Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT401	Mathematics-III	3L-1T-0P	4 Credits

OBJECTIVES: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- ➢ To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- ➢ To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering.
- ➢ To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT402 - Computer Architecture

Course Objectives
The objective of course is to understand the basic structure and operation of computer system. Students will be able to know the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division. To study the different ways of communicating with I/O devices and standard I/O interfaces, hierarchical memory system including cache memories and virtual memory, concept of pipeline.

Unit-I Computer architecture and organization, computer generations, von Neumann model, CPU organization, CPU organization, Register organization, Various CPU register, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro-operations, Arithmetic logic shift unit.

Unit–II The arithmetic and logic unit, Fixed-Point representation: integer representation, sign-magnitude, 1's and 2's complement and range, Integer arithmetic: negation, addition and subtraction, multiplication, division, Floating-Point representation, Floating-Point arithmetic, Hardwired micro-programmed control unit, Control memory, Micro-program sequence.

Unit–III Central Progressing Unit (CPU), Stack Organization, Memory Stack, Reverse Polish Notation. Instruction Formats, Zero, One, Two, Three- Address Instructions, RISC Instructions and CISC Characteristics, Addressing Modes, Modes of Transfer, Priority Interrupt, Daisy Chaining, DMA, Input-Output Processor (IOP).

Unit–IV Computer memory system, Memory hierarchy, main memory: RAM, ROM chip, auxiliary and associative memory, Cache memory: associative mapping, direct mapping, set-associative mapping, write policy, cache performance, Virtual memory: address space, memory space, address mapping, paging and segmentation, TLB, page fault, effective access time, replacement algorithm.

Unit–V Parallel Processing, Pipelining General Consideration, Arithmetic Pipeline, and Instruction Pipeline, Vector Operations, Matrix Multiplication, and Memory Interleaving, Multiprocessors, Characteristics of Multiprocessors.

Course Outcomes
At the end of the course student will be able to :
1. Understand basic structure of computer system, arithmetic operations,
2. Understand the arithmetic operations, Study of hardwired and micro-programmed control units.
3. Develop the concepts of memory management, interleaving and mapping.
4. Analyze the arithmetic and instructional pipelines.

Reference Books:-

1. M. Morris Mano, "Computer System Architecture", Pearson.
2. Dr. M. Usha, T.S. Srikanth, "Computer System Architecture and Organization", Wiley India.
3. William Stallings, "Computer Organization and Architecture", Pearson.
4. V. Rajaraman, T. Radhakrishnan, "Computer Organization and Architecture", PHI.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT403 - Analysis and Design of Algorithm

Course Objectives

Data structure includes analyzing various algorithms along with time and space complexities. It also helps students to design new algorithms through mathematical analysis and programming.

Unit-I Algorithms, Designing algorithms, analyzing algorithms, asymptotic notations, heap and heap sort. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

Unit-II Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm, etc.

Unit-III Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm, etc.

Unit-IV Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.

Unit-V Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Course Outcomes:
At the end of the course student will be able to :
1. Implement sorting and searching algorithm
2. Experiment with techniques for obtaining maximum output with minnium efforts
3. Make use of dynamic programming for finding
4. Solve 8 queen's problem and others of the kind for application in real world scenarios .
5. Distinguish between NP hard and NP complete problems and develop their solutions

Reference Books:-

1. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
2. Horowitz & Sahani; Analysis & Design of Algorithm
3. Dasgupta; algorithms; TMH
4. Ullmann; Analysis & Design of Algorithm;
5. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India

List of Experiments(expandable):

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for optimal merge patterns.
6. Write a program for Huffman coding.
7. Write a program for minimum spanning trees using Kruskal's algorithm.
8. Write a program for minimum spanning trees using Prim's algorithm.
9. Write a program for single sources shortest path algorithm.
10. Write a program for Floye-Warshal algorithm.
11. Write a program for traveling salesman problem.
12. Write a program for Hamiltonian cycle problem.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Information Technology, IV-Semester

IT404 - Analog & Digital Comm.

Course Objectives

The study of communication systems starts with the concept of analog communication. In this course time and frequency representation of information is given. The objective of this course is to be familiar with the basic building blocks of communication systems such as modulator and demodulator. Different types of analog modulation techniques are given in this course.

Unit-I Signals and Systems: Block diagram of a communication system, signal-definition, types of signals continuous, discrete, deterministic, non-deterministic, periodic, non-periodic, energy, power, analog and digital signals. Electromagnetic Spectra, Standard signals- DC, sinusoidal, unit step, ramp, signum, rectangular pulse, impulse(delta) signal. System definition, classification of systems, linear, nonlinear, time variant, time invariant, causal, non causal, stable and unstable systems. Fourier transforms: Time domain and frequency domain representation of signal, Fourier Transform and its properties, conditions for existence, Transform of Gate, unit step, constant, impulse, sine and cosine wave. Shifting property of delta function, convolution, time and frequency convolution theorems.

Unit-II Amplitude modulation: Modulation, need of modulation, types of modulation techniques, amplitude modulation (DSB-FC), modulation index, frequency spectrum of AM wave, linear and over modulation, power relation in AM, transmission efficiency, modulation by a complex signal, bandwidth of AM, AM modulators, square law and switching modulator, advantages and disadvantages of AM. Demodulation of AM: Suppressed carrier amplitude modulation systems, DSB-SC, SSB-SC, VSB-SC systems, comparison of various amplitude modulation systems. Demodulation of AM, square law and envelope detector, synchronous detection of AM, Low and high power AM transmitters, AM receivers, TRF and superheterodyne receivers, sensitivity, selectivity and fidelity of receivers.

Unit-III Angle modulation: Introduction and types of angle modulation, frequency modulation, frequency deviation, modulation index, deviation ratio, bandwidth requirement of FM wave, types of FM. Phase modulation, difference between FM and PM, Direct and indirect method of FM generation, FM demodulators- slope detector, Foster seeley discriminator, ratio detector. Introduction to pulse modulation systems.

Unit-IV Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-V Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM).

Course Outcomes:
At the end of the course student will be able to :
1. Differentiate Analog and Digital Signal and types of signals.
2. Understand the communication of information over the communication channel.
3. Understand how information signal of low frequency can be transmitted with the help of modulation techniques over a long distance.
4. Differentiate different modulation techniques such as AM, SSB, DSB and FM.
5. Explain using block diagrams, modulation and demodulation techniques for digital signal and determine bandwidth requirement.

Reference Books:
1. Singh & Sapre, "Communication Systems", TMH.
2. Taub Schilling, "Principles of Communication Systems", TMH.
3. W. Tomasi "Electronic Communications Systems", Pearson Education Pvt. Ltd.
4. Taub & shilling, "Communication Systems", TMH.
5. Abhay Gandhi, "Analog and Digital Communication", CENGAGE Learning.

List of Experiments:
1. AM Modulation and Demodulation (Envelope Detector)
2. Frequency modulation using reactance modulator.
3. Frequency modulation using varactor modulator.
4. Pulse Amplitude Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Analog Multiplexing.
7. Amplitude Modulation using Pspice
8. Receiver characteristics (selectivity, sensitivity, fidelity).
9. Operation of foster-seeley loop detector.
10. Operation of ratio detector.

IT405 - Data Base Management System

Course Objectives:

The main objectives of the course are
1. To understand fundamental knowledge of file system, database concepts and use of relational database.
2. To study of different data model and conceptual design using ER diagram.
3. Students can use SQL operations to manipulate the database and learn how to design and create a good database using functional dependencies and normalization.
4. The course provides an overview of transaction management, concurrency control, distributed database and Big Data.

Basic Concepts: Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Entities and attributes, Entity types, Key attributes, Relationships, Defining the E-R diagram of database.

Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, Entity-Relationship model :Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features –generalization, specialization and aggregation

SQL: Data definition in SQL, update statements and views in SQL: Data storage and definitions, Data retrieval queries and update statements, Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans. Case Study of ORACLE and DB2.

Relational Database design: Functional Dependency –definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization –1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, lossless join, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF

Introduction of transaction, transaction processing and recovery, Concurrency control: Lock management, specialized locking techniques, concurrency control without locking, Protection and Security Introduction to: Distributed databases, Basic concepts of object oriented data base system.

Course Outcomes:
After successful completion of this course, the students would be able to:
1. Compare file system and DBMS and explain how DBMS is better than traditional File Processing Systems.
2. Analyze the physical and logical database designs, database modeling, relational, hierarchical, and network models

3. Analyze and renovate an information model into a relational database schema and to use a DDL, DML and DCL utilities to implement the schema using a DBMS.
4. Formulate data retrieval queries in SQL and Relational Algebra.
5. Demonstrate an understanding of functional dependencies, normalization theory and apply such knowledge to the design of a database.
6. Demonstrate and explain terms like Transaction Processing, Concurrency Control, distributed database and big data.

Reference Books:
1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson.
3. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB publications.
4. S. Sharma, J. Agrawal, S. Agrawal, "Advanced Database Management System", Dreamtech Press.
5. Leon & Leon, "Fundamental of Data Base Management System", TMH

List of Experiments:
1. To perform various SQL Commands of DDL, DML, DCL.
2. Write SQL Commands such as Insertion, deletion and updation for any schema.
3. To execute Nested Queries, Join Queries, order-by, having clause and string operation.
4. To perform set operators like Union, Intersect, Minus on a set of tables.
5. To execute various commands for GROUP functions (avg, count, max, min, Sum).
6. Write a PL/SQL block for transaction application using Triggers.
7. Write a DBMS program to prepare report for an application using function.
8. Designing of various Input screens/Forms.
9. Create reports using database connectivity of Front end with back end.
10. Create database Design with normalization and implementing in any application.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Information Technology, IV-Semester

IT406 - Introduction to MATLAB/SciLab/Web Design

Course Objective:
To familiarize students with open source academic software like Scilab or licensed software like Matlab to carryout experiments in various fields in due course like computer graphics and multimedia, soft-computing, image processing, data mining etc.
 Experimental works in web design will enable students to design web pages and develop web based projects.

Introduction to MATLAB/SciLab
Installing MATLAB/SciLab Under windows/linux, Basics of MATLAB programming, Data Types, Creating variables, comments, multiline comments, Array operations in MATLAB/Scilab, Loops and execution control statements, inbuilt mathematical functions, Working with files: Scripts and Functions, Plotting and program output, overview of various toolboxes, introduction to Matlab simulink.

Introduction to Web Design
Introduction, Elements, Tags, Attributes, Paragraph, Headings, Line Breaks, Horizontal Rule, Lists, Formatting, Color Codes, Font, Text Links, Email, Images, Image Link, Forms, Table, Frames, Comments, Music Codes, Video Codes, Div, DHTML: Cascading Style Sheet Introduction, Types of CSS, Selectors (Tags), Class and Id with the Selectors, CSS Background & Color, CSS Text, CSS Font, CSS Border, CSS Padding.

 Reference Books:

1. Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed., Pearson Education
2. Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., McGraw Hill
3. N.P. Gopalan, "Web Technology", PHI.
4. Ivan Bayross, "HTML, JavaScript, DHTML and PHP", BPB Publication.

Suggested List of Experiments/ program (Expandable):
1. Write your first Matlab/Scilab program.
2. Extract an individual element of an array
3. Write Matlab/Scilab program to illustrate loops and control statements.
4. Create a simple plot.
5. Name the title, axes title of the plot.
6. Create a webpage with HTML describing your department on following points: Use paragraph and list tags. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.
7. Create a web page using HTML for following: Create a table to show your class time-table. Use tables to provide layout to your HTML page describing your university infrastructure.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Information Technology, IV-Semester

IT 407 Open Source Software Lab (Linux and R)

Course Objectives:
To develop an understanding of Linux commands and shell programming and enable students to use the Linux distributions to create, debug and run applications. Learn basic R data types, R functions, objects and class, graphs and charts.

Unit I Introduction to LINUX Operating System: Overview of popular Linux distributions, Hardware requirements for Linux, Installation of LINUX distributions
Internal And External Commands, Command Structure, general-purpose utilities: cal, date, echo, printf, bc, script, passwd, PATH, who, uname, tty, stty, pwd, cd, mkdir, rmdir

Unit II Handling files: The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, VI editor, security by file permissions commands: chmod, find, locate, Compiling C/C++ files, File processing: awk, sed, Commands: gcc, sh.

Networking commands: ping, telnet, ftp, arp, rlogin, other commands: make, apt-get, Accessing remote servers and files, Editing and manipulating files, System Administration: Configuration of Linux, Connecting to remote machines-ftp, telnet, Adding and removing users.

Unit III Programming in Linux: Bash shell scripting, Interactive scripts, shell variables, assigning values to variables, positional parameters, command line arguments, arithmetic in shell script, exit, status of a command, sleep and wait, script termination, Decision taking, -if else, nested if, file tests, string tests, case control structure, Loop control, break, continue, logical operators and executing Script, Debugging a script, executing multiple scripts, other shell script examples.

Unit IV R Introduction: Installation of R, R reserved words, Variables and Constants, R Operators, R Control Structures, R Programming: for loop, R while loop, R break & next, R repeat loop
R Functions: R Programming Function, Function Return Value, R Environment and Scope, R recursive function, R switch function

Unit V R Data Structure: R Vectors, R Matrix, R List, R Data Frame
R Object and Class: Object and Class, R S3 Class, R S4 Class, R Reference Class, R Inheritance
R Graphs and Charts: Bar plot, Histogram, Pie Chart, Box plot, Strip chart

References:
1. Forouzan, "Unix & Shell Programming", Cengage Learning.
2. Sumitab Das,"Unix Concept & Application",TMH.
3. Richard Peterson,"Linux Complete Reference",TMH.
4. Michael J. Crawley, "The R Book", Wiley
5. Roger D. Peng, "R Programming for Data Science" Lean Publishing
6. Tilman M. Davies, "The Book of R", No Starch Press

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand the basic commands used in Linux operating system
2. Learn the important Linux/UNIX library functions and system calls
3. Write, compile and debug shell script in Linux environment
4. Learn how to program in R and write R functions
5. Read data into R, access R packages

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Information Technology, IV-Semester

BT408- 90 hrs Internship based on using various software's –Internship -II

To be completed anytime during fourth semester. Its evaluation/credit to be added in fifth semester.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

BT409 Cyber Security

Unit I
Introduction- Introduction of Cyber Crime, Categorizing Cybercrime, Cybercrime Theory, Criminology perception of cyber criminals: hackers, computer intrusions and Attacks, Privacy, surveillance and protection, hiding crimes in cyberspace, cryptography, hacking vs cracking, privacy and security at risk in the global information society.

Unit II
Application Security- Data Security, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards.

Unit III
Cryptrography concepts and Techniques
Plain text , cipher text, types – substitution ,transposition ,encryption, decryption , symmetric and asymmetric key cryptography algorithms, steganography .

Unit IV
Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Unit V
Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.
Case Study – Corporate Security , Cyber cases

References:

- Nina Godbole " Cyber Security: Wiley.
- Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
- William stallings "Cryptography and Network Security" PEARSON
- Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
- Vinod V. Sople, "Managing Intellectual Property" PHI Learning Private Limited
- IT Act 2000 Details www.mit.gov.in
- Atul Khate, "Cryptrography and Network Security" ,TMH
- V.K.Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
- CHANDER, HARISH," Cyber Laws And It Protection " , PHI Learning Private Limited ,Delhi