O with multiple objects
 - 2. File pointers, Disk I/O with member functions, error Handling
 - 3. Redirection of input and Output Command Line Arguments, Printer Output.

Books:

Robert Lafore, Turbo C++, 2nd Edition, SAMS Publishing, 1997.

Code: BCS122

Credit Hours: 3

Mathematics-II(Calculus-II)

Vector-I

- a) Vectors
- b) Vector Analysis

Vector-II

- a) Calculus of vectors
- b) Application of Vector Calculus

Infinite Series

- a) Sequence, Monotonic Sequence, Infinite Series
- b) Convergence, integral Tests, Convergence Test, Comparison Test
- c) Alternating Series, Conditional Convergence

Functions of Several Variables

- a) Functions of several variables
- b) Limit and continuity of function of several variables
- c) Partial derivatives

Hyperbolic Functions

- a) Hyperbolic Functions
- b) Calculus of Hyperbolic Functions

Higher Integration

- a) Reduction Formula
- b) Some more techniques of integration

Application of integration

- a) Line integral
- b) Multiple integrals
- c) Double and triple integrals

First order differential equations

First order differential equations

Second order differential equations

Second order differential equations/

Books:

1. *Anton Howard, Calculus, John Wiley & Sons Inc, 1999.*
2. *George B.Thomas, Ross L. Finney, Maurice D. Weir, Frank R. Giordano, CALCULUS, 10th Edition, Addison Wesley Publishing Company, 2002.*

Code: BCS123

Credit Hours:3

Physics**Electrostatics**

- a) Coulomb's Law
- b) Coulomb's Law and its experimental verification
- c) Electric Charge
- d) Charge quantized
- e) Electric fields
- f) Gauss' Law
- g) Electric Potential
- h) Flux of electric field, Gauss's law and its application
- i) Electric potential as line integral potentials due to charge distribution, potential and field due to bipole
- j) Capacitors and dielectrics
- k) Equation of continuity
- l) Capacity of a spherical and parallel plate capacitor, polarization of matter
- m) Gauss's law in dielectrics, electric susceptibility and dielectric constant
- n) Energy density of electrostatic field

Electric Current and Magnetic Fields

- a) Current and magnetic field, electric current, Ohm's law
- b) Equation of continuity
- c) Field due to a current interaction of magnetic field with current
- d) Magnetic induction vector B. Biot Savart law
- e) Field due to a straight and circular current
- f) Ampere's law, Ampere's circuital theorem
- g) Fields due to a solenoid and a toroid, thermo electrically feedback
- h) Peltier and Thomson's effect, total e.m.f in thermocouple
- i) Photo Voltaic effect pi electric effect
- j) Faraday's law, Faraday's law of electromagnetic induction and its
- k) Differential form
- l) Self induction, self inductance of a toroidal solenoid, mutual induction
- m) Mutual inductance of toroidal solenoid
- n) Magnetic fields in matter-I, magnetization vector, the magnetic intensity
- o) Vector H
- p) Magnetic energy, dia, para and ferro magnetism phlegmatic hysteresis

Maxwell's Equations

- a) Maxwell's equations
- b) Maxwell's equations, wave equations and its plane, wave solution in free space
- c) Relation between the propagation vector
- d) Electric and magnetic vectors in a plane wave poynting vector

Books:

Halliday, D., Resnick, R., & Walker, J., Fundamentals of Physics extended, 5th Edition, John Wiley & Sons, New York, 1997.

Code: BCS124

Credit Hours:4

Discrete Mathematics

Logic: propositional logic, rules of propositional logic, predicate logic, symbols, tautologies, quantifiers, inference rules, Introduction to Logic Programming.

Recursion: definition, recursive function, examples of recursive functions.

Sets: terminology, operations, set identities.

Counting: sum rule, product rule, pigeon-hole principle, permutations, combinations, using trees in counting, inclusion-exclusion principle, discrete probability.

Trees and Graphs: terminology, binary trees, recursive definition of a binary tree, applications of binary trees, directed and un-directed graphs, adjacency matrix.

Boolean Algebra: Boolean operators and functions, functional completeness, combinational circuits.

Functions and Relations: types of functions, types of relations.

Regular Expressions: regular grammar, context-free grammar.

Books:

K. H. Rosen, Discrete Mathematics and its Applications, 5th Edition, McGraw-Hill, 2002.

Code: BCS125

Credit Hours: 3

Pakistan Studies/Islamic Studies**Pakistan Studies**

- a) Ideology of Pakistan in the historical perspective
- b) Two nation theory
- c) Pakistan movement
- d) Creation of Pakistan and role of Quaid-e-Azam
- e) Initial difficulties
- f) Islamization in Pakistan
- g) The land of Pakistan

Books:

1. *M. Ikram Rabbani, A comprehensive book of Pakistan Studies, 3rd Edition, The Caravan Press, Lahore, Pakistan, 2001.*
2. *I.H. Qureshi, The struggle for Pakistan.*
3. *Waheed-uz-Zaman, Towards Pakistan.*
4. *K.K. Aziz, The making of Pakistan.*

Islamic Studies

- a) Definition and meaning of Islam
- b) The place of Quran in Islamic World Nations
- c) The Hadith
- d) The Political System of Islam
- e) The Legal System of Islam
- f) Principles of an Islamic state and chances of their people

Books:

1. *S. Abul A'la Maududi, The Islamic Law and Constitution, 12th Edition, Islamic Publications(Pvt) Ltd, Lahore, Pakistan, 1997.*
2. *Farkhanda Noor Muhammad, ISLAMIAT for Students, 2nd Edition, Ferozsons(Pvt) Ltd.Lahore, Pakistan, 2000.*
3. *Anwar H. Syed Islam, Politics and National Solidarity.*
4. *M.A. Hai, A handbook of Islam.*
5. *Al-Quran(a contemporary translation).*
6. *Ishtiaq Ahmad, The concept of an Islamic state.*
7. *Dr. Ismail Al Farooqi, Jinnah and Pakistan of Islamic identify.*

Code: BCS231

Credit Hours: 3

Digital Logic Design

Numbering Systems

- a) Number Representation, Conversion, and Arithmetic in/between Binary, Octal, Decimal, Hexadecimal Numbering Systems
- b) Complements and Complement Arithmetic, Binary Coding Schemes, Binary Logic, ICs

Boolean Algebra and Logic Gates

- a) Definitions, Theorems and Properties, Boolean Algebra theorem Proving, Duality Principle
- b) Boolean Functions, Standard and Canonical Forms of Boolean, Functions, Conversion between standard and canonical forms, Logic Gates, Implementation of Boolean Functions with AND, OR, and Not Gates.

Simplification of Boolean Functions

Simplification by Algebraic Manipulation, Map and Tabulation Methods, Boolean Function Implementation with NAND and NOR Gates.

Combinational Logic

- a) Design and Analysis Procedures for Combinational Circuits, Designing and Analyzing Adders, Subtractions, and Code Converters.
- b) EOR and ENOR Functions, their Applications and Implementations

Combinational Logic with MSI and LSI

- a) Binary Parallel Adder, Decimal Adder, BCD Adder, Magnitude Comparator, Decoders, Demultiplexors, Encoders, Multiplexers, ROMs, PLAs
- b) Implementation of Boolean Function with Decoders, Multiplexers, ROMs, and PLAs.

Sequential Logic

- a) Introduction, Latches, Flip Flops, Types of Flip-Flops, Synchronous and Asynchronous Flip-Flops, Master-Slave and Edge-Triggered Flip-Flops.
- b) Design and Analysis Procedures for Sequential Circuits, Designing and analyzing Counters and Other Sequential Circuits, State Machines.

Registers, Counters, and Memory Unit

Registers, Counters, Timing Sequence and Memory Unit.

Asynchronous Sequential Logic

- a) Analysis Procedure, Circuits with Latches, Design procedure
- b) Reduction of State and Flow Tables, Race Free State Assignment

Digital Integrated Circuits

- a) Bipolar Transistor Characteristics, RTL and DTL Circuits
- b) Transistor-Transistor Logic, Emitter-Coupled Logic(ECL)
- c) Metal Oxide Semiconductor (MOS), CMOS

Books:

Morris Mano, Digital Logic and Computer Design, Prentice Hall, 1992.

Code: BCS232

Credit Hours: 4

Database-I**Database Foundation**

- a) Introduction, Data and Information, Components, Advantages
- b) Data Association, Entities, Keys and its Types, Attributes
- c) Data Associations, Data Structure Diagram

E-R Model

- a) Basic Constructs (Symbols), Degree of Relationships, Cardinality, Gerund
- b) Modelling time dependent Data Super Types, sub Types

Data Models

- a) Hierarchical, Network, Relational Comparison of all Data Models
- b) Relation, Characteristics of Relation, Converting E-R Model into Relations.

Normalization (1NF, 2NF, 3NF, 4NF, 5NF)**Relational Algebra, Relational Calculus****Database Design (Conceptual Design, Physical Design)****SQL**

- a) Introduction: Creating, Altering, and Deleting table
- b) Inserting, Updating, and Deleting Rows, Querying Tables
- c) SQL Functions.
 - 1. Arithmetic: Group (AVG, COUNT, MAX, MIN, SUM)
 - 2. DATE, Special Functions (IN, BETWEEN, LIKE, NULL)
- d. Managing Multiple Tables

Books:

1. *Jeffery A. Hoffer, Modern Database Management, 4th Edition, The Benjamin/Cummings Publishing Company Inc, 1994.*
2. *Oracle Developer/2000 Forms 4.5, 2nd Edition. SAMS Publishing, 1997.*

Code: BCS233

Credit Hours: 3

Data Structures**Introduction**

Linear Structures: Arrays

- a) Linked implementation
- b) Odd shaped Arrays
- c) Right Triangular
- d) Isosceles triangular

Notations and their conversion (using stack)**Stacks & Queues**

- a) Stacks
- b) Queues
- c) Basic Operations

Lists

- a) Linked Lists
- b) Types of Linked Lists

Trees

- a) Linked implementation
- b) Binary Trees
- c) B-Trees

Trees Traversal

- a) Basic Operations
- b) Traversals Sets

Graphs

- a) Representation of directed and undirected graphs
- b) Traversals
- c) Minimum cost spanning tree

Files

- a) File organizations: Sequential
- b) Indexed Sequential
- c) Direct (Hashing)
- d) Inverted
- e) Use of B-Tree Indexes
- f) Merging files

Sorting & Searching

- a) Internal Sorting
 - 1. Selection
 - 2. Insertion
 - 3. Quick, Using recursion & stack
 - 4. Tree
 - 5. Heap
- b) External Sorting
 - 1. Balanced Merged Sort
 - 2. Poly-phase Merged Sort
- c) Searching
 - 1. Binary Search
 - 2. Sequential Search for ordered and unordered list

Books:

1. *Jean-Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures with Applications, McGraw Hill Inc, 1984.*
2. *Aaron M. Tenebaum, Data Structures, 2nd Edition, Prentice Hall, 1995.*

Code: BCS234

Credit Hours: 3

Business Communications**An Overview of Communication**

- a) Defining communication, importance of communication concepts of communications.
- b) Barriers of communication, Nonverbal communication, Principles of effective communications.

Business Communication in Context

- a) Business communication and the global context.
 - 1. Background to international communication, and the national cultural variables.

2. Individual cultural variables.
- b) Business communication and ethics Influences on personal ethics, communication and ethical issues.

Business communication and technology

- a) Managing information with in organization
 1. History of technological developments.
 2. Challenges to the organization made by the new technologies.
- b) E-mail and other technologies for communication
 1. Defining e-mail, using e-mail, understanding how email works.
 2. Understanding the internet, Establishing Security, Voice mail, Group ware.
 3. CD-ROM Database, Teleconference, Faxes.
- c) Managing information our sides the organization

Message design

- a) Process of preparing effective business messages
 1. Five planning steps, Basic organizational plans, Beginning and ending.
 2. Composing the message.
- b) The appearance and the design of business message business letters, memorandums, special timesaving message media
- c) Good news and natural messages
- d) Organizational plan favorable Replies, neutral messages

Written communication: Major Plans for letters and MEMOS

- a) Bad/+
- b) 123-News messages
 1. The right attitude, plans for bad news messages.
 2. Negative replies to request, Unfavorable unsolicited messages
- c) Persuasive written messages.
 1. Organization of persuasive messages.
 2. Persuasive request persuasive sales letters.

Written communication: Reports

- a) Short reports
 1. Suggestions for short reports, information memorandum reports.
 2. Analytical memorandum reports, letter reports.
- b) Long formal reports (prefatory and supplement selection, presentation of long reports
- c) Proposals (Purpose , kinds, parts, sort proposals, long formal proposals)
- d) Writing style and appearance

Strategies for oral communication

- a) Strategies for successful speaking and successful listening
 1. Strategies for improving oral presentation, Strategies for reducing stage fright.
 2. Strategies for improving listing skills.
- b) Strategies for success informative and persuasive speaking

Books:

Herta A Murphy, Herbert W. hildebrandt, Jane P. Thomas,Effective business communication, 7th edition, McGraw Hill/Irwin, 1997.

Code: BCS235

Credit Hours: 3

Electronics

Direct Current Circuits

- a) Joules' Law
- b) Circuit Analysis

- c) Kirehhoff's Rules
- d) Wheatstone Bridge

Alternating Currents

- a) Sinusoidal Signals, Frequency, amplitude and phase, uns, value, power factor.
- b) Capacitive reactance
- c) Inductive reactance
- d) RL Filter
- e) RC Filter
- f) Diffenitiating and integrating factor
- g) Transient currents
- h) Transition and Diffusion Capacitance
- i) Reese Recovery Time
- j) Zener Diode
- k) Light Emitting Diode.

Diode Applications

- a) Load Line Analysis
- b) Series/Parallel and Series-Parellel Configurations.
- c) AND/OR Gates
- d) Half wave and full wave rectifier.
- e) Clippers and clampers
- f) Voltage multiplier circuits, junction.

Transistor

- a) Transistor Construction
- b) Transistor Operation
- c) Different Configurations
- d) Transistor amplifying action
- e) Limits of Operations
- f) DC Biasing
- g) Fixed Bias Circuit
- h) Emitter Stabilized bias circuit
- i) Voltage Divider biased
- j) BJT transistor Modeling
- k) BJT small signal analysis

Amplifiers

- a) Differential and Common mode operation
- b) Op-amp basic
- c) Op-amp application

Books:

James J. Brophy, Basic Electronics for Scientists, 5th Edition, McGraw Hill Publishing Company Inc, 1990.

Code: BCS241

Credit Hours: 3

Databases-II

Database Administration

- a) Introduction, Layers of Database Administration, DBA Functions and Responsibilities

Database Integrity

- a) Introduction
- b) Integrity Rules
 1. Entity Integrity

2. referential
 - a) Insertion Rule
 - b) Deletion Rule (Restrict, Nullity, Cascade)
 - c) Range of values, Not Null, Selection Based Entry(Radio Button, Check Boxes LOV)

Database Security

- a) Introduction
- b) Physical Security, (Locks, Logbooks, Staff, Categorization)
- c) Database Security
 1. View, authorization, Table Subject, Object, Privileges, User defined Procedures
 2. encryption

Database Recovery

- a) Introduction, Reasons of Database Failures, Database Recovery Facilities
 1. Backup Logs (Transaction Log, Database Change Log)
- b) Database Recovery Methods (Restore, Roll Forward, Roll Backward)
- c) Transaction processing

Database Concurrency

- a) Introduction, the problem of Lost Updation
- b) Concurrency Control Methods (Optimistic Approach, Pessimistic Approach)
- c) Managing the Deadlock, Transaction Integrity

Distributed Databases

- a) Introduction, Types of Distributed Databases
- b) Advantages and Disadvantages of Distributed Database

Object Oriented Databases

- a) Introduction to Object Oriented Paradigm
- b) Differences in Object Model and Design
- c) Object oriented Analysis and Design
- d) Cost and benefits of Object data bases

Books:

1. *C.J. Date, An introduction to Database, 6th Edition, Addison Wesley Company, 1983.*
2. *Jeffrey A Hoffer, Database Management, 4th edition, The Benjamin/Cummings Publishing Company Inc, 1994.*
3. *Thomas M. Connolly, Carolyn E. Begg, Database Systems: A Practical Approach To Design, Implementation And Management, 4th Edition, Addison Wesley Publishing Company, 2004.*
4. *Tools: Any SQL based DBMS.*

Code: BCS242

Credit Hours: 4

Programming Language-II(Visual C++)

Templates

- a) Function and Class Templates, Overloading Templates, Overriding Templates
- b) Templates and Inheritance, Templates and Friend Functions

Exception Handling

Basic Bug Traps, C++ Exception Handling and Resumption

Basic GUI Programming

1. Documents and Views, Status Bars and Tool Bars, Dialog Boxes, Controls, Property Pages and Sheets, Drawing Functions, Menus
2. Bitmaps and Bit Operations, Printing and Previewing

ActiveX Applications and Controls

Developing ActiveX Controls and Applications

Socket Programming**Communication Among Processes**

Process Synchronization, Exchange Data through Pipes and Shared Memory, Clipboards, Using OLE

Advance Programming Techniques

Database Access, SQL, Multithreading, MFC Library

Debugging

Understanding Debugging, Basic Debugging Operations

Books:

1. *Ivor Horton, Beginning Visual C++6, New Edition, Wrox. Publications, 1998.*
2. *Michael J.Young, Mastering Visual C++6, Sybex Inc, 1998.*

Code: BCS243

Credit Hours: 4

Operating Systems**Introduction**

- a) Definitions
- b) Evolution
- c) Structure and Functions

Process Management

- a) Processes, Process States, Process State Models
- b) Process Synchronization and Inter-Process Communication. Classical IPC Problems
- c) Process Scheduling
- d) Process Management in Windows NT and UNIX

Memory Management

- a) Real Memory Organization and Management
- b) Virtual Memory Organization: Paging, Segmentation, Combined Paging and Segmentation
- c) Virtual Memory Management: Placement, Replacement, and Fetch Strategies. Working Set Theory, Virtual Memory Management with Working Sets.

File Systems

- a) Files
- b) Directory Systems
- c) File System Implementation
- d) Security
- e) Protection Mechanisms

Input/Output Management

- a) Principles of I/O Hardware
- b) Principles of I/O Software
- c) Disks
- d) Clocks
- e) Terminals

Deadlock

- a) Resources

- b) Deadlock
- c) Deadlock Detection
- d) Deadlock recovery
- e) Deadlock Avoidance
- f) Deadlock Prevention
- g) Other issues

An overview of major Operating Systems

- a) Unix
- b) NT
- c) Windows

Distributed Operating Systems

- a) Network Operating Systems
- b) Distributed Operating System

Case Studies

- a) Unix
- b) NT
- c) Windows

Books:

1. *Deitel, H.M, An Introduction to Operating System, 2nd Edition, Addison Wesley Publishing Company, 1983.*
2. *Collin Ritchie, Operating Systems, 2nd Edition, BPB Publications, 1998.*
3. *Tenenbaum, Modern Operating Systems, 2nd Edition, Prentice Hall, 1998.*

Code: BCS244

Credit Hours:3

Computer Organization and Assembly Language Programming

Computer Organization

Data and Instruction Representation.

Assembly Language Programming

- a) ASCII Code Assembler Directives vs Machine Instructions.
- b) Keyboard Input and Screen Output.
- c) Addressing & Instruction Formats/types
 - i. Op-code encoding.
 - ii. Addressing modes.
 - iii. Addressing types.
- d) Detailed study of different/Instruction types-I
 - i Data-transfer instructions.
 - ii Data transfer instructions.
 - iii Arithmetic instructions.
 - iv Logical instructions, program control instructions.
- e) Conversion between ASCII Strings and Binary Numbers
- f) Stack Operations
- g) Debugging
- h) Interrupts
- i) Macros
- j) Video Output
- k) Disk I/O

Books:

Kip R. Irvine, Assembly Language for IBM PC, 2nd Edition, Macmillan Publishing Company, 1993.

Code: BCS245

Credit Hours: 4

Data Communications and Networking

Data transmission & Networking Concept

- a) Introduction to data communication, advantages of digital communication, A communication Model.
- b) Codes for digital signal transmission
- c) Parallel and serial transmission
- d) Synchronous and Asynchronous Transmission
- e) Baseband and Broadband Transmission
- f) Simplex, Half-duplex and Full-duplex transmission
- g) Modems, types of Modems, properties of modems
- h) Topologies: Bus,Star, Ring,Tree,Mesh.
- i) Need of Networks, Peer- to-Peer networks, Client- Server networks, Hybrid networks
- j) Circuit Switching, Message Switching and Packet Switching

Transmission Impairments

- a) Attenuation
- b) Delay Distortion
- c) Noise
- d) Channel Capacity

Transmission Media

- a) Guided Transmission Media, Twisted Pair, Coaxial Cable and Optical Fiber.
- b) Wireless Transmission- Terrestrial & Satellite Microwave and Broadcast Radio

Data Encoding

- a) Digital and Analog transmission.
- b) Digital Data & Digital Signals
- c) Digital Data & Analog Signals
- d) Analog Data & Digital Signals
- e) Analog data & Analog Signals

Data Communication Interface

- a) Line Configuration, Interfacing, Null Modem
- b) Point to point and multipoint link

Data Link Control

Flow Control Techniques:

- a) Polling Selection, Request to send/clear
- b) XON/XOFF
- c) Stop & Wait
- d) Sliding Window

Error Detection/correction & Control Techniques

Error Detection and Correction Techniques:

1. Parity bit method
2. Vertical and horizontal redundancy checking
3. Cyclic redundancy checking(CRC).

Error Control Techniques:

1. Stop and Wait ARQ
2. Go-Back-N ARQ
3. Selective-Reject ARQ
4. High Level Data Link Control Protocols (HDLC)

Multiplexing

- a) Frequency Division Multiplexing
- b) Synchronous and Statistical Time Division Multiplexing

Internetworking Devices

- a) Hubs
- b) Switches
- c) Routers
- d) NICs

Network Models

- a) TCP/IP Model
- b) OSI Model

LAN Architectures

- a) Ethernet, Token Ring, FDDI, Token Bus, ARCNet, AppleTalk.

Books:

1. *William Stallings, Data and Computer Communications, 7th Edition, Prentice Hall, 2003.*
2. *Behrouz A.Forouzan, Data Communications and Networking, 3rd Edition, McGraw Hill, 2003.*
3. *Andrew S. Tenanbaum, Computer Networks, 4th Edition, Prentice Hall, 2002.*
4. *Dr. D.C.Agarwal, Computer Communication and ISDN systems, 1st Edition, Khanna Publishers, 1989.*

Code: BCS351

Credit Hours: 3

Internet Programming

HTML(Hypertext Markup Language)

- a) Internet, Web and HTML Fundamentals
- b) What is HTML
- c) The World Wide Web and Web Servers
- d) Working of Web Browsers
- e) HTML's Role on the Web
- f) Way of launching the Web Site

Creating Static Web Pages with HTML

- a) Creating a Web page and entering Text
- b) Changing and Customizations
- c) Display Text in List
- d) Adding Graphics into Web Pages
- e) Hypertext and Creating Links
- f) Issuing Links with other HTML Tags

Advance HTML

- a) Tables, Forms, Images
- b) Frames
- c) Multimedia Objects

Java Script

- a) Data types

- b) Control Structures
- c) Object & Function
- d) Event Handling

VB Script

Introduction, Data Types, Syntax, Controls, etc.

Active Server Pages

Personal Home Page

Common Gateway Interface(CGI) Script

Database Connectivity

- a) Using ASP
- b) Using CGI
- c) Using PHP

Books:

1. *Thomas A. Powell, HTML The Complete Reference, 2nd Edition, McGraw Hill, 1999.*
2. *Ann Navarro, Todd Stauffer, HTML by Example, 1st Edition, Que Corp, 1999.*
3. *Andrew Wooldrige, Mike Morgan, Mona Everett, Scott J. Walter, Special Edition Using Java Script, Que Corp, 1997.*

Code: BCS352

Credit Hours: 3

Artificial Intelligence

Basic Concepts: Intelligence, Artificial Intelligence, Branches of Artificial Intelligence.

Tools: Prolog language, LISP language, Introduction to Small Talk, Expert System Shells.

Techniques: Searching (Blind search, knowledge-directed search); Knowledge Representation (Logic, Rules, Semantic Networks, scripts).

Applications: Natural Language Processing, Expert System, Speech Processing, Computer Vision, Robotics, Neural Networks, Machine Learning.

Books:

1. *D. Partridge, Artificial Intelligence applications in the future of software engineering, International Edition, Halsted Press, 1986.*
2. *Elaine Rich, Kevin Knight, Artificial Intelligence, 2nd Edition, McGraw Hill 1990.*
3. *Steven L. Tanimoto, The Elements of Artificial Intelligence: An Introduction using LISP, W.H.Freeman and Company, New York, 1987.*
4. *G.A. Orban, H. H. Hagel, Artificial and Biological Vision Systems, Springer-Verlag, 1992.*

Code: BCS353

Cred Hrs: 3

Analysis of Algorithm

Introduction, Properties of algorithms, features of algorithms, factors influencing the performance of algorithms (not in control of the programmer), Analysis of Algorithms, classification of algorithms, computational complexity, Asymptotic Notations, usefulness and limitations of the Asymptotic notation, Basic Recurrences, Recurrence Solutions, Factors influencing the execution time of an algorithm, some examples to calculate the T(n) of algorithms (including examples from searching and sorting), implementation of algorithms, rules for implementation, empirical analysis, Introduction to Generation functions, system approach, algorithms and systems, dynamic programming, greedy algorithms, divide and conquer approach.

Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms, 2nd Edition, The MIT Press, 2001.*
2. Robert Sedgewick, Philippe Flajolet, *An Introduction to the Analysis of Algorithms, 1st Edition, Addison Wesley Publishing Company, 1995.*

Code: BCS354

Cred Hrs: 4

Programming Language III**Introduction to Java**

- a) Introduction, Data Types, Syntax etc.
- b) Writing Simple Java Console Application

Applets

- a) Introduction to AWT and Applets, Use of AWT components in Java Application
- b) Writing Simple Applets

Servlets

- a) Introduction to Servlets, Servlets Life Cycle
- b) Developing Basic Servlets
- c) Using doPost, doGet, Service according to HTML Form Methods
- d) SSI (Server Side Include)
- e) Session Management

Advanced Java

- a) Packages and Interface
- b) Exceptions

Java Class Libraries

- a) Threads
- b) Writing Java Application
- c) The Java Class Libraries

Books:

1. Jamie Jaworski, *Java Developer's Guide, Macmillan Computer Pub. 1996.*
2. Dustin R. Callaway, *Inside Servlets : Server-side Programming for Java Platform, 2nd Edition, Addison Wesley Publishing Company, 2001.*

Code: BCS355

Cred Hrs: 3

Software Engineering-I**Introduction**

- a) The Evolving Role of Software
- b) Software: A Crisis on the horizon, Software Myths

The Process

- a) Software Engineering- A Layered Technology
- b) The Software Process. Software Process Models, The Linear Sequential Model
- c) The prototyping Model, The Red Model, Evolutionary Software Process Models

Project Management Concepts

The Management Spectrum, People, The Problem, The Process.

System Engineering

- a) Computer-Based System, the Modeling Engineering Hierarchy
- b) Information Engineering, Information Strategy planning, Business Area Analysis
- c) Product Engineering, Modeling The system Architecture
- d) System Modeling and Simulation, System Specification

Analysis Concepts and Principles

- a) Requirements analysis, Communication Techniques, Analysis Principle
- b) Software Prototyping, Specification Review

Analysis Modeling

- a) A Brief History, the Elements of the analysis Model, data Modeling
- b) Functional Modeling and information Flow, Behavioral Modeling
- c) The Mechanics of STRUCTURED Analysis, The Data Dictionary
- d) An Overview of Other Classical Analysis Methods

Design Concept and Principle

- a) The Design process, Design Principles, Design Concepts, Effective Modular Design
- b) Design Heuristics for Effective Modularity, the Design Model, Design Documentation

Design Methods

- a) Data Design, Architectural Design, The Architectural Design Process
- b) Transform Mapping, Transaction Mapping, Design Post Processing
- c) Architectural Design Optimization, interface Design, Human Computer Interface Design
- d) Interface Design Guidelines, Procedural Design

Software Testing Methods

- a) Software Testing Fundamental, test case Design, White Box
- b) Basic path testing, Control Structure Testing, Black Box Testing
- c) Testing for Specialised Environments
- d) Strategies approaches to software testing and strategic issues
- e) Unit testing and Integrating testing.

Books:

Roger Pressman, Software Engineering, 6th Edition, McGraw Hill, 1997.

Code: BCS356

Credit Hrs: 3

Network Strategies**Switching circuit and packet switching**

- a) switching networks, circuit-switching networks, switching concepts
- b) Routing in circuit in switched networks, control signaling
- c) Packet switching principles, routing , congestion control,X.25 protocols

Frame relay and asynchronous transfer mode (ATM) :

- a) beak ground ,frame relay protocol architecture frame relay ,call control
- b) user data transfer, network function ,congestion control,
- c) protocol architecture ,ATM logical connection ,ATM cells ,transmission of ATM cards
- d) ATM adaption layer , traffic and conjunction control
- e) ISDN and broad band ISDN , channels, user access ,isdn protocol, broad band protocol

Internetworking and network security:

- a) principles of internetworking connectionless and connection oriented internetworking

- b) the internet protocol ,routing protocol,IPv4,Ipv6(IPng),ICMPv6
- c) security requirements and attacks, privacy with conventional encryption message
- d) authentication and hash function ,public key encryption and digital signatures
- e) NetBIOS Names, NetBIOS background and names

Protocols and architecture:

- a) Internet protocol address resolution protocols(ARP)
- b) Internet control message protocol(ICMP)
- c) Internet group management protocol(IGMP)
- d) Border gateway protocol (BGP).
- e) Routing information protocol (RIP), Open shortest path first (OSPF),

Transport protocol

- a) Transport layer , transport services, protocol mechanisms
- b) Transmission control protocol, TCP header
- c) User data gram protocol, UDP header
- d) Ports and sockets

Network/Data Link Control protocol and Microsoft networking protocol suite:

- a) High level data link control protocols (HDLC), Serial Line Internet Control protocol (SLIP), Point – to-point protocol (PPP)
- b) Application /file System driver, Transport driver interface
- c) Protocol (TCP/IP, NW link, NetBEUI, AFP, DLC), network driver interface specification (NDIS)

Distributed application protocol:

- a) Abstract syntax notation one (ASN 1), network management –SNMPV2
- b) Electronic mail –SMTP and MIME

URL and URI

- a) Uniform resource locators (URL) and Universal resource identifiers (URI).

HTTP, FTP, TFTP:

- a) Hypertext transfer protocol(HTTP),Dynamic host configuration protocol (DHCP)
File transfer protocol(FTP),TFTP

Books:

1. William Stallings, *Data and Computer Communications, 5th Edition, Prentice Hall, 1994.*
2. Andrew S. Tanenbaum, *Computer Networks, 2nd Edition, Prentice Hall Inc, 1995.*

Code: BCS361

Credit Hours: 3

Computer Architecture

Computer Architecture Introduction

- a) Introduction to Computer Architecture
- b) Evolution of computers (form Mechanical to Electronic)

Basics of Computer Architecture

- a) Hardware and firmware
- b) Basics of computer architecture
- c) Introduction
- d) Computer structure
- e) Type of computers and future trend computer instruction se

Detailed Study of different Instruction types

- a) I/O instructions reduced instruction sets computers

- b) case study: RISC (University of California Berkeley)

Execution

- a) Introduction to Execution unit (EU)
- b) Register sections
- c) General register design
- d) Combinatorial Design of Adders

ALU Design & BIT SLICE Processor Control Unit

- a) ALU design
- b) BIT SLICE Processor Control Unit
 1. Basic concept
 2. Design Methods (Hardware control design and micro programmed control unit)

Memory Organization

- a) Primary memory design (ROM/RAM)
- b) Secondary memory (Hard disk, floppy disk, CD-ROM) Cache Memory, Virtual Memory Management

Input/Output Design

- a) Cache Memory
 1. Associative mapping
 2. Direct mapping
- b) Segmentation and Mapping, and input / output design
 1. Programmed I/O
 2. Standard I/O unconditional programmed I/O
 3. Interrupt I/O
 4. Computer Organization
 5. Microprocessor and its supports circuitry
 6. Peripheral devices

Books:

1. *M. Moris Mano, Modern Computer architecture, 3rd Edition, Prentice Hall, 1992.*
2. *William Stallings, Computer Organization and Architecture, 3rd Edition, Macmillan Publishing Company, 1993.*

Code: BCS362

Credit Hours: 3

Numerical Analysis

Error Analysis

- a) Definition of error, Sources of error, Significant digits, Precision and accuracy
- b) Effect of Rounding errors in arithmetic operations, Numerical Cancellation
- c) Evaluation functions by series expansion and estimation of errors

Non-Linear Equations

- a) Methods to solve Non-Linear equations, Simple interactive procedure
- b) Acceleration of convergence, Newton's Raphons Methods, the Bisection method
- c) The Secant methods, methods of False portion, Multiple Roots, Zeros of Polynomials

Linear System of Equations

- a) Basic concept, Methods to solve a system of linear equations, Cramer's rule
- b) Guassian elimination method, Triangular decomposition method
- c) Triangular decomposition for symmetric matrices
- d) Solution of Tridiagonal system of equation, Jacobi's method, Guass-seidel method

Finite Differences

- a) Difference table, Detection and correction of error in a difference table
- b) Forward difference operator, Backward difference operator, Central difference operator
- c) Shift operator, Mean operator, Relationship between operators

Interpolation

- a) Choice of a / suitable interpolation Formula
- b) Type of interpolation Formulas for Equally-paced data points
- c) Type of interpolation Formulas for Unequally – spaced data points
- d) Newton's Forward Difference interpolation Formula
- e) Newton's Backward Difference interpolation Formula
- f) Interpolation with Central Difference Formula, Stirling's interpolation Formula
- g) Bessel's Interpolation Formula, Everett's interpolation Formula
- h) Gaussian Interpolation Formula, Lagrange's Formula Iterative, Interpolation Method
- i) Error Estimation in Interpolation

Numerical Differentiation

- a) Derivation of Differentiation Formulas, Relationship Between Operator E and D
- b) Derivatives Using Newton's Forward Difference Formula
- c) Derivatives Using Newton's Backward Difference Formula
- d) Derivatives Using Central Difference Formula

Numerical Integration-I

- a) Derivative of Integration Formulas, Trapezoidal Rule, Simpson's 1/3rd Rule
- b) Boole's Rule, Weddle's Rule, Estimation of error in some Newton-cotes formula
- c) Error in Trapezoidal Rule, Error in Simpson's 1/3rd Rule, Automatic Subdivision of Interval

Numerical Integration-II and Ordinary Differential Equation

- a) Repeated use of Trapezoidal Rule, Romberg's Integration Method
- b) Ordinary Differential Equations
 1. Classification of differential equations, Categories of ODEs
 2. Linear and Non-Linear ODEs, Boundary Conditions, Methods to solve ODEs,
 3. Numerical Methods to solve ODEs, Picard's Method
- c) Taylor Series Methods, Euler's Methods and variations

Ordinary Differential Equations

- a) Runge-Kutta Methods, Predictor-Corrector Methods
- b) Milne-Simpson Predictor-corrector Method, Adams-bashforth
- c) Adams-Moulton Method
- d) Solution of simultaneous and Higher-order ordinary differential equations
- e) Solution of First order Simultaneous differential equations, Solution of an nth order differential equations

Books:

Richard L. Burden, Faires J. Douglas, Numerical Analysis, 5th Edition, PWS-KENT Publishing Company, 1993.

Code: BCS363

Credit Hours: 3

Automata Theory**Regular Languages**

Regular Grammars

Finite-State Automata**Compiler-Writing Tools**

Lex, Yacc, etc

Transducers and Relationship among Them**Context-Free Languages and Grammars****Language Recognition**

Parsers

Properties of Formal Languages**Turning Computability and Undesirability****Books:**

1. *Dean Kellye, Automata and Formal Languages: An Introduction, 1st Edition, Prentice Hall, 1998.*
2. *Dexter C.Kozen, Automata and Computability, 1st Edition, Springer Verlag, 1987.*
3. *M.W.Shields, An Introduction to Automata Theory (Computer Science Texts), Alfred Waller Ltd, 1988.*

Code: BCS364

Credit Hours: 4

Computer Graphics**Fundamentals**

- a) Introduction, Points and Lines
- b) Planes and Co-Ordinates, Lines Segments

Fundamentals (Continued)

- a) Perpendicular Lines, Vectors, Pixels and Frame Buffers
- b) Vector Generation Character Generation, Displaying The Frame Buffer

Graphic I/O Device

- a) Calligraphic Refresh Display
- b) Raster Refresh Display
- c) Keyboard
- d) Graphic Tablet

Drawing Algorithms

- a) Lines
- b) Bresenham's Algorithm
- c) Curves
- d) Rectangle
- e) Rounded Rectangles

2-D Transformations

- a) Uses for Transformations
- b) Modeling, Mapping
- c) 2-D Co-Ordinate Transformations
- d) Matrix Representation
- e) Homogeneous Co-Ordinates

3-D Transformations and Projections

- a) Parallel and Perspective Projections
- b) Rotations

Scan Conversion Techniques

- a) Real – Time Scan Conversion
- b) Run – Length Encoding

Polygons

- a) Inside Test
- b) Algorithm for Filling Polygons
- c) Seed Fill Algorithms
- d) Inclusion of Polygons as Graphics System Primitive

Clipping and Windowing

- a) Viewing Transformation
- b) Specification of Window and View Port
- c) Clipping Algorithms
- d) Sutherland-Cohen Algorithm for Clipping Lines
- e) Sutherland-Hodgman Algorithm for Clipping Polygons
- f) Addition of Clipping
- g) Windowing to Graphic System

Books:

Harrington, Computer Graphics: A Programming Approach, McGraw Hill, 1983.

Code: BCS365

Credit Hours: 3

Software Engineering-II**Object Oriented Analysis and Design****Introduction**

- a) Introduction & Definitions
- b) OO Modeling Concepts
- c) OO Developments

Modeling as a Design Technique

- a) Object Modeling Technique

Object Modeling

- a) Objects & Class
- b) Links & Associations
- c) Generalization & Inheritance
- d) Grouping Constructs
- e) Aggregation
- f) Abstract Class
- g) Multiple Inheritance, Meta Data, Candidate Key

Dynamic Modeling

- a) Events & States.
- b) Operations, Nested State Diagram
- c) Concurrency, Advanced Dynamic Modeling Concepts

Functional Modeling

- a) Functional Models, DFD
- b) Specifying Operations, Constraints
- c) Relation of Functional to Object and Dynamic Model

Design Methodology

- a) Methodology review
- b) OMT as Software Engineering Methodology
- c) OMT Methodology, Impact of OO approach

System Design

- a) Overview of System Design
- b) Breaking of System into Sub Systems
- c) Identifying Concurrency
- d) Allocating Subsystems to Processors and Tasks
- e) Management of Data Store
- f) Handling Global Recurs
- g) Choosing Software Control Implementation
- h) Handling Boundary Conditions
- i) Settling Traded-off Priorities
- j) Common Architectural Framework
- k) Architecture of ATM System

Implementation

- a) Form Design to Implementation
- b) Implementation using programming languages
- c) Implementation using Database System
- d) Implementation using Outside a Computer

OO Testing

- a) Testing OOA and Models
- b) OO Testing Strategies
- c) Test Case Design for OO Software
- d) Testing methods applicable at class levels
- e) Inter class test case design

Object Diagram Compiler

- a) Background
- b) Problem Statement
- c) Analysis
- d) System Design
- e) Object Design
- f) Implementation

Books:

1. *James Rumbaugh, Object Oriented Modeling and Design, 6th Edition, Prentice Hall International, 2000.*
2. *Craig Larman, Applying UML and Patterns: An introduction to Object-Oriented analysis and Design, 2nd Edition, Prentice Hall International, 2001.*
3. *James R.Rumbaugh, Michael R.Blaha, William Premerlani, Frederick Eddy, William Lorenzen, Object Oriented Modeling and Design with UML, 2nd Edition, Prentice Hall, 2004.*

Code: BCS471

Cred Hrs: 3

Compiler Construction

Compiler and Interpreters

- a) Compiler
- b) Interpreter

Compilation Process

Organization of Compiler

Analysis

- a) Lexical
- b) Syntax
- c) Semantic

Symbol Tables**Recognizer**

- a) Top-Down Recognizer
- b) Bottom up recognizer

Error Detection and Recovery**Storage Allocation****Code Generation Code Optimization**

- a) Code Generation
- b) Code Optimization

Books:

1. *Elder and John, Compiler Construction A Recursive Descent Model, Prentice Hall International, 1994.*
2. *Alfred V. Aho, Principles of Compiler Design, Addison Wesley, 1977.*

Code: BCS472

Cred Hrs: 3

Wireless and Mobile communications**Principles of wireless communication**

- 1) Technologies used for wireless communications.
- 2) Major wireless standards.
- 3) The problems characterising wireless and mobile computing.
- 4) Limitations of the wireless technology.

Wireless networks

- 1) The main components of a Wireless LAN.
- 2) Modes of Operation for Wireless LANs (Infrastructure Mode, Adhoc Mode).
- 3) Compatibility of different technologies.
- 4) Main components of a satellite-based network.

Wireless LANs Standards

802.11 and its flavors (802.11a, 802.11b, 802.11g), HIPERLAN.

Characteristics of radio propagation

Fading, Multipath propagation

.

Narrowband digital modulation

The need for modulation. Binary and multi-level (M-ary) amplitude-shift keying (ASK), frequency-shift keying (FSK) and phase-shift keying (PSK).

Mobile computing

Introduction, need for mobile computing.

Radio Channel Characterisation

Multipath propagation, Co-channel interference, Exponential power delay profile, Propagation effects -

scattering, ground reflection, fading, Log-normal shadowing, Coherence Bandwidth.

PHY Layer techniques

Wideband modulation techniques to cope with intersymbol interference (Diversity, Spread Spectrum, Frequency Hopping, Direct Sequence, Adaptive Equalisation, Orthogonal Frequency Division Multiplexing).

MAC protocols

MAC protocols for digital cellular systems such as GSM. MAC protocols for wireless LANs such as IEEE802.11 and HIPERLAN I and II. The near far effect. Hidden and exposed terminals. Collision Avoidance (RTS-CTS) protocols.

The Cellular Concept--System Design Fundamentals

Frequency reuse, Reuse distance, Cluster size, Channel assignment strategies, Handoff strategies, Co-channel interference and system capacity, Trunking and grade of service

Wideband CDMA concept/principles

Example:-Global System for Mobile W-CDMA(3G) UMTS.

Protocols supporting mobility

- 1) The functions of the main protocols for mobile stations
 - a) Mobile network layer protocols such as mobile-IP, Dynamic Host Configuration Protocol (DHCP).
 - b) Mobile transport layer protocols such as mobile-TCP, indirect-TCP.
 - c) Wireless Application Protocol (WAP). Bluetooth.
- 2) Understand the range of applicability of each protocol

Books:

1. *J.Schiller, Mobile communications, 2nd Edition, Addison-Wesley, 2003.*
2. *T.S. Rappaport, Wireless communications: Principle and Practice, 2nd Edition, Prentice Hall, 2001.*
3. *A S. Tanenbaum, Computer Networks, 4th Edition, Prentice Hall, 2002.*
4. *William Stallings, Wireless Communications and Networks, 1st Edition, Prentice Hall, 2001.*

Code: BCS473

Cred Hrs: 3

Software Project-I

Code: BCS474

Cred Hrs: 3

Digital Signal Processing

Digital Signal Processing and DSP Systems

Need for DSP
Advantages of DSP Systems

A Model of a DSP System

Input
Signal Conditioning
Anti-Aliasing Filters
Analog-to-Digital Converter
Processor
Digital-to-Analog Converter
Output Smoothing Filter
Output Transducer
DSP Processors
DSP Format Types

Alternative Formats for Commercial DSP Processors

How Numbers are processed in a DSP

- Polynomials
- Transcendental Functions
- Series Expansions
- Limits
- Integration
- Oscillatory Motion
- Complex Numbers

Acquisition of the Signal

- Sampling Theory
- Sampling Resolution
- Aliasing
- Reconstruction

Application Examples-Filters

- Filtering
- Sample Filter
- Types of Filters
 - Bessel
 - Butterworth
 - Elliptical

Fourier Series

- Insights to be gained from Fourier series
- Fourier Series
- Nyquist Frequency

Orthogonality and Quadrature

- Orthogonality – Basic Building Blocks of DSP
- Quadrature – Signal 90 degrees of phase with each other

Transforms

- The Z- Transform
- DFT – Discrete Fourier Transform
- Laplace Transform

Finite Impulse Response Filter – FIR

- What is it?
- Stability
- Cost
- Design Methodology
- Design Examples
- Convolution

Infinite Impulse Response Filter – IIR

- What is it?
- Stability
- Cost
- Design Methodology
- Design Examples

DSP Tools

- Programming Language
- Mathematical Tools

Special Purpose Tools
Development Package

DSP and the Future

New User
DSP Directions
Future Technologies

Books:

1. *John G. Proakis, Dimitris Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 3rd Edition, Prentice Hall, 1995.*
2. *Robert D. Strum and Donald E. Kirk, First Principles of Discrete System and Digital signal Processing, Addison Wesley, 1998.*

Code: BCS475

Cred Hrs: 3

E-Commerce Applications and Technologies

Fundamentals of E-Commerce Technologies: An overview of the principles of E-Commerce. The origin and growth of E-Commerce. Technologies that support the development of E-Commerce applications. Business models and strategies for E-Commerce. Legal issues related to E-Commerce such as privacy, consumer rights and intellectual property.

Electronic Payments Systems: Electronic money, electronic contracts, micro-payments, authenticity, integrity and reliability of transactions, the encryption and digital signature techniques available to support secure transactions on the internet.

Cryptography, Information Security and E-Commerce: Symmetric cryptography, Asymmetric cryptography, Digital signature, one-way hashing, zero-knowledge proof, certificate and certificate authority. Secure information infrastructure, virtual private network (VPN), online shopping and payment systems, e-crash. Economic impact. Smart card, steganography, time stamping. Cryptanalysis technology. Authentication protocols, analysis and evaluation.

Distributed Systems and Software: Architectural models for distributed systems, server techniques, remote procedure call and multicast communication, emerging standard and platforms (CORBA, DCOM), distributed transactions, concurrency control, reliability and security issues.

Network and Web Programming: Client-server system design; interprocess communication; sockets; blocking and nonblocking I/O; multithreaded process; iterative and concurrent server designs; Web programming includes HTML, JAVA, Web page design and construction.

Open Systems for E-Commerce: Introduction to open system standards and protocols. Transaction protocols. Electronic commerce applications using open system and artificial intelligence technologies. Application of intelligent agents for automated transaction processing. Integration of Web programming techniques with information and communication systems.

Project in E-Commerce Technologies: An individual or a team project on E-Commerce technologies. *Project in E-Commerce Technologies are designed to allow students to gain first hand experience in studying and developing real-world systems for E-Commerce. These could be conducted either individually or by teamwork. Possible projects include, but are not limited to: On-line Banking and Financial Systems Supply Chain, Web-based Forecasting and pricing Electronic Payment Systems, Internet Shopping, Virtual Store or Virtual Campus, Electronic Office, Cryptography Servers, Security Fire Wall, Network Management and Quality of Service, Distributed System Technologies in CORBA or DCOM,

HTML(Hypertext Markup Language): Internet, web & HTMLK Fundamentals, The world Wide Web & Web Servers,

Creating Static Web Pages with HTML:**Advanced HTML:****Java Script:** Data Type, Control Structures, Object & Function, Event Handling,**VB Script:** Introduction, Data Types, Syntax, Control, etc,**Active Server Pages:****Common Gateway Interface (CGI) Script:****Database Connectivity:** Using ASP, Using CGI,**Books:**

1. *Ann Navarro, Todd Stauffer, HTML by Example, 1st Edition, Que Corp, 1999.*
2. *Andrew Wooldrige, Mike Morgan, Mona Everett, Scott J. Walter, Special Edition Using Java Script, Que Corp, 1997.*

Code: BCS476

Cred Hrs: 3

Expert Systems

Introduction, The Principles of operation of expert systems, State transition model: Expert system models: Planning actions, solving a problem, diagnosis, Producing advice; how to backtrack; a structure for expert system.

The structure of state spaces: connectivity, form; the implicit description of state spaces; search: depth and breadth first search.

Functions for handling lists: functions for search; best first search.

Eliciting knowledge from an expert: interviewing, examples, problem solving, psychological techniques.

Knowledge representation schemes: rules, semantic nets, logic, frames.

Some existing expert systems: MYCIN, DENDRAL, MACSYMA, PROSPECTOR.

Characteristics of knowledge-bases systems, features of problem solvers, Architectural principals.

The choices of system (language/package) production pit falls.

Books:

Gary Marshall, Advanced Students' Guide to Expert Systems, Heinemann Newnes Publications, Oxford, 1990.

Code: BCS477

Cred Hrs: 3

Data Mining & Data Warehousing

Features of a data warehouse. Transformation Process. Multidimensional queries. Data warehousing job functions. Data warehousing operations: Hash join processing, bitmapped indexes, star queries, parallel processing, read-ahead mechanisms. Data Mining: Benefits. Data Mining Techniques: Association, discovery, classification, clustering. Data Marts: Stand alone data marts, subset data marts, multidimensional database. Queries against data mart. Data Mining Tools.

Books:

1. *Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining, and OLAP (Data Warehousing/Data Management), Computing McGraw Hill, 1997.*
2. *George M. Marakas, Modern Data Warehousing, Mining and Visualization: Core Concepts, 1st Edition, Prentice Hall, 2002.*
3. *Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, 1st Edition, Prentice Hall, 2002.*

Code: BCS478

Cred Hrs:3

Management Information System

Information systems, strategic role of information systems, organizations and business process, information management and decision making, ethical and social impact of IS. Computers and IS Software and hardware data resources and telecommunication ensuring quality in information system, enhancing decision making. Accounting, Executive, Decision support, Management Marketing Information Systems. Controlling and managing international information system.

Books:

1. *Kenneth C. Laudon, Jane P. Laudon, Management Information Systems, 8th Edition, Prentice Hall, 2003.*
2. *James A. O'Brien, Management Information Systems: Managing Information Technology in the E-Business Enterprise, 6th Edition, McGraw Hill, 2003.*
3. *Raymond McLeod, George Schell, Management Information Systems, 9th Edition, Prentice Hall, 2003.*

Code: BCS479

Cred Hrs:3

Distributed Computing

Introduction to Distributed Computing. Architectures and interaction mechanisms. Remote procedure Calling (RPC). SunRPC and its application using Linux. Distributed Object Technology (DOT). Java RMI. COBRA using Java as programming Language. Knowledge representation issues. XML and SOAP. Service Description, Advertisement and Discovery. Load balancing. Transaction management. Fault Tolerance and Recovery Mechanisms. Agent Theory.

Books:

1. *George Coulouris, Jean Dollimore, Tim Kindberg, Distributed Systems: Concepts and Design, 3rd Edition, Addison Wesley, 2000.*
2. *M.L. Liu, Distributed Computing: Principles and Applications, 1st Edition, Addison Wesley, 2003.*
3. *Andrew S. Tanenbaum, Maarten van Steen, Distributed Systems: Principles and Paradigms, 1st Edition, Prentice Hall, 2002.*

Code: BCS481

Cred Hrs: 3

Software Project Management

Introduction to Software Project Management

- a) Introduction, the increasing Demand for Software
- b) The Role of Management in Software Development
- c) Gaining acceptance for New Development Procedures

Software Development Problems

Basic Problem, Risk analysis

Software Development under Contract

- a) The Customer-Developer Relationship, the Cost-Pls vs Fixed Price Dilemma
- b) Other Customer-Developer Relationships, the Request for Proposal (RFP)
- c) The Proposal, F) the Proposal Review and STECTION Process, the Proposal Selection Board
- d) Proposal Evaluation Methods Some Additional Proposal Considerations

The Software Development Cycle

- a) Variations on a Waterfall Theme, the concept Phase, the Software Requirements Phase
- b) The Design Phase, the Implementation Phase, the Integration Test Phase
- c) The Atmosphere During the Integration and Test phase
- d) Problems During the Integration and Test Phase

The Maintenance Phase

- a) The Atmosphere During the Maintenance Phase, Problem During the Maintenance Phase
- b) IEEE standard 1074: a standard for Software Life Cycle process
- c) The Selection of the Project software Life Model Project Management Processes
- d) Pre-Development Process, Development Process, Post-Development process
- e) Integral Processes

Managing Software Engineering and handling Large Projects

- a) The Software Project Organizational Structure, the Team Structure
- b) Basic reporting Techniques, Status Report, Project Status meetings
- c) General Guidelines for Managing Software Engineers, Large Need Not Mean Difficult
- d) Stepwise Refinement, the Work Breakdown Structure, Handling Large Project

Software Project Management in a Client/Server Environment

- a) An Introduction to Client/Server Environments, the Network
- b) Project Management Advantages and Disadvantage of a Client/Server Environment
- c) Selecting a Client/Server Environments, Project Management
- d) Tips for Managing Client/Server Environments

Project Support Functions & Software Development Standards

- a) Project management Support, Software Configuration Control (SCC)
- b) Software Quality Assurance (SQA), Development Standard: the Necessary Evil
- c) An Overview of Software Development Standards, US DOS Standard 2167
- d) The IEEE Software Engineering Standards, European Software Standards
- e) The Ada standards, Other software Development Standards

Project Scheduling and Preparation of Estimates

- a) Scheduling: the Problem, the Project Development Plan, Scheduling Activities and Milestones
- b) Gantt Charts, PERT Charts and the Critical Path, Scheduling Personnel
- c) Scheduling Resources, Monitoring and updating the Schedule
- d) Some General Guideline for Scheduling and Planning
- e) Estimation the Problem, Project Estimates Stepwise Estimation
- f) Estimating New Development, the Constructive Cost Model
- g) Function Point Analysis, the Constructive Cost Model (COCOMO)
- h) Non-Development Overhead

Books:

Edwin M. Bennatan, Software Project Management: A Practitioner's Approach, 2nd Edition, Computing McGraw-Hill, 1992.

Code: BCS482

Cred Hrs: 3

Natural Language Processing**Monolingual Natural Language Processing:**

Difference between natural and formal languages.

Natural language understanding: syntax, semantics, phonetics, morphology, discourse analysis.

anaphora/cataphora, cohesion/coherence, ellipses, ambiguity (structural, lexical, transient, discourse).

Natural language Generation: steps in generation.

Natural Language Interfaces.

Machine Translation:

Translation steps: analysis, transfer and generation.

Translation Strategies: direct translation, interlingua and transfer.

Types: Bilingual, Multi-lingual.

Dictionary design: monolingual, bilingual.

Units of translation: word, sentence, discourse.

Some operational and R&D machine translation systems.

Speech translation, benefits of machine translation, integration of machine translation to other fields of computer science, Urdu, Pashto and machine translation.

Books:

1. *Terry Winograd, Understanding Natural language, Addison-Wesley Publishing Company, 1972.*
2. *M. A. Khan, Text Based Machine Translation, 1995.*
3. *Daniel Jurafsky and James H. Martin, SPEECH and LANGUAGE PROCESSING: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Pearson Education, Inc, 2000.*

Code: BCS483

Cred Hrs: 3

Software Project-II

Code: BCS484

Cred Hrs: 3

Digital Image Processing

Introduction

Images as Digital Objects
 Images Storage and Display
 Image Acquisition
 Image Types and Application

Bi-Level Images

Usefulness of Bi-Level Images
 Connectivity and Geometry
 Measurable Properties of Regions
 Area
 Perimeter
 Length
 Moments – Center of Mass
 Simple Shapes
 Derivative and Complex Shape Measures
 Operations on Bi-Level Image
 Boundary enhancement
 Erosion and dilation
 Sketonization
 Chain Code
 Run-Length Coding

Grey-Level Images

Introduction to Multiple Levels and Histograms
 Thresholding
 Selecting a Single Threshold
 Selecting Multiple Threshold
 Grey-Level Modification
 Line and Edges
 Geometric Operation

Noise
Color

Classifying and Recognizing Object

Features
Statistical Pattern Analysis
Decision Functions
Template Matching
Structural Methods

1. Representing Relationship
2. Identifying Components

Counting and Classifying Objects

Counting Simple Objects
Classifying Seeds
Classifying Galaxies
Detecting Forged Signatures

Computer Readable Codes

The Universal Product Code
Fonts for Machine Readable Text
Reading Printed Text
The General OCR Problem

Scientific Images

Chromatography and DNA Sequencing: Biology
Stellar Image: Astronomy
Voyager Image Color Synthesis
Making Distance Measurements: Archaeology

Books:

1. *J. R. Parker, Practical Computer Vision Using C, John Wiley & Sons, 1993.*
2. *R. C Gonzalez and R. E. Woods, Digital Image Processing, Addison-Wesley Publishing Company, 1992.*

Code: BCS485

Cred Hrs: 3

Network Security

Principles and practices of Network Security, potential threats in connected environment and strategies to avoid, classical and contemporary cryptographic theories, cryptography as a tool to secure network communication, Modern SPN ciphers, block and stream ciphers. DES algorithm and public key cryptography. Linear cryptanalysis, key distribution and management, digital signatures and authentication. Data communication security protocols like IPSec, SSL etc. Secure voice communications, viruses and worms, denial of service attacks, firewalls. Digital Cash. Bio Authentication Algorithms.

Books:

1. *Mark Rhodes-Ousley, Roberta Bragg, Keith Strassberg, Network Security: The Complete Reference, 1st Edition, McGraw Hill, 2003.*
2. *Eric Maiwald, Network Security: A Beginner's Guide, 2nd Edition, McGraw Hill Osborne Media, 2003.*

Code: BCS486

Cred Hrs: 3

Modeling and Simulation

Introduction to OPNET: Introduction, Tool Environment, System Buttons, Tools, Online Documentation.

Introduction to Network Simulation:M/M/1 Queue Example, objectives, M/M/1 Queue Extensions.

Automatic Request Repeat (ARQ) Protocols: Objectives, Preparation, Stop and Wait, Go-Back-N, Selective Repeat, Conclusions.

Multiple Access Protocols: Objectives, Preparation, Aloha, CSMA, Ethernet, Token Ring, Conclusions.

Frame Relay: Objectives, Preparation, Network Model, Specify Probes, Prepare a simulation Set Object, Conclusions, extensions.

Fiber Distributed Data Interface: Objectives, Network Model, Specify Probes, Simulation, Execution and Result Analysis, Conclusions.

Job Service Disciplines: First-in-First-out, Priority Job Discipline, Preempt and Resume, Processor sharing, Shortest –job First discipline, Conclusions.

Books

1. *Modeling and Simulation Communication Networks: A hands on Approach Using OPNET, 1st Edition, Prentice Hall Inc, 1998.*
2. *Andrew S. Tanenbaum, Computer Networks, 3rd Edition, Prentice Hall, 1996.*

Code: BCS487

Cred Hrs: 3

Database Administration

Data administration objectives and functions. Data dictionary: Management uses and features. Developing a Data Dictionary System. Database security: Threats Analysis, Cryptographic controls. Database Integrity. Auditing of databases. Evaluation of Controls. Case histories.

Books:

1. *Craig S. Mullins, Database Administration: The Complete Guide to Practices and Procedures, 1st Edition, Addison Wesley Professional, 2002.*
2. *Jeffery A.Hoffer, Mary Prescott, Fred McFadden, Modern Database Management, 7th Edition, Prentice Hall, 2004.*

Code: BCS488

Cred Hrs:3

Telecommunication systems

Introduction to media, bandwidth and noise, twisted pair (UTP, STP), coaxial cables (types and specification), optical fibers (types), introduction to optical sources and detectors, microwave links, satellite communication and infrared links, switching, circuit and packet switching, introduction to mobile and cellular communication, block diagram and current trend.

Analog modulation schemes: AM, DSBSC, SSB, FM and PM; FDM and FDMA concepts; carrier frequency recovery and phase locked loop. Analog Mobile System (AMPS). Partial digital systems, PAM, PCM, DPCM, Delta Modulation. Frame synchronization. Telephone systems(TDM); Digital satellite systems(TDMA).Simple Digital systems: Binary modulation, QPSK, Binary FSK. Digital Mobile Systems (GSM, CDMA and GPRS). Satellite Mobile Systems. Simple network concepts, Telephone network.

Books:

1. *Annabel Z. Dodd, The Essential Guide to Telecommunications, 2nd Edition, Prentice Hall incorp, 1999.*

2. *William Stallings, Data and Computer Communications, 5th Edition, Prentice Hall, 1994.*
3. *Andrew S. Tanenbaum, Computer Networks, 2nd Edition, Prentice Hall Inc, 1995.*

Code: BCS489

Cred Hrs: 3

Multimedia Technologies

Introduction to multimedia programming, scope of multimedia programming, convention and trends, media used in current application (including digital video, audio, and graphics), system level issues of performance synchronization, storage and server schemes, dynamic Interactivity, hyperlinking, multimedia, device control, distributed media development and delivery, non-standard media and programming frame works, introduction to multi-media networks.

Books:

1. *Stephen M. Alessi, Stanley R. Trollip, Multimedia for Learning: Methods and Development, 3rd Edition, Allyn & Bacon, 2000.*
2. *Richard E. Mayer, Multimedia Learning, New Edition, Cambridge University Press, 2001.*