The New unified Syllabus for both CSe & IT are to be compulsorily followed from the session 2013-14.Details of some electives are yet to be received for approval by BoS. These electives can only be offered after the details are approved by BoS & uploaded on the University website. No electives other than those listed & detailed are to be offered.

M.Tech. Computer Science & Engineering

Semester - 1

Sr. No:	Paper Code	Paper Name	Class Hours			Credit
Sr. No:	Paper Code	**Theory**	L	T	P	Cr. Pt.
1	PGCSE101	Advanced Engineering Mathematics [Compusory]	3	1	0	4
2	PGCSE102	Advanced Operating System [Compulsory]	4	0	0	4
3	PGCSE103	Advanced Computer Architecture [Compulsory]	4	0	0	4
4	PGCSE104	Advanced Algorithms [Compulsory]	4	0	0	4
5	PGCSE105	Elective - I A) Artificial Neural Networks B) Agent Based Intelligent Systems C) Advanced Soft Computing D) Object Oriented Information System Design E) **Software Engineering & CASE tools** F) **Computer Graphics & Multimedia**	4	0	0	4
		Total	19	1	0	**20**
		Practical				
6	PGCSE191	Operating System Laboratory [Compulsory]	0	0	3	2
7	PGCSE192	A) Advanced Programming Lab	0	0	3	2
		Total	0	0	6	**4**
		Seminar				
8	PGCSE193	Seminar – Based on literature survey	0	2	0	**1**
		Total	19	3	6	**25**

Semester - 2

Sr. No:	Paper Code	Paper Name	Class Hours			Credit
		Theory	L	T	P	
1	PGCSE201	Advanced DBMS [Compulsory]	4	0	0	4
2	PGCSE202	Advanced Computer Network & Security [Compulsory]	4	0	0	4
3	PGCSE203	Theory of Computation [Compulsory]	4	0	0	4
4	PGCSE204	Elective - I I A) **Cluster, Grid and Cloud Computing** B) Mobile Computing C) Advanced Web Technology D) Soft Computing E) Cryptography & Computer Security	4	0	0	4

The New unified Syllabus for both CSe & IT are to be compulsorily followed from the session 2013-14.Details of some electives are yet to be received for approval by BoS. These electives can only be offered after the details are approved by BoS & uploaded on the University website. No electives other than those listed & detailed are to be offered.

5	PGCSE205	Elective - III A) Image Processing B) Pattern Recognition C) Real-time Embedded Systems & Programming D) Complex Systems E) Distributed System Principle	4	0	0	4
		Total	20	0	0	**20**
		Practical				
6	PGCSE291	Part-I – Computer Networking & DBMS Laboratory [Compulsory]	0	0	3	2
		Total	0	0	3	**2**
		Seminar & Viva				
7	PGCSE292	Seminar – Term paper leading to project.	0	2	0	1
8						
		Total	20	2	6	**23**

Semester - 3

Sr. No:	Paper Code	Paper Name	lass Hou s			Credit
		Theory	L	T	P	
1	PGCSE301 Management	A: Project Management & Enterpreneurship B: Teaching & Research Methodologies	4	0	0	4
2	PGCSE302	Elective - IV A) Human Computer Interaction B) Bioinformatics C) Data Mining & Data Ware Housing D) Compiler Construction E) VLSI Design	4	0	0	4
		Total	8	0	0	**8**
		Project				
3	PGCSE393	Project – Part 1 (Dissertation I + Defence of Project - I)	0	0	18	4+8=12
		Total	8	0	18	**20**

Semester - 4

Sr. No:	Paper Code	Paper Name	lass rs ou			Credit
		Project	L	T	P	

1	PGCSE491	Project – Part 1I (Dissertation II + Defence of Project - II)	0	0	24	6+18=24
2	PGCSE481	Comprehensive Viva Voce				4
		Total	0	0	24	**28**

Total credits = 96

PGCSE101: Advanced Engineering Mathematics

Compulsory:

Module I

Numerical Analysis:

Introduction to Interpolation formulae: Stirling, Bessel's, Spline. **Solutions of system of linear and non-linear simultaneous equations**: SOR algorithm, Newton's method, (8 **L**)

Module II

Stochastic process:

Probability: review, random variables, random processes, Random walk, brownian motion, markov process, queues: (M/M/1) : (/FIFO), (M/M/1) : (N/FIFO). (**8 L**)

Module III

Advanced linear algebra:

Vector spaces, linear transformations, eigenvalues, Eigenvectors, some applications of eigenvalue problems, symmetric, skew-symmetric And orthogonal matrices, similarity of matrices, basis of Eigen vectors, diagonalisation. **(8L)**

Module

IV

Advanced Graph Theory:

Connectivity, Matching, Hamiltonian Cycles, Coloring Problems, Algorithms for searching an element in a data structure (DFS, BFS). (**8 L**)

Optional:

Module V

A: Complex Variables: Review of Complex variables, Conformal mapping and transformations, Functions of complex variables, Integration with respect to complex argument, Residues and basic theorems and applications of residues. (8L) **Module - V**

B: Combinatorics: Basic Combinatorial Numbers, Generating Functions and Recurrence Relations, InclusionExclusion Principles **(8L)**

Module V

C: Optimization Technique: Calculus of several variables, Implicit function theorem, Nature of singular points, Necessary and sufficient conditions for optimization, Elements of calculus of variation, Constrained Optimization, Lagrange multipliers, Gradient method, Dynamic programming. (8L)

Module – V

D: Fourier series and Transform: Revision of Fourier series, integrals and transforms and their properties. The 2dimensional fourier transform, convolution theorem, Parseval's formula, discrete fourier transform, fast fourier transform **(8L) Module V**

E: Z-transforms: sequence, representation of sequence, basic operations on Sequences, z-transforms, properties of ztransforms, change on scale, shifting Property, inverse z-transform, solution of difference equations, region of Convergence, bilinear (s to z) transform **(8L)**

Module V

F: Walsh function and hadamard transform: generating walsh functions of Order n, characteristics and applications of walsh function, hadamard Matrix, properties, fast hadamard transform, applications**(4L)** Wavelet transform**:** fundamentals, the fourier transform and the short term Fourier transform, resolution problems, multi-resolution analysis, the Continuous wavelet transform, the discrete wavelet transform**(4L)**

References books:

1. Sen, M. K. and Malik, D. F.-Fundamental of Abstract Algebra, Mc. Graw Hill
2. Khanna, V. K. and Ghamdri, S. K.- Course of Abstract Algebra, Vikash Pub.
3. Halmos, T. R.-Naïve Set Theory, Van Nostrand
4. Scarborough, J. B.-Numerical Mathematical Analysis, Oxford University Press
5. Cone, S. D.-Elementary Numerical Analysis, Mc. Graw Hill.
6. Mukhopadhyay ,P.-Mathematical Statistics ,New Central Book Agency
7. Kapoor, V. K and Gupta, S.C.-Fundamental of Mathematical Statistics, Sultan Chand and Sons.
8. Uspensky, J. V.-Introduction to Mathematical Probability, Tata Mc. Graw Hill
9. Dreyfus, S. E.-The Art and Theory of Dynamic Programming –Theory and Applications, Academic Press.
10. Rao, S. S.-Optimisation Theory and Application, Wiley Eastern Ltd., New Delhi
11. Somasundaram, Discrete Mathematical structures, PHI
12. Kolman, Busby & Ross, Discrete Mathematical structures 5th ed, PHI
13. V. Krishnamurthy, Combinatorics, Theory and Applications, East-West Press, 1985.
14. N. Alon and J. Spenser, Probabilistic Methods, John Wiley and Sons, 2nd edition, 2000.
15. R. Diestel, Graph Theory, Springer-Verlag, 2nd edition, 2000.
16. I. N. Herstein, "Topics in Algebra", Vani Educational Books, India 1986
17. Kryszig, ‘advanced engineering mathematics’
18. Numerical Methods for Engineers & Scientists by Joe D. Hoffman

PGCSE102: Advanced Operating System [Compulsory]

Module – I

Operating System Introduction, Structures - Simple Batch, Multi programmed, time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating-System services, System Calls, Virtual Machines, System Design and Implementation. [~4L]

Process and CPU Scheduling - Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple -Processor Scheduling, Real-Time Scheduling. [~5L] ***Module – 2***

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation,

Paging, Segmentation, Segmentation with Paging. Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing. [~6L]

File System Interface and Implementation -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance. [~6L] **Module 3**

Deadlocks - System Model, Dead locks Characterization, Methods for Handling Dead locks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock. [~4L]

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors. [~5L]

Module 4

Operating System Security Issues- Introduction to the topic of Security in Operating Systems, Principles of Information Security, Access Control Fundamentals, Generalized Security Architectures. [~5L]

Module 5

Introduction to Distributed systems: Goals of distributed system, hardware and software Concepts, design issues. [~2L]
Elementary introduction to the terminologies within Modern Oss: Parallel, Distributed, Embedded
& Real Time, Mobile, Cloud and Other Operating System Models. [~3L]

Reference Books

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Distributed Operating System - Andrew. S. Tanenbaum, PHI
3. Operating System a Design Approach-Crowley, TMH.
4. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI
5. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI
6. Operating Systems, Dhamdhere, TMH
7. Tanenbaum, Modern Operating Systems, 2nd ed.
8. Silberschatz & Galvin, Operating System Concepts, 6th ed.
9. Saltzer & Kaashoek, Principles of Computer System Design, 2009
10. Coulouris et al., Distributed Systems: Concepts and Design, 3rd ed., - Lynch,
11. Distributed Algorithms, - Lynch et al., Atomic Transactions,
12. Casevant & Singhal, Readings in Distributed Computing Systems,
13. Ananda & Srinivasan, Distributed Computing Systems: Concepts and Structures Mullender, Distributed Systems
14. Filman & Friedman, Coordinated Computing: Tools and Techniques for Distributed Software, - Andrews, Concurrent Programming: Principles and Practice.

PGCSE103: Advanced Computer Architecture [Compulsory]

Module – 1: The evolution of modern Computer systems – from DEC PDP-11, IBM 360/370 family, CDC Cyber 6600, Intel X86 architecture, Performance measurement parameters – MIPS, MFLOPS, SPEC ratings, CPI etc. (4L)
Introduction to high performance Computing – Overview, Flynn's classifications – SISD, SIMD, MISD, MIMD, Examples from Vector & Array Processors, Performance comparison of algorithms for Scalar, Vector and Array Processors, Fundamentals of UMA, NUMA, NORMA architectures, Performance measurement for parallel architectures – Flynn,s measure, Feng,s measure, Handler's measure, Amadahl's law of limitation for parallel processing, Gustafson's law. (8L)

Module – 2: Pipelined processor design, Pipeline performance measurement parameters – speedup factor, efficiency, throughput of a linear pipeline, comparing performance of a N stage pipeline with a N processor architecture, Pipeline design principles – Uniform subcomputations, Identical computations, Independent computations, Examples from design of Arithmetic pipelines – Floating point Adders, Multipliers, Dividers etc.,Classifications of Unifunction, Multifunction & Dynamic pipelines, Scheduling in a pipelines with feedback , Pipeline hazards and their solutions(12L)

Module –3: RISC architecture, characteristics of RISC instruction set & RISC pipeline, its comparisons with CISC, necessity of using optimizing compilers with RISC architecture, Examples from POWER PC and SPARC architectures , Superpipelining (MIPS architecture), Superscalar architecture , Diversified pipelines and out of order execution, VLIW architecture, Hardware multithreading (Coarse grained, fine grained & simultaneous multithreading. (12L)

Module – 4: Memory hierarchy – Techniques for improving Cache memory performance parameters,(reduce cache miss rate, reduce hit time, reduce miss penalty), Main memory performance enhancement – interleaved memory, improvement of memory bandwidth, use of TLB for performance enhancement. (6L)

References:

1. Computer Organization & Design – Patterson & Hennessy (Morgan Kaufmann)
2. Computer Architecture: A Quantitative Approach – Patterson & Hennessy (Elsevier)
3. Computer Architecture & Parallel Processing – Hwang & Briggs(TMH)
4. Computer organization and architecture, designing for performance – Stallings (PHI)
5. Modern Processor Design – Shen & Lipasti (TMH)
6. Advanced Computer Architecture – Hwang (TMH)
7. An Introduction to Intel family of Microprocessors – Antonakos (Pearson)
8. Computer Architecture – Flynn (Narosa)
9. Structured Computer Organization – Tanenbaum (PHI)
10. Computer Architecture & Organization – J P Hayes (McGraw Hill)
11. Computer Organization – Hamacher, Vranesic, Zaky(McGraw Hill)

PGCSE104: Advanced Algorithms [Compulsory]

MODULE 1: [8L]

TIME AND SPACE COMPLEXITY. ASYMPTOTIC NOTATIONS. RECURRENCE FOR DIVIDE AND CONQUER AND ITS SOLUTION, THE SUBSTITUTION METHOD AND RECURSION-TREE METHOD FOR SOLVING RECURRENCES. THE MASTER METHOD: PROOF AND SOLVING RECURRENCE PROBLEMS, MERGE SORT, HEAP SORT, QUICK SORT AND THEIR COMPLEXITY ANALYSIS.

MODULE 2: [8L]

ADVANCED DATA STRUCTURE: ADT AND DATA STRUCTURE, LINEAR VS NON-LINEAR DATA STRUCTURE. TREE: TREE AS AN ADT, DEFINITION AND TERMINOLOGIES, THREADED BINARY TREE, BST. AVL TREE, BALANCE MULTI WAY SEARCH TREE: 2-3 TREE, RED- BLACK TREE, B TREE, B+ TREE, TRIES,SPATIAL DATA REPRESENTATION USING K-D TREE, QUAD TREE

MODULE 3 [12L]

GRAPH: DEFINITION, COMPUTER REPRESENTATION OF GRAPHS, GRAPH TRAVERSALS: BFS & DFS, SPANNING TREE. GRAPH COLOURING-CHROMATIC NUMBER, ALGORITHM FOR TRANSITIVE CLOSURE, TOPOLOGICAL SORT, AND CRITICAL PATHS

DYNAMIC PROGRAMMING : MATRIX-CHAIN MULTIPLICATION, ALL PAIR SHORTEST PATHS, SINGLE SOURCE SHORTEST PATH, TRAVELLING SALESMAN PROBLEM, 0-1 KNAPSACK PROBLEM, LCS PROBLEM.

GREEDY METHOD : KNAPSACK PROBLEM, JOB SEQUENCING WITH DEADLINES, ACTIVITY – SELECTION, HUFFMAN CODES, MINIMUM SPANNING TREE BY PRIM'S AND KRUSKAL'S ALGORITHMS.

DISJOINT SET MANIPULATION : SET MANIPULATION ALGORITHM LIKE UNION-FIND, UNION BY RANK,

PATH COMPRESSION. TOPOLOGICAL SORTING

BACKTRACKING: USE IN SOLVING PROBLEM, 4 QUEEN AND 8-QUEEN PROBLEM, SUBSET SUM PROBLEM

BRANCH AND BOUND: BASIC METHOD, APPLICATIONS: THE 15-PUZZLE PROBLEM,

.**MODULE 4 [4L]**

COMPUTATIONAL GEOMETRY: ROBUST GEOMETRIC PRIMITIVES, CONVEX HULL, TRIANGULATION, VORONOI DIAGRAMS, NEAREST NEIGHBOR SEARCH, RANGE SEARCH, POINT LOCATION, INTERSECTION DETECTION, BIN PACKING, MEDIAL-AXIS TRANSFORM, POLYGON partitioning, simplifying polygons, shape similarity, motion planning, maintaining line arrangements, minkowski sum.

MODULE 5 [8L]

SET AND STRING PROBLEMS: SET COVER, SET PACKING, STRING MATCHING, APPROXIMATE STRING MATCHING, TEXT COMPRESSION, CRYPTOGRAPHY, FINITE STATE MACHINE MINIMIZATION, LONGEST

COMMON SUBSTRING/SUBSEQUENCE, SHORTEST COMMON SUPERSTRING.

ADVANCED AREAS: NOTION OF NP-COMPLETENESS: P CLASS, NP-HARD CLASS, NP-COMPLETE CLASS,

CIRCUIT SATISFIABILITY PROBLEM. approximation algorithms, randomized algorithms, multithreaded ALGORITHMS, PARALLEL ALGORITHMS.AMORTIZED ANALYSIS AND ITS APPLICATIONS,

REFERENCE BOOKS:

1. A.AHO, J.HOPCROFT AND J.ULLMAN “THE DESIGN AND ANALYSIS OF ALGORITHMS”, PE.
2. T CORMEN, C LEISERSON AND R RIVEST “INTRODUCTION TO ALGORITHMS”, PHI.
3. FUNDAMENTALS OF ALGORITHMS- G.BRASSARD,P.BRATLAY, PHI.
4. HOROWITZ ELLIS, SAHANI SARTAZ, R. SANGUTHEVAR " FUNDAMENTALS OF COMPUTER ALGORITHMS".

PGCSE291: Computer Networking & DBMS Laboratory

Group-A - Computer Networking

Group-B - Data Base Management System

Elective - I

PAPER NAME: ARTIFICIAL NEURAL NETWORK PAPER CODE: PGCSE105A Credit: 4, Total Lectures: 43

Introduction to artificial neural networks [5L]

Biological neural networks, Pattern analysis tasks: Classification, Regression, Clustering, Computational models of neurons, Structures of neural networks, Learning principles

Linear models for regression and classification [8L]

Polynomial curve fitting, Bayesian curve fitting, Linear basis function models, Bias-variance decomposition, Bayesian linear regression, Least squares for classification, Logistic regression for classification, Bayesian logistic regression for classification

Feedforward neural networks [8L]

Pattern classification using perceptron, Multilayer feedforward neural networks (MLFFNNs), Pattern classification and regression using MLFFNNs, Error backpropagation learning, Fast learning methods: Conjugate gradient method, Autoassociative neural networks, Bayesian neural networks.

Radial basis function networks [5L]

Regularization theory, RBF networks for function approximation, RBF networks for pattern classification,

Kernel methods for pattern analysis [8L]

Statistical learning theory, Support vector machines for pattern classification, Support vector regression for function approximation, Relevance vector machines for classification and regression,

Self-organizing maps [4L]

Pattern clustering, Topological mapping, Kohonen's self-organizing map

Feedback neural networks [5L]

Pattern storage and retrieval, Hopfield model, Boltzmann machine, Recurrent neural networks.

Text Books:

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

PGCSE105D : Software Engg & Case Tools

MODULE – 1: PRINCIPLES AND MOTIVATIONS: [8L]
DEFINITIONS AND NEED FOR ENGINEERED APPROACH TO SOFTWARE DEVELOPMENT; SOFTWARE DEVELOPMENT PROCESS MODELS FROM THE POINTS OF VIEW OF TECHNICAL DEVELOPMENT AND PROJECT MANAGEMENT: WATERFALL, RAPID PROTOTYPING, INCREMENTAL DEVELOPMENT, SPIRAL **MODULE – 2:** MODELS, AND EMPHASIS ON COMPUTER-ASSISTED ENVIRONMENTS. [8L]
INTRODUCTION TO MODELING TOOLS BASICS OF OBJECT-ORIENTED APPROACH, OBJECT-ORIENTED PROGRAMMING AND LANGUAGES, OMT, VISUAL MODELING, UML, RATIONAL ROSE TOOL
MODULE – 3: SOFTWARE DEVELOPMENT METHODS [8L]
FORMAL, SEMI-FORMAL AND INFORMAL METHODS; REQUIREMENTS ELICITATION, REQUIREMENTS SPECIFICATION; DATA, FUNCTION, AND EVENT-BASED MODELING; SOME OF THE POPULAR METHODOLOGIES SUCH AS YOURDON'S SAD, SSADM ETC; CASE TOOLS-CLASSIFICATION, FEATURES, STRENGTHS AND WEAKNESSES; ICASE; CASE STANDARDS.

MODULE – 4: SOFTWARE PROJECT MANAGEMENT [8L]
PRINCIPLES OF SOFTWARE PROJECTS MANAGEMENT; ORGANIZATIONAL AND TEAM STRUCTURE; PROJECT PLANNING; PROJECT INITIATION AND PROJECT TERMINATION; TECHNICAL, QUALITY, AND MANAGEMENT PLANS; PROJECT CONTROL; COST ESTIMATION METHODS - FUNCTION POINTS AND COCOMO.

MODULE – 5: OBJECT MODELING AND DESIGN [8L]
CLASSES, OBJECTS, RELATIONSHIPS, KEY ABSTRACTIONS, COMMON MECHANISMS, DIAGRAMS, CLASS DIAGRAMS, ADVANCED CLASSES, ADVANCED RELATIONSHIPS, INTERFACES, TYPES, ROLES, PACKAGES, INSTANCES, OBJECT DIAGRAMS, INTERACTIONS, USE CASES, USE CASE DIAGRAMS, INTERACTION DIAGRAMS, ACTIVITY DIAGRAMS, EVENTS AND SIGNALS, STATE MACHINES, PROCESSES, THREADS, STATE CHART DIAGRAMS, COMPONENTS, DEPLOYMENT, COLLABORATIONS, PATTERNS AND FRAMEWORKS, COMPONENT DIAGRAMS, SYSTEMS AND MODELS, CODE GENERATION AND REVERSE ENGINEERING.

REFERENCES:

1. ROGER PRESSMAN; SOFTWARE ENGINEERING - A PRACTITIONER'S APPROACH, MCGRAW HILL, NEW YORK.
2. IAN SOMMERVILLE; SOFTWARE ENGINEERING, ADDISON-WESLEY PUBLISHING COMPANY, ENGLAND
3. PANKAJ JALOTE; AN INTEGRATED APPROACH TO SOFTWARE ENGINEERING, NAROSA PUBLISHING HOUSE, NEW DELHI.
4. 4. GRADY BOOCH, JAMES RUMBAUGH, IVAR JACOBSON, THE UNIFIED MODELING LANGUAGE USER GUIDE, PEARSON EDUCATION, NEW YORK.

PGCSE105F: **Allotted Hrs: 45LComputer**

Graphics & Multimedia

Module I

Introduction to computer graphics & graphics systems [6L]

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion: [6L]

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II

2D transformation & viewing [8L]

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear;

Transformation of points, lines , parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D transformation & viewing [7L]

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Module III

Curves [3L]

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. Hidden surfaces [3L]

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

Color & shading models [2L]

Light & color model; interpolative shading model; Texture;

Module IV

Multimedia [10L]

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia; Image, video and audio standards. Audio: digital audio, MIDI, processing sound, sampling, compression. Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intra-frame compression. Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.

Text Books:

1. Hearn, Baker – " Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – " Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
5. Sanhker, Multimedia –A Practical Approach, Jaico
6. Buford J. K. – "Multimedia Systems" – Pearson Education
7. Andleigh & Thakrar, Multimedia, PHI
8. Mukherjee Arup, Introduction to Computer Graphics, Vikas
9. Hill,Computer Graphics using open GL, Pearson Education

Reference Books:

- Foley, Vandam, Feiner, Hughes – "Computer Graphics principles (2nd Ed.) – Pearson Education.
- W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – TMH.
- Elsom Cook – "Principles of Interactive Multimedia" – McGraw Hill

Practical

Advanced Operating System Lab
Code: PGCSE191
Contact: 3P
Credits: 2

1. **Preliminaries of Operating System [6P]:** managing users, managing systems, file managements, useful commands.
2. **Shell scripting [9P]:** shell syntax, executing shell scripts.
3. **Process [15P]:** creating new process, counting maximum number of processes a system can handle at a time, handling system calls; inter process communication through pipes and message passing, zombie process, orphan process.
4. **Process Synchronization [6P]:** handling threads and semaphores to achieve synchronization among processes using POSIX standard functions.
5. **Signal [6P]:** study of some POSIX signals (SIGINT, SIGILL, SIGFPE, SIGKILL, SIGHUP, SIGALRM, SIGABRT).

Artificial Neural Networks LAB [PGCSE192(A)]

*Introduction to Matlab Programming***:** Program to perform various operations on variables, Basic Arithmetic operations on Matrix, Program to plot a straight line, Program to plot sine curve, Program to plot Graph for multiple Curves.
List of assignments on Artificial Neural Networks:

i) Program to illustrate how the choice of Activation Function (or transfer function) affects the Output of a Neuron.
ii) Program to classify with a 2-input perceptron. iii) Program to illustrate how the Perceptron Learning Rule works for non-linearly separable problems.
iv) Realise a Hebb Net for the AND, OR and NOT function with bipolar inputs and targets.
v) Develop a Matlab program for OR function with bipolar inputs and targets using ADALINE network.
vi) Develop a Matlab program to generate XOR function for bipolar inputs and targets using MADALINE Network.
vii) Develop a Matlab program to store the vector (-1,-1,-1,-1) and (-1,-1,1,1) in an autoassociative network. Find the weight matrix. Test the net with (1,1,1,1) as input.

viii) Develop a Matlab program to store the letters (patterns) A,B,C,D and after training, test the noisy version of these patterns using a Hetero Associative network. Assume a matrix representation for these patterns forming the alphabets A,B,C,D and their noisy versions.

ix) Consider a vector(1,0,1,1) to be stored in the net. Test a discrete Hopfield net with error in the 1^{st} and 4^{th} components (0,0,1,0) of the stored vector.

x) Develop a Matlab program for XOR function (binary input and output) with momentum factor using back-propagation algorithm.

xi) Develop Matlab program for drawing feature maps (Kohonen Self Organizing Feature maps) in 1-Dimensional view.

xii) Use Kohonen Self Organizing feature map to Cluster the vectors (assume four binary vectors) using own initial weights(to be assumed) and learning rate(to be assumed).

COMPUTER GRAPHICS & Multimedia LAB (PGCSE192) P-3, Cr. Pt.-2

- Learning graphics functions in C, C++.
- DDA line drawing algorithm.
- Bresenham's algorithm for generation of octant of a circle.
- Circle generation using Mid-point method.
- Ellipse generation using Mid-point method.
- Point plotting, line & regular figure algorithms.
- Polygon filling algorithm (FLOODFILL / SEEDFILL) .
- Cohen-Sutherland clipping algorithm.
- Polygon clipping using Sutherland Hodgeman algorithm.
- 2D and 3D Transformations such as translation, rotation, scaling, reflection and sharing.
- Curve generation using Interpolation methods.
- Curve generation using B-spline and Bezier curves.
- Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm.
- Creating Animation using Flash

Software Engineering & CASE Tools Lab.
PGCSE195
Contracts: 3L
Credits- 2
Assignments to be given from the following:

- .Preparation of SRS document for standard application problems in standard format.(e.g Library Management System, Railway Reservation system, Hospital management System, University Admission system)
- Prepare Software Design Document (ERD, DFD & structure chart)
- Project Schedule preparation .
- Use Case diagram, Class diagram, Sequence diagram etc. using tools like Rational Rose(For standard application problems)
- .Estimation of project size using Function Point(FP) calculation.
- Drawing control flow graph(CFG) and determining cyclomatic complexity for some problems.
- Design Test Script/Test Plan(both Black box and White Box approaches)
- Designing test suites for some applications.
- Estimation of product Cost by Cost Estimation models like COCOMO and its variations.
- Comperative study on variations of COCOMO models.

Semester – 2.

PGCSE201: Advanced DBMS [Compulsory]

Module 1 [8L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Lossless Decomposition ,Boyce-Codd Normal Form, 3NF, Normalization using multi-valued depedencies, 4NF, 5NF

Module 2 [5L]

Transaction processing, Concurrency control and Recovery Management, conflict and view serializability, lock base protocols, two phase locking. **Module 3 [9L]**

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design - fragmentation, allocation criteria.Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Module 4 [6L]

Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries.Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

Module 5 [2L]

Introduction to Oracle RDBMS

Books:

1. Leon & Leon, Essentials Of Dbms, Mc.Graw Hill

2. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.

3. Saeed K. Rahimi, Frank S. Haug*Distributed Database Management Systems: A Practical Approach*,*Willey*

PGCSE202:Advanced Computer Network & Security [Compulsory] Total Lecture Hours: 44

1. INTRODUCTION TO INTERNETWORKING: HOW NETWORKS DIFFER, HOW NETWORKS CAN BE CONNECTED, CONNECTIONLESS INTERNETWORKING, TUNNELING, FRAGMENTATION, OVERVIEW OF UNDERLYING TECHNOLOGIES (ETHERNET, TOKEN RING, TOKEN BUS, FDDI, PPP). [6 Lectures]
2. NETWORK LAYER PROTOCOLS: IPV4, IPV6, NAT, ARP, RARP, DHCP, ICMP, OSPF, BGP, IGMP, CIDR. [4 Lectures]
3. TRANSPORT LAYER PROTOCOLS: UDP, REMOTE PROCEDURE CALL, RTP, TCP, TCP TAHOE, TCP RENO, TCP NEW RENO, TCP SACK. [4 Lectures]
4. MOBILE TELEPHONE SYSTEMS: INTRODUCTION TO WIRELESS NETWORKS AND CELLULAR TECHNOLOGY, AMPS, D-AMPS, GSM, GPRS, CDMA, BLUETOOTH. [4 Lectures]
5. WIRELESS NETWORKS: WLAN: INTRODUCTION, PROBLEMS AND SOLUTIONS, PROTOCOL STACK, ACCESS METHODS, SERVICES, WIMAX, WIFI, ZIGBEE. [4 Lectures]
6. AD-HOC NETWORKS: INTRODUCTION, ROUTING CHALLENGES FOR AD-HOC NETWORKS, ROUTING PROTOCOLS (AODV, DSDV, DSR,), TRANSPORT PROTOCOLS (ATCP, TCP-F, TCP BUS).

[4 Lectures]

7. WIRELESS INTERNET: MIPV4, MIPV6, TCP PERFORMANCE, I-TCP, TCP SNOOP, FREEZE TCP, WWP, TCP REAL.

[4 Lectures]

8. CONGESTION CONTROL: GENERAL PRINCIPLES, CONGESTION PREVENTION POLICIES, CHOKE PACKET, RED, ECN, ELN, ELN-ACK.

[4 Lectures]

9. QOS PROVISIONING: DELAY GUARANTEES, NETWORK DELAY, DELAY JITTER, PLAY OUT DELAY,

ADMISSION CONTROL, QOS OBJECTIVES, THE RSVP APPROACH.

[4 Lectures]

10. SECURITY: INTRODUCTION TO CRYPTOGRAPHY, SYMMETRIC KEY AND PUBLIC KEY ALGORITHMS,

DIFFIE HELLMAN KEY EXCHANGE ALGORITHM, DIGITAL SIGNATURES, IPSEC, FIREWALL, VPN, VLAN, WIRELESS SECURITY, AUTHENTICATION PROTOCOLS.

[6 Lectures]

BOOKS

1. INTERNETWORKING WITH TCP/IP: PRINCIPLES, PROTOCOLS, AND ARCHITECTURE - DOUGLAS COMER.
2. COMPUTER NETWORKS –A.S.TANNENBAUM.
3. DATA AND COMPUTER COMMUNICATIONS – WILLIAM STALLINGS
4. WIMAX SECURITY & QOS-AN END-TO-END PERSPECTIVE: ISBN: 978-0-470-72197-1, WILEY PUBLICATION.

PGCSE203: Theory of Computation [Compulsory] Mathematical preliminaries.

Models of Computation

: Models of computation - classification, properties and equivalences.

Finite Automata

: Formal definition of a Finite Automata (FA) -Examples of FA, Designing FA, DFA and NFA, regular operations. Equivalence of NFAs and DFAs. FA with Epsilon-Transitions, Epsilon-Closures, Eliminating epsilon -Transitions. Applications of FAs. Mealy and Moore machine, Dead state, Minimization of FA, Incompletely specified machine. FA on infinite inputs.

Regular expression and Languages

: Definition of a Regular Expressions (RE), The Operators of RE – Building RE, Conversions DFA's to RE. Equivalence of

RE and NFA with Epsilon-moves, - Application of REs. Equivalence of regular grammar and FA.; Properties of Regular

Languages (RL), Proving Languages not to be Regular, Pumping Lemma for RLs. Applications of the Pumping Lemma.

Closure Properties of RLs, Decision Properties of Rls

Context Free Languages

: Context free languages, Derivation and languages, Relationship between derivation and derivation trees, Leftmost and Rightmost Derivations. Simplification of context free grammars – Normal forms for context free grammars, CNF, and GNF.

Applications of Context-Free Grammars. Non determinism vs. ambiguity in CFLs. Closure properties of CFLs. Algorithmic

properties about CFLs. Pumping Lemma for CFL.

Push Down Automata

: Definition, Acceptance by a Push Down Automata (PDA), DPDA & NPDA, example, Equivalence of PDA's and CFG's

(conversion : PDA's to CFG's and reverse). Multi stack PDA. Non-determinism adds power to PDAs.

Turing Machine

: Unsolvable Problems. Definition, notation and Example of Turing Machine (TM). Programming techniques Computable

languages and functions, Church Turing hypothesis, Universal TM, Random Access TM. Multitape TM, Equivalence of

One-Tape and Multitape TM's , Nondeterministic TMs. Conversion of RE to TM. Multi-stack PDA & TM.

Computability and Decidability: Church-Turing Thesis, Decision Problems, Decidability and undecidability, unsolvable problems; Halting Problem of

Turing Machines; Problem reduction (Turing and mapping reduction), Intractability (Hierarchy Theorems). Mapping reductions. More undecidable languages. Rice theorem. Reductions using controlled executions. RE Completeness. Reductions using computation histories. Linear Bounded Automata. Unrestricted grammars.

Computational Complexity:

Resource-constrained computation. Time Complexity- notion of complexity classes, classes P NP, NP-complete, Boolean satisfiability, NP-Completeness of CSAT and 3SAT , NP-Hard, Cook- Levin Theorem. The concept of reduction, coNP, polynomial Hierarchy. Some natural NP-complete problems. Space Complexity-Savich's Theorem. The class PSPACE. Optimization, search, and decision problems. Approximate solutions to optimization problems.

Logic: Propositional and First-order logic and their applications to theorem proving and logic programming.

Advanced/Emerging areas: Elementary introductions to DNA Computing, Quantum Computing, Cellular Automata, Circuit complexity, Structural Complexity, Parallel Complexity, Algorithmic Information.

Course Guidelines: Large majority of the lectures would focus only on the core areas, with only elementary introduction to other remaining advanced areas.

Elective – II

Cluster, Grid and Cloud Computing
Code: PGCSE204A
Contact: 4L
Credit: 4
Allotted Hrs: 44

Cluster Computing [12L]

A general introduction to the concept of cluster based distributed computing.

Hardware technologies for cluster computing, including a survey of the possible node hardware and high-speed networking hardware and software.

Software and software architectures for cluster computing, including both shared memory (OpenMP) and messagepassing (MPI/PVM) models

MPI-2 extension, dynamic process creation, one-sided communication, parallel I/O.
Variants based on new low level protocols (MVAPICH), evaluation and tuning of system and software performance

Performance evaluation tools, HINT, netperf, netpipe, ttcp, Iperf.

Grid Computing [16L]

The Grid - Past, Present, Future, A New Infrastructure for 21st Century Science - The Evolution of the Grid - Grids and Grid Technologies, Programming models - A Look at a Grid Enabled Server and Parallelization Techniques – Grid applications

The concept of virtual organizations – Grid architecture – Grid architecture and relationship to other Distributed Technologies – computational and data Grids, semantic grids

Case Study: Molecular Modeling for Drug Design and Brain Activity Analysis, Resource management and scheduling, Setting up Grid, deployment of Grid software and tools, and application execution

Cloud Computing [16L]

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS

Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo.

Issues in cloud computing, Implementing real time application over cloud platform

Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment.

Text Book:

- 1. Cluster Computing by Rajkumar Buyya, Clemens Szyperski
  2. High Performance Cluster Computing: Architectures and systems by Rajkumar Buyya
  3. Grid and Cluster Computing by C.S.R Prabhu
  4. Fran Bermn, Geoffrey Fox, Anthony Hey J.G., "Grid Computing: Making the Global Infrastructure a Reality", Wiley, USA, 2003
  5. Joshy Joseph, Craig Fallenstein, "Grid Computing", Pearson Education, New Delhi, 2004,
  6. Ian Foster, Carl Kesselman, "The Grid2: Blueprint for a New Computing Infrastructure". Morgan Kaufman, New Delhi, 2004
  7. Ahmar Abbas, "Grid Computing: Practical Guide to Technology and Applications", Delmar Thomson Learning, USA, 2004,
- 8. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
- 9. Enterprise Cloud Computing by Gautam Shroff,Cambridge
- 10. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

PGCSE 204(B): Mobile Computing
(42 LECTURES)

Fundamentals of Cellular Communications [8L]

Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Teletraffic Engineering, Radio Propagation and Propagation Path-Loss Models, Cellular Geometry, Interference in Cellular Systems, Frequency Management and Channel Assignment Issues, Multiple Access Techniques, GSM Logical Channels and Frame Structure, Privacy and Security in GSM, Mobility Management in Cellular Networks.

Wireless Transmission Fundamentals [8L]

Spread Spectrum (SS) and CDMA Systems, Wireless Medium Access Control, IEEE 802.11 Architecture and Protocols, Issues in Ad
Hoc Wireless Networks (Medium Access Scheme), Routing, Multicasting, Transport Layer Protocols, QoS Provisioning, Energy Management and Energy Consumption Models, Traffic Integration in Personal, Local, and Geographical Wireless Networks, Bluetooth, Technologies for High-Speed WLANs, Third-Generation Cellular Systems: UMTS.

Mobile Adhoc Networks [8L]

Introductory Concepts. Different models of operation, Various applications of MANET, Destination-Sequenced Distance Vector protocol - overview, Route Advertisement, Extending Base Station Coverage, Properties of DSDV protocol, Dynamic Source Routing protocol - overview and properties, DSR Route Discovery, Route Maintenance, Support for Heterogeneous Networks and Mobile IP, Multicast routing with DSR, Ad Hoc On-Demand Distance-Vector protocol - properties, Unicast Route Establishment, Multicast Route Establishment, Broadcast Optimizations and Enhancements, Link Reversal Routing - Gafni-Bertsekas Algorithm, lightweight mobile routing algorithm, Temporally Ordered Routing Algorithm, Preserving battery life of mobile nodes - Associativity Based Routing, Effects of beaconing on battery life.

Wireless Sensor Networks [8L]

Sensor networks overview: introduction, applications, design issues, requirements, Sensor node architecture, Network architecture: optimization goals, evaluation metrics, network design principles, Sensor network operating systems and brief introduction to sensor network Programming, Network protocols: MAC protocols and energy efficiency, Routing protocols: data centric, hierarchical, location-based, energy efficient routing etc, Sensor deployment, scheduling and coverage issues, Self Configuration and Topology Control, Querying, data collection and processing, collaborative information processing and group connectivity, Target tracking, localization and identity management, Power management, Security and privacy.

Topology Control and Clustering in Adhoc Networks [5L]

Algorithms for Graphs Modeling Wireless Ad Hoc Networks, Clustering and Network Backbone, Dominating-Set-Based Routing in Ad Hoc Wireless Networks, Formation of a Connected Dominating Set, Backbone-Formation Heuristics.

Mobile, Distributed and Pervasive Computing [5L]

Pervasive Computing Applications, Architecture of Pervasive Computing Software, Indoor Wireless Environments, Challenges for the Future: Nomadic Computing.

Text Books:

a) Sivaram Murthy, Manoj, “Adhoc Wireless and Sensor Networks: Architecture and Protocols”, Pearson.
b) Vijay Garg, “Wireless Communications and Networking”, Morgan Kaufmann Publishers
c) Gast,” 802.11 Wireless Networks”, Oreilly-SPD
d) Theodore Rappaport, “Wireless Communications: Principles and Practice” TMH.
e) J. Schiller, Pearson Education, “Mobile Communications”, TMH.
f) William C.Y Lee Cellular Mobile Telecommunications, TMH
g) Garg and Wilkes, Principles and Applications of GSM, Pearson.

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Reference Books

a) Gabrilovska, Prasad, "Adhoc Networking Towards Seamless Communication", Springer.
b) Azzedine Boukerche, "Handbook of Algorithms for Wireless Networking and Mobile Computing", Chapman and Hall/CRC, New York.
c) Wagner, Wattenhofer (Eds.), "Algorithms for Adhoc and Sensor Networks: Advanced Lectures", Springer Lecture Notes in Computer Science.
d) Mukherjee, Bandopadhyay, Saha, "Location Management and Routing in Mobile Wireless Networks", Artech House, London.
e) Redl, S.M., Weber, M.K., Oliphant, M.W.: An Introduction to GSM. Artech House, London.
f) Mehrotra, A.: GSM System Engineering. Artech House, London.
g) Ivan Stojmenovic, "Handbook of Wireless Networking and Mobile Computing", Wiley Inc, New York.
h) XiangYang Li, "Wireless Adhoc and Sensor Networks", Cambridge University Press.

ADVANCED WEB TECHNOLOGY
PGCSE204C
Contracts: 4L
Credits- 4
Total 40 lectures

Module I-6L (Internet & WWW)

Introduction (2L):

Overview, Computer Network, Intranet, Extranet and Internet. Types of Networks (LAN, MAN, WAN), Network Topologies .Definition of Internet, Internet organization. Growth of Internet, Internet Application.

Review of TCP/IP (2L):

OSI Reference model, TCP/IP Model, IP addressing, Classful and Classless Addressing, Subnetting, Features and services of TCP/IP, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram. Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. Electronic Mail-POP3, SMTP.

World Wide Web (2L):

Evolution of distributed computing. Core distributed computing technologies – Client/Server Architecture & its Characteristics, JAVA RMI.
Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.
Web Server Concept and Architecture. Definition of DNS (Domain Name System). Domain and Sub domain, Address Resolution, FTP & its usage, Telnet Concepts, Remote Logging, HTTP & HTTPs.

Module II-12L(Client Side Application Development)

HTML & CSS (3L):
Introduction, Editors, Elements, Tags, Attributes, Heading, Paragraph. Formatting, Link, Image, Table, List, Block, Form, Frame Layout, DHTML, Basic Web Page Development, CSS- Create Class Styles, Create ID Styles ,Span, Colors.HTML5 in brief.

Extensible Markup Language (XML) (3L):

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation, Tree, Syntax, Elements, Attributes, Validation, and Viewing. XHTML in brief.

JavaScript (6L):

Introduction, JavaScript in Web Pages, The Advantages of JavaScript Writing JavaScript into HTML; Building Up JavaScript Syntax; Basic
Programming Techniques ; Operators and Expressions in JavaScript; JavaScript Programming Constructs; Conditional Checking Functions in
JavaScript, Dialog Boxes, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array. Function, Errors,
Validation. The JavaScript Document Object Model-Introduction (Instance, Hierarchy); The JavaScript Assisted Style Sheets DOM; Understanding
Objects in HTML (Properties of HTML objects, Methods of HTML objects); Browser Objects, Handling Events Using JavaScript

Module III-16L (Server Side Programming withPHP & MySQL)

Installing and Configuring (2L) :

Current and Future Versions of MySQl and PHP, How to Get MySQL, Installing MySQL on Windows, Trouble Shooting your Installation, Basic Security Guidelines, Building PHP on Windows with Apache, Windows, php.ini.Basics,The Basics of PHP scripts.

The Building blocks of PHP (3L):

Variables, Data Types, Operators and Expressions, Constants. Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser
Output.

Functions (3L):

What is function? Calling functions, Defining Functions. Variable Scope, more about arguments. Working with Arrays and Some Array-Related Functions.

Working with Objects (2L):

Creating Objects, Object Instance Working with Strings, Dates and Time: Formatting strings with PHP, Investigating Strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP.

Working with Forms (2L):

Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, and Working with File Uploads.

Learning basic SQL Commands (2L):

Learning the MySQL Data types, Learning the Table CreationSyntax, Using Insert Command, Using SELECT Command, Using WHERE in your Queries,Selecting from Multiple Tables, Using the UPDATE command to modify records, Using the DELETE Command, Frequently used string functions in MySQL, Using Date and Time Functions in MySQL.

Interacting with MySQL using PHP (2L):

MySQL Versus MySQLi Functions, Connecting to MySQL with PHP, Working with MySQL Data.

Module IV-6L(Multimedia for WEB)

Multimedia Application Development (4L):

Pixel, Image Resolution, Image Editing using Photoshop, 2D & 3D Animation, Logo Design, Banner. Animated Component Preparation using Flash & Action script.

Multimedia Web Applications (2L):

Multimedia over IP: RTP, RTCP. Streaming media, Codec and Plugins, VoIP, Text and Voice Chat.

Books:

1. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.
2. Web Technology & Design, C.Xavier, New Age International Publication, Delhi
3. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
4. Sams Teach Yourself PHP in 24 Hours, Third Edition
5. Wrox, Beginning PHP, Apache, MySQL Web Development
6. Wrox, Beginning PHP
7. ULLMAN, LARRY ,'PHP AND MYSQL FOR DYNAMIC WEB SITES' 8. ULLMAN, LARRY, 'PHP ADVANCED FOR THE WORLD WIDE WEB'

Soft Computing: PGCSE 204(D) [40 LECTURES]

Introduction to Soft Computing [8L]

Evolution of Computing - Soft Computing Constituents – From Conventional Artificial Intelligence to Computational Intelligence - Machine Learning Basics.

Fuzzy Logic [8L]

Fuzzy sets and Fuzzy logic: Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets,
Extension principle, Fuzzy relations and relationequations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, App lications, fuzzy controllers, fuzzy pattern recognition, fuzzy image processing, fuzzy database.

Artificial Neural Networks [8L]

Artificial Neural Network: Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation,Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Genetic Algorithms [8L]

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GeneticAlgorithm,Analysis of selection oper ations, Hypothesis of buildingBlocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications. Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reducti on of Knowledge, Decision Tables, and Applications.

Hybrid Systems [8L]

Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design andLe arning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

Books/References:

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.
3. S. Haykin, “Neural Networks”, Pearson Education, 2ed, 2001.
4. S. Rajasekaran & G. A. V. Pai , Neural Networks, Fuzzy logic, and Genetic Algorithms, PHI.
5. Fuzzy Sets and Fuzzy Logic, Klir & Yuan, PHI, 1997

6. Rough Sets, Z. Pawlak, Kluwer Academic Publisher, 1991.

7. Neural Networks, Fuzzy logic, and Genetic Algorithms, S. Rajasekaran and G. A. V. Pai, PHI.

8. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997.

PGCSE204E
Cryptography and Computer Security
Total Lectures: 34

Introduction (4L)

Linear algebra: non linearity, echelon form of matrix, Galois Field, vector space, Modular arithmetic

Coding Theory [4L]

- Elementary Concepts of Coding Theory;
- Applications of Algebraic Coding Theory to Cryptography
- Huffman coding
- Hamming coding

Primality Testing **[3L]**

- Primality Testing
- Fermat Primality Test
- AKS PRIMALITY TEST

Factorization **[5L]**

- Large prime variant
- Dixon's factorization method
- Quadratic-Sieve Factoring
- Pollard-Rho Method

Eliptic curves Cryptography **[3L]**

- Elliptic Curves
- Elliptic Curves(contd.) and Finite Fields
- Elliptic Curve Cryptography
- ECDLP
- Zero Knowledge Proof

Bilinear Pairings (3L)

- Basic concept
- Identity based encryption
- Analogous of pairing based cryptosystems

Communication Security (4L)

- Secret Sharing Schemes
- A Tutorial on Network Protocols, Kerberos
- IPsec: AH and ESP
- IPsec: IKE
- SSL/TLS
- Intruders and Viruses
- Firewalls

Electronic Mail Security (4L)

- Distribution lists
- Establishing keys
- Privacy, source authentication, message integrity, nonrepudiation, proof of submission, proof of delivery, message flow confidentiality, anonymity • Pretty Good Privacy (PGP)
- S/MIME

Secure Electronic Transaction [4L]

- SET
- Millicent protocol
- Micropayment system
- Smart-card authentication **Text Books:**

1. Public-key Cryptography: Theory and Practice by Abhijit Das and C E Veni Madhavan, First Edition, Publisher (Pearson Education)
2. Cryptography and Network security: Principles and Practice by W. Stallings, Pearson Education
3. Cryptography & Network Security, by B. A. Forouzan and D. Mukhopadhyay, Tata Mc Graw Hill
4. Cryptography Theory and Practice, by Douglas Stinson, 2nd Edition, Chapman & Hall/CRC :
5. A Course in Number Theory and Cryptography by Neal Koblitz, Springer-Verlag, New York Inc
6. Information theory, coding and cryptography by Ranjan Bose; TMH.
7. Information and Coding by N Abramson; McGraw Hill.

Elective - III

Image Processing

Code: PGCSE205A

Contact: 4L

Credit: 4

Allotted Hrs: 40

Introduction [5L]

Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation [6L]

A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries [7L]

Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement [8L]

Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration [7L]

Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation – Spatial Transformation, Gray Level Interpolation.

Image Segmentation [7L]

Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection – Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

Books:

1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3.Digital Image Processing & Analysis,Chanda & Majumder,PHI 4.Fundamentals of Digital Image Processing, Jain, PHI
5.Image Processing, Analysis & Machine Vision, Sonka, VIKAS

Elective - III

Paper Name: Pattern Recognition
Paper Code: PGCSE205B
Contact: 4L
Credit: 4
Allotted Hrs: 38

INTRODUCTION TO PATTERN RECOGNITION **6**

Basic concepts- Definitions, data sets for Pattern Recognition, Structure of a typical pattern recognition system. Different Paradigms of Pattern Recognition. Representations of Patterns and Classes. Metric and non-metric proximity measures

FEATURES SELECTION **5**

Feature vectors - Feature spaces - Different approaches to Feature Selection-Branch and Bound Schemes. Sequential Feature Selection.

FEATURES EXTRACTION **4**

Principal Component Analysis (PCA), Kernel PCA

PATTERN CLASSIFICATION **12**

Pattern classification using Statistical classifiers - Bayes' classifier - Classification performance measures – Risk and error probabilities. Linear Discriminant Function, Mahalanobis Distance, K-NN Classifier, Fisher's LDA, Single Layer Perceptron, Multi-layer Perceptron, Training set, test set; standardization and normalization

CLUSTERING **8**

Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures. K-means algorithm, K-medoids, DBSCAN

RECENT ADVANCES IN PATTERN RECCOGNITION **3**

Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy techniques, and real life examples.

BOOKS:

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
3. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
4. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

PGCSE205C:

Real Time Embedded Systems and Programming

(Sy l la b u s Up da te d) **Allotted Hrs: 36**

Code: PGIT205C
Contact: 4L
Credit: 4

Syllabus-Theory:

UNIT-I Introduction to Real Time System - 8 Hours

Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).

UNIT-II Embedded Hardware for Real Time System – 10 hours

Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip

peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts
Case study of C2000 architecture, Real time applications by interfacing C2000 with sensors and actuators (example: Motor Control, Digital Power, and Power Line Communication)

UNIT III Embedded Hardware – On chip Peripherals and Communication protocols – 08 hours

Role of peripherals for Real time systems,C2000 MCU- On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART

Case study - Illustration of configuring and interfacing the peripherals (timers, ADC, DAC, and PWM) and Real time communication protocols (I2C, SPI & UART) using C2000 platforms

UNIT IV Embedded Software and RTOS - 08 hours

Software Architecture of real time System, Understanding RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking, Introduction to TI-RTOS
Case study examples for demonstrating task management functionalities (ex: Task switching, task deleting, task suspending and resuming, managing priority and etc.,) using TI RTOS on C2000 platforms.

UNIT-V Scheduling, Synchronization and Inter task communication in Real Time Systems – 08 Hours

Basic Concepts for Real-Time Task Scheduling, Scheduling criteria, Overview of Scheduling policies, Task Synchronization – Need of synchronization, shared data problems and its ways of handling, Role of Semaphore, types of semaphores, semaphore functions, Inter task communication – Need of communication, Message Mailbox and Message Queues, RTOS problems - Priority inversion phenomenon, Deadlock phenomenon and steps to handle them.
Case study examples to demonstrate concepts of task synchronization (Semaphore) and Inter task communication (Mailbox and Message queues), using TI RTOS for C2000 platforms

TEXT BOOKS

1. Real-Time Systems by Jane W. S. Liu Prentice Hall; 1 edition ISBN: 978-0130996510
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, "DSP based Electromechanical Motion Control" CRC Press, 2003, ISBN 9780849319181.
4. Jean J Labrosse, "Embedded System Design blocks", CMP books, Second Edition, ISBN 0-87930-604-1
5. REFERENCES
6. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Number: SPRU 430E, Revised January 2009
7. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Number: SPRU566J, Revised April 2011
8. Online C2000 Teaching from Texas Instruments
9. Intro to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments, Rev 2.3 – December 2014

PGCSE205E:
Distributed System Principle **Allotted Hrs: 36**
Code: PGIT205E
Contact: 4L
Credit: 4

Distributed Systems [9L]

Computer architecture : CICS, RISC, Multi-core Computer networking : ISO/OSI Model Evolution of operating systems Introduction to distributed computing systems. DCS design goals, Transparencies, Fundamental issues

Distributed Coordination [7L]

Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection

Process synchronization [6L]
Distributed mutual exclusion algorithms, Performance matrix

Inter-process communication [6L]
Message passing communication, Remote procedure call, Transaction communication, Group communication; Broadcast atomic protocols

Distributed file systems [6L]
Deadlocks in distributed systems and Load scheduling and balancing techniques

Books:

1. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
2. Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill
3. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
4. Distributed Operating Systems, A.S. Tanenbaum, Prentice Hall
5. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International 6. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 1995.
7. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.
8. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
9. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
10. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.
11. Galli, D.L., Distributed Operating Systems: Concepts and Practice (ISBN 0-13-079843-6), Prentice-Hall 2000.

Semester 3

PGCSE301A: PROJECT MANAGEMENT & ENTREPRENEURSHIP
COURSE DESCRIPTION
THIS COURSE IS INTENDED TO BE AN INTRODUCTION TO THE FIELD OF PROJECT MANAGEMENT. THE PRIMARY OBJECTIVE OF THIS COURSE IS TO ACQUAINT STUDENTS WITH A BROAD BASIC OVERVIEW OF PROJECT MANAGEMENT, AND THE ROLE OF A PROJECT MANAGER THROUGHOUT THE FIVE PRIMARY PROCESSES OF MANAGING PROJECTS. THE OTHER THREE REQUIRED CORE COURSES WILL PROVIDE A MORE COMPREHENSIVE COVERAGE. THIS IS A 15-HOUR COURSE.

SYLLABUS:
Module – 1: WHAT "PROJECT MANAGEMENT" MEANS. ABOUT THE CONTEXT OF MODERN PROJECT MANAGEMENT. HOW TO MANAGE PROJECTS THROUGHOUT THE FIVE MAJOR PROCESS GROUPS. HOW THE TRIPLE CONSTRAINT AFFECTS THE PROJECT MANAGER. HOW TO DEVELOP AN EFFECTIVE PROJECT PLAN. HOW TO GAIN COMMITMENT TO THE PROJECT PLAN. HOW TO EFFICIENTLY EXECUTE THE PROJECT PLAN. HOW TO MINIMIZE OR ELIMINATE SCOPE CREEP. HOW TO ORGANIZE AND DEVELOP SUCCESSFUL PROJECT TEAMS. HOW TO DEVELOP AN EFFECTIVE PROJECT CONTROL SYSTEM. HOW TO DEVELOP REALISTIC PROJECT SCHEDULES. HOW TO EFFICIENTLY CLOSE OUT A PROJECT.

OBJECTIVES:
TO DEVELOP AN APPRECIATION FOR THE EVOLUTION OF ENTREPRENEURSHIP AS AN ACADEMIC DISCIPLINE. TO GAIN UNDERSTANDING OF THE ENTREPRENEURIAL PROCESS THROUGH ANALYSIS OF VARIOUS SITUATIONS. TO LEARN DIVERSE RESEARCH THEMES IN THE AREA OF ENTREPRENEURSHIP COURSE FORMAT:

SYLLABUS
Module -2: ENTREPRENEURSHIP IS AN INTENSIVE COURSE INVOLVING THE STUDY OF JOURNALS

ARTICLES, ANALYSIS OF CASES, TO EVOLVE PERSPECTIVE ON ENTREPRENEURSHIP AS AN ACADEMIC DISCIPLINE

Module -3: ENTREPRENEURSHIP: AN INTRODUCTION, NEW VENTURE CREATION, FINANCING ENTREPRENEURIAL VENTURES AND THE BUSINESS PLAN, FAMILY BUSINESS MANAGEMENT, MANAGING A GROWING BUSINESS, VENTURE GROWTH STRATEGIES, ENTREPRENEURIAL SKILLS AND STRATEGIES, ENTREPRENEURIAL SKILLS AND STRATEGIES, INTRAPRENEURSHIP: ENTREPRENEURIAL VENTURES IN A CORPORATE SETTING, ENTREPRENEUR AS CHANGE AGENT, SUSTAINABLE INNOVATION AND ENTREPRENEURSHIP, SOCIAL ENTREPRENEURSHIP

REFERENCE BOOKS:

1. M. Y. YOSHINO AND U. S. RANGAN, STRATEGIC ALLIANCES: AN ENTREPRENEURIAL APPROACH TO GLOBALIZATION, HBS PRESS, 1995.
2. FOSTER, RICHARD N., INNOVATION: THE ATTACKER'S ADVANTAGE, LONDON, MACMILLAN, 1986.
3. HOWARD H. STEVENSON, MICHAEL J. ROBERTS, AMAR BHIDE, WILLIAM A. SAHLMAN (EDITOR), THE ENTREPRENEURIAL VENTURE (THE PRACTICE OF MANAGEMENT SERIES).
4. UDAYAN GUPTA (EDITOR), DONE DEALS: VENTURE CAPITALISTS TELL THEIR STORIES.
5. STEVE KEMPER, CODE NAME GINGER: THE STORY BEHIND SEGWAY AND DEAN KAMEN'S QUEST TO INVENT A NEW WORLD.
6. PAUL A. GOMPERS AND JOSH LERNER, THE MONEY OF INVENTION: HOW VENTURE CAPITAL CREATES NEW WEALTH.
7. LARRY BOSSIDY, RAM CHARAN AND CHARLES BURCK, EXECUTION: THE DISCIPLINE OF GETTING THINGS DONE.
8. JEFFRY TIMMONS AND STEPHEN SPINELLI, NEW VENTURE CREATION: ENTREPRENEURSHIP FOR THE 21ST CENTURY WITH POWERWEB AND NEW BUSINESS MENTOR CD.
9. THE ENTREPRENEUR'S GUIDE TO BUSINESS LAW, CONSTANCE E. BAGLEY AND CRAIG E. DAUCHY, WEST EDUCATIONAL PUBLISHING, 1998.
10. MARY COULTER, ENTREPRENEURSHIP IN ACTION, PRENTICE-HALL, 2001.
11. TRACY KIDDER, THE SOUL OF A NEW MACHINE, AVON BOOKS, 1990.
12. H. L. MORGAN, A. KALLIANPUR, AND L. M. LODISH, ENTREPRENEURIAL MARKETING: LESSONS FROM WHARTON'S PIONEERING MBA COURSE, JOHN WILEY & SONS, 2001.
13. RITA GUNTHER MCGRATH AND IAN MACMILLAN, THE ENTREPRENEURIAL MINDSET.
14. JAMES COLLINS, WILLIAM C. LAZIER, BEYOND ENTREPRENEURSHIP: TURNING YOUR BUSINESS INTO AN ENDURING GREAT COMPANY.

REFERENCE (LIST OF) CASES:

1. KODAK (A), HBS CASE # 703503
2. COMMERCE BANK, HBS CASE # 603080
3. HAUSSER FOOD PRODUCTS CO., HBS CASE: 402055
4. E INK IN 2005, HBS CASE # 705506
5. WHOLE FOODS MARKET, INC., HBS CASE # 705476
6. DISCIPLINED ENTREPRENEURSHIP, HBS CASE # SMR156

PGCSE30B: Teaching & Research Methodology Total Lecture Hours: 44

MODULE A: TEACHING METHODOLOGY [16 Lectures]

Unit 1 Instruction:

Introduction to content, Elements of instruction, Learning objectives, Roles of the teacher and the learner in instruction. [4 Lectures]

Unit 2 Teaching and Learning:

Application of theories of learning to teaching and learning, Sequence of learning and Strategies of learning, Teaching methods, their merits and demerits, Use of ICT in teaching & learning, Classroom management, Individual differences. [4 Lectures]

Unit 3 Planning for teaching and learning

: Understanding the syllabus, Preparation of a scheme of work, Lesson plan preparation, Micro teaching. [4 Lectures]

Unit 4 Assessment and Evaluation

: Define measurement, assessment, test, evaluation, Purpose of assessment and evaluation, Types of tests, Grading and reporting the results assessment, Evaluating teaching and learning. [4 Lectures]

MODULE B: RESEARCH METHODOLOGY [28 Lectures]

Unit 1 Definition and explanation of research: Types and Paradigms of Research, History and Philosophy of Research (esp. Philosophical evolution, pathways to major discoveries & inventions), Research Process decision, planning, conducting, Classification of Research Methods; Reflective Thinking, Scientific Thinking.

Research problem formulation: Literature review- need, objective, principles, sources, functions & its documentation, problem formulation esp. sources, considerations & steps, Criteria of a good research problem, Defining and evaluating the research problem, Variables esp. types & conversion of concepts to variables. Research design esp. Causality, algorithmic, quantitative and qualitative designs, Various types of designs. Characteristics of a good research design, problems and issues in research design; Hypotheses: Construction, testing, types, errors; Design of experiments especially classification of designs and types of errors. [8 lectures]

Unit 2 Problem solving: Understanding the problem- unknowns, data & conditions, conditions - satisfiability, sufficiency, redundancy & contradiction, separation of parts of the problem and conditions, notations; devising a plan- connection between data and unknown, similar/related problems, reuse of previous solutions, rephrasing/transforming the problem, solving partial or related problem, transforming data and unknowns; carrying out the plan- esp. correctness of each step in multiple ways; evaluation of solution and method- checking correctness of solution, different derivations, utility of the solution. [5 lectures]

Unit 3 Theoretical methods of research: Algorithmic methods including probabilistic, soft computing, and numerical methods; Modeling and Simulation; Engineering Design & Optimization (techniques); Statistical methods in research: Central tendency, Dispersions, Skewness, Moments, Kurtosis, esp. Distributions, Time series, Overview of Non-parametric tests & Multivariate analysis; Emerging techniques in discrete mathematics, algorithms, probability-statistics, internet technology and software engineering, and their application to research in computer science and information technology. [8 lectures]

Unit 4 Foundation of Hypothesis: Meaning of assumption, postulate and hypothesis, nature of hypothesis, function and importance of hypothesis, Characteristics of good hypothesis, formulating hypothesis. [2 Lectures]

Unit 5 Data & Reports: Infrastructural setups for research; Methods of data collection esp. validity and reliability, Sampling; Data processing and Visualization espicially Classification; Ethical issues espicially. bias, Misuse of statistical methods, Common fallacies in reasoning. Research Funding & Intellectual Property; Research reports: Research Proposal & Report writing esp. Study objectives, study design, problems and limitations; Prototype microproject report implementing a major part of all the above (compulsory assignment) [5 lectures]

Course guidelines:

Faculty member will introduce the elementary ideas of most of the topics with emphasis on 3-5 topics preferably from those that are highlighted.

Books:

1. Teaching Methodology, Caroline W. Ndirangu, African Virtual University.
2. R. Paneerselvan: Research Methodology, Prenctice-Hall India
3. G. Polya, How to Solve It, Princeton University Press
4. Fundamental of Research Methodology and Statistics, Yogesh Kumar Singh, New Age International Publishers.
5. Research Methodology Methods and Techniques (Second Revised Edition), C.R.Kothari, New Age International Publishers.

Electives - IV.

Bio-Informatics **Allotted Hrs:35**

Code: PGCSE302B
Contact: 4L
Credit: 4

INTRODUCTION TO MOLECULAR BIOLOGY [5L]

Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles.

Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept.

Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA.

Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation, Introduction to Metabolic Pathways.

Sequence Databases [2L]

Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed;

DNA SEQUENCE ANALYSIS [14L]

DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules.

DeBruijn Graph.

Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

Introduction Probabilistic models used in Computational Biology [8L]

Probabilistic Models; Hidden Markov Model : Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics : Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model :Architecture, Principle ,Application in Bioinformatics.

Biological Data Classification and Clustering [6L]

Assigning protein function and predicting splice sites: Decision Tree
Gene Expression Clustering. K Means Algorithm.

Books:

1. Vavid W. Mount: Bioinformatics:Sequenc and Genome analysis
2. Arther M. Leok: Introduction to Bioinformatics, Oxford
3. Rastogi et.al.:Bioinformatics-Methods and applications-enomics, Proteomics and Drug Discovery, Prentice Hall.
4. Dan Gasfield: Algorithms on Strings, Trees and Sequences, Computer Science and Computational Biology, Cambridge University Press
5. M. S. Waterman: Introduction to Computational Biology: Maps, Sequences and Genomes, 1995.
6. Gibas, Jambeck: Developing Bio-informatics Computer Skills, SPD

Data Mining & Data Ware Housing

PGCS302C **36L**

UNIT-I **4 L**

Introduction: Basics of Data Mining . Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Issues, Data Mining Goals. Stages of the Data Mining Process.

UNIT-II **5 L Data**

Warehouse and OLAP: Data Warehouse concepts, Data Warehouse Architecture, OLAP technology, DBMS , OLTP VS. Data Warehouse Environment, Multidimensional data model Data marts.

UNIT-III **6 L**

Data Mining Techniques: Statistics, Similarity Measures, Decision Trees, Neural Networks, Genetic Algorithms.

UNIT-IV **9 L**

Mining Association Rules : Basic Algorithms, Parallel and Distributed algorithms, Comparative study, Incremental Rules, Advanced Association Rule Technique, Apriori Algorithm, Partition Algorithm, Dynamic Item set Counting Algorithm, FP tree growth Algorithm, Boarder Algorithm.

UNIT-V 5 L Clustering Techniques: Partitioning Algorithms-K- means Algorithm, CLARA, CLARANS, Hierarchical algorithmsDBSCAN, ROCK.

UNIT-VI **4 L**

Classification Techniques: Statistical–based, Distance-based, Decision Tree- based Decision tree.

UNIT-VII **3 L**

Applications and Trends in Data Mining: Applications, Advanced Techniques - Web Mining, Web Content Mining, Structure Mining.

Text Books:

1. Roiger & Geatz, Data Mining, Pearson Education
2. A.K.Pujari, Data Mining, University Press
3. M. H. Dunham. Data Mining: Introductory and Advanced Topics. Pearson Education.
4 J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufman.

References Books:

1) I. H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann.
2) D. Hand, H. Mannila and P. Smyth. Principles of Data Mining. Prentice-Hall.

VLSI Design

PGCSE302E

Contact: 3L+1T

Credit:4

Introduction: Overview of VLSI design Methodologies, VLSI Design flow, Design Hierarchy, Concept of Regularity,

Modularity, and Locality, VLSI design styles [3L]

Fabrication of MOSFETs: Fabrication Process flow: basic steps, Fabrication of NMOS Transistor, the CMOS n-Well Process, Layout Design Rules , Full- Custom mask Layout design , CMOS Inverter Layout Design [4L]

MOS Transistor: The MOS Structure, Structure and operation of MOSFET, The MOS System under External Bias, The Threshold Voltage, MOSFET Current–Voltage Characteristics, Channel Length Modulation, Substrate Bias Effect, MOSFET Scaling and Small Geometry Effects, Short Channel Effects, Narrow Channel Effects, Limitation Imposed by Small Device Geometries , MOSFET Capacitances [6L]

MOS Inverters: Static Characteristics: CMOS Inverters , Circuit operation, Voltage transfer characteristics of CMOS

Inverter, Calculation of V_{IL} , Calculation of V_{IH} , Calculation of inverter threshold voltage, Noise Margin. [5L]

MOS Inverters: Switching Characteristics: Delay Time Definitions, Calculation of Delay Times, Inverter Design with delay constraints, Estimation of Interconnect Parasitic, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters [6L]

Combinational MOS Logic Circuits: CMOS Logic Circuits, Layout of simple logic gates, Complex Logic Circuits, Layout of Complex Logic Gates, AOI and OAI Gates , CMOS Transmission Gates (pass gates) , Complementary PassTransistor Logic [4L]

Sequential MOS Logic Circuits: Behavior of Bitable element, SR Latch Circuits, Clocked Latch and Flip flop Circuits, CMOS D-Latch and Edge Triggered Flip flop , Clocked JK Latch, Master slave Flip flop [4L]

Semiconductor Memories: Dynamic Random Access Memory, DRAM Configuration, Historical Evaluation of DRAM Cell, DRAM Cell Types, operation of one transistor DRAM Cell, DRAM Operation Modes, Static Random Access Memory, Full custom SRAM Cell, CMOS SRAM Design Strategy, Operation of SRAM, Flash Memory NOR Flash Memory Cell, NAND Flash Memory Cell, Flash Memory Circuit [4L]

Design for Testability: Fault Types and Models, Ad Hoc Testable Design Techniques, Scan –based Techniques, Built-In Self Test Techniques. [4L]

REFERENCE BOOKS:

1. S. M. Kang and Y. Leblebici, *CMOS Digital Integrated Circuits : Analysis and Design*, Third Edition, MH, 2002.
2. W. Wolf, *Modern VLSI Design : System on Chip*, Third Edition, PH/Pearson, 2002.
3. N. Weste, K. Eshraghian and M. J. S. Smith, *Principles of CMOS VLSI Design : A Systems Perspective*, Second Edition (Expanded), AW/Pearson, 2001.
4. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, *Digital Integrated Circuits : A Design Perspective*, Second Edition, PH/Pearson, 2003.
5. D. A. Pucknell and K. Eshraghian, *Basic VLSI Design : Systems and Circuits*, Third Edition, PHI, 1994.
6. J. P. Uyemura, *CMOS Logic Circuit Design*, Kluwer, 1999.
7. J. P. Uyemura, *Introduction to VLSI Circuits and System*, Wiley, 2002.
8. R. J. Baker, H. W. Li and D. E. Boyce, *CMOS Circuit Design, Layout and Simulation*, PH, 1997.

The New unified Syllabus for both CSe & IT are to be compulsorily followed from the session 2013-14.Details of some electives are yet to be received for approval by BoS. These electives can only be offered after the details are approved by BoS & uploaded on the University website. No electives other than those listed & detailed are to be offered.

M.Tech. Information Technology

Semester - 1

Sr. No:	Paper Code	Paper Name	Class Hours			Credit
		Theory	L	T	P	
1	PGIT101	Advanced Engineering Mathematics [Compusory]	3	1	0	4
2	PGIT102	Real Time Operating System [Compulsory]	4	0	0	4
3	PGIT103	Advanced Computer Architecture [Compulsory]	4	0	0	4
4	PGIT104	Software Engg & Case Tools [Compulsory]	4	0	0	4
5	PGIT105	Elective - I A) Communication Systems B) Image Processing C) Artifial Intelligence D) VLSI Design	4	0	0	4
		Total	19	1	0	**20**
		Practical				
6	PGIT191	Real Time Operating System Laboratory [Compulsory]	0	0	3	2
7	PGIT192	College Specific Lab: A. Communication System Lab (IEM) [Other Colleges to update their specific laboratories]	0	0	3	2
		Total	0	0	6	**4**
		Seminar				
8	PGIT193	Seminar – Based on literature survey	0	2	0	**1**
		Total	19	3	6	**25**

Semester - 2

Sr. No:	Paper Code	Paper Name	Class rs Hou			Credit
		Theory	L	T	P	
1	PGIT201	Advanced DBMS [Compulsory]	4	0	0	4
2	PGIT202	Advanced Computer Network & Security [Compulsory]	4	0	0	4
3	PGIT203	Distributed Computing System [Compulsory]	4	0	0	4
4	PGIT204	Elective - I I A) Web Technology B) Object Oriented Systems C) Cloud Cluster & Grid Computing D) Advance JAVA and Web Technology E) Data Warehousing and Data Mining F) Multimedia Technology (IEM)	4	0	0	4

5	PGIT205	Elective - III A) Electronic Commerce Technology [BCRCE] B) Enterprise Resource Planning [BCRCE-Durgapur] C) Mobile Computing [BCRCE-Durgapur] D) Complex Systems [BCRCE-Durgapur] E) Design and Analysis of Algorithm (HerIT] F) Pattern Recognition [,,] G) Wireless and Mobile Communication [,,]	4	0	0	4
		Total	20	0	0	**20**
		Practical				
6	PGIT291	Elective PART 1: Java & Web Tech Lab [BCRCE-Durgapur] PART 2: Dot Net Lab [BCRCE-Durgapur] Advanced Computer Network & Security Lab (IEM)	0	0	3	2
		Total	0	0	3	**2**
		Seminar & Viva				
7	PGIT292	Seminar – Term paper leading to project.	0	2	0	1
8						
		Total	20	2	6	**25**

Semester - 3

Sr. No:	Paper Code	Paper Name	lass Hou s			Credit
		Theory	L	T	P	
1	PGIT301 Management	A: Project Management & Enterpreneurship B: Teaching & Research Methodologies	4	0	0	4
2	PGIT302	Elective - IV A) Supply Chain Management B) BioMedical Informatics C) Human Computer Interaction D) Soft Computing E) Bio-Informatics F)` E-Business and ERP G) Internet & Web Technology	4	0	0	4
		Total	8	0	0	**8**
		Project				
3	PGIT393	Project – Part 1 (Dissertation I + Defence of Project - I)	0	0	18	4+8=12
		Total	8	0	18	**20**

Semester - 4

Sr. No:	Paper Code	Paper Name	lass Hours			Credit
		Project	L	T	P	
1	PGIT491	Project – Part 1I (Dissertation II + Defence of Project - II)	0	0	24	6+18=24
	PGIT481	Comprehensive Viva Voce				4
		Total	0	0	24	**28**

Total credits = 96

Detailed Syllabus of Information Technology

PGIT101: Advanced Engineering Mathematics

Compulsory:

Module I

Numerical Analysis:

Introduction to Interpolation formulae: Stirling, Bessel's, Spline. **Solutions of system of linear and non-linear simultaneous equations**: SOR algorithm, Newton's method, (8 **L**) **Module II** ***Stochastic process:***

Probability: review, random variables, random processes, Random walk, brownian motion, markov process, queues: (M/M/1) : (/FIFO), (M/M/1) : (N/FIFO). (**8 L**)

Module III

Advanced linear algebra:

Vector spaces, linear transformations, eigenvalues, Eigenvectors, some applications of eigenvalue problems, symmetric, skew-symmetric And orthogonal matrices, similarity of matrices, basis of Eigen vectors, diagonalisation. **(8L)**

Module IV

Advanced Graph Theory:

Connectivity, Matching, Hamiltonian Cycles, Coloring Problems, Algorithms for searching an element in a data structure (DFS, BFS). (**8 L**)

Optional:

Module V

A: Complex Variables: Review of Complex variables, Conformal mapping and transformations, Functions of complex variables, Integration with respect to complex argument, Residues and basic theorems and applications of residues. (8L) **Module - V**

B: Combinatorics: Basic Combinatorial Numbers, Generating Functions and Recurrence Relations, InclusionExclusion Principles **(8L)**

Module V

C: Optimization Technique: Calculus of several variables, Implicit function theorem, Nature of singular points, Necessary and sufficient conditions for optimization, Elements of calculus of variation, Constrained Optimization, Lagrange multipliers, Gradient method, Dynamic programming. (8L)

Module – V

D: Fourier series and Transform: Revision of Fourier series, integrals and transforms and their properties. The 2dimensional fourier transform, convolution theorem, Parseval's formula, discrete fourier transform, fast fourier transform **(8L) Module V**

E: Z-transforms: sequence, representation of sequence, basic operations on Sequences, z-transforms, properties of ztransforms, change on scale, shifting Property, inverse z-transform, solution of difference equations, region of Convergence, bilinear (s to z) transform **(8L)**

Module V

F: Walsh function and hadamard transform: generating walsh functions of Order n, characteristics and applications of walsh function, hadamard Matrix, properties, fast hadamard transform, applications**(4L)** Wavelet transform**:** fundamentals, the fourier transform and the short term Fourier transform, resolution problems, multi-resolution analysis, the Continuous wavelet transform, the discrete wavelet transform**(4L)**

References books:

1. Sen, M. K. and Malik, D. F.-Fundamental of Abstract Algebra, Mc. Graw Hill
2. Khanna, V. K. and Ghamdri, S. K.- Course of Abstract Algebra, Vikash Pub.
3. Halmos, T. R.-Naïve Set Theory, Van Nostrand
4. Scarborough, J. B.-Numerical Mathematical Analysis, Oxford University Press
5. Cone, S. D.-Elementary Numerical Analysis, Mc. Graw Hill.
6. Mukhopadhyay ,P.-Mathematical Statistics ,New Central Book Agency
7. Kapoor, V. K and Gupta, S.C.-Fundamental of Mathematical Statistics, Sultan Chand and Sons.
8. Uspensky, J. V.-Introduction to Mathematical Probability, Tata Mc. Graw Hill
9. Dreyfus, S. E.-The Art and Theory of Dynamic Programming –Theory and Applications, Academic Press.
10. Rao, S. S.-Optimisation Theory and Application, Wiley Eastern Ltd., New Delhi
11. Somasundaram, Discrete Mathematical structures, PHI
12. Kolman, Busby & Ross, Discrete Mathematical structures 5th ed, PHI
13. V. Krishnamurthy, Combinatorics, Theory and Applications, East-West Press, 1985.
14. N. Alon and J. Spenser, Probabilistic Methods, John Wiley and Sons, 2nd edition, 2000.
15. R. Diestel, Graph Theory, Springer-Verlag, 2nd edition, 2000.
16. I. N. Herstein, "Topics in Algebra", Vani Educational Books, India 1986
17. Kryszig, ‘advanced engineering mathematics’
18. Numerical Methods for Engineers & Scientists by Joe D. Hoffman

PGIT102: Real Time Oprating System [Compulsory]

UNIT-I **[4L]**

INTRODUCTION: DEFINITION OF REAL TIME, APPLICATIONS OF REAL-TIME SYSTEMS, A BASIC MODEL OF A REAL-TIME SYSTEMS, CHARACTERISTICS OF REAL-TIME SYSTEMS, SAFETY AND RELIABILITY, TYPES OF REAL-TIME TASKS, TIMING CONSTRAINTS, MODELING TIMING CONSTRAINTS.

UNIT-II **[8L]**

REAL-TIME TASK SCHEDULING SOME IMPORTANT CONCEPTS, TYPES OF REAL TIME TASKS AND THEIR CHARACTERISTICS, TASK SCHEDULING, CLOCK-DRIVEN SCHEDULING, HYBRID SCHEDULERS, EVENT-DRIVEN SCHEDULING, EARLIEST DEADLINE FIRST (EDF) SCHEDULING. RATE MONOTONIC ALGORITHM. SOME ISSUES ASSOCIATED WITH RMA, ISSUES IN USING RMA IN PRACTICAL SITUATIONS. HANDLING RESOURCE SHARING AND DEPENDENCIES AMONG REAL-TIME TASKS: RESOURCE SHARING AMONG REAL TIME TASKS, PRIORITY INVERSION, PRIORITY INHERITANCE PROTOCOL, HIGHEST LOCKER PROTOCOL, PRIORITY CEILING PROTOCOL, DIFFERENT TYPES OF PRIORITY INVERSIONS UNDER PCP, IMPORTANT FEATURES OF PCP, SOME ISSUES IN USING A RESOURCE SHARING PROTOCOL, HANDLING TASK DEPENDENCIES.

UNIT-III **[8L]**

SCHEDULING REAL-TIME TASKS IN MULTIPROCESSOR: MULTIPROCESSOR TASK ALLOCATION, DYNAMIC ALLOCATION OF TASKS, FAULT-TOLERANT SCHEDULING OF TASKS, CLOCKS IN DISTRIBUTED REAL-TIME SYSTEMS, CENTRALIZED CLOCK SYNCHRONIZATION, DISTRIBUTED CLOCK SYNCHRONIZATION.

COMMERCIAL REAL-TIME OPERATING SYSTEMS: TIME SERVICES, FEATURES OF A REAL-TIME OPERATING SYSTEM, UNIX AS A REAL-TIME OPERATING SYSTEM, UNIX - BASED REAL-TIME OPERATING SYSTEMS, WINDOWS AS REAL-TIME OPERATING SYSTEM, POSIX, A SURVEY OF CONTEMPORARY REAL TIME OPERATING SYSTEMS, BENCHMARKING REAL-TIME SYSTEMS.

UNIT-IV **[8L]**

REAL-TIME COMMUNICATION: EXAMPLES OF APPLICATIONS REQUIRING, REAL-TIME COMMUNICATION, BASIC CONCEPTS, REAL-TIME COMMUNICATION IN A LAN, HARD REAL-TIME COMMUNICATION IN LAN, BOUNDED ACCESS PROTOCOLS FOR LANS, PERFORMANCE COMPARISON, REAL-TIME COMMUNICATION OVER PACKET SWITCHED NETWORKS, Q0S FRAMEWORK, ROUTING, RESOURCE RESERVATION, TATE CONTROL, QOS MODELS.

UNIT-V **[6L]**

REAL-TIME DATABASES EXAMPLE APPLICATIONS OF REAL-TIME DATABASES, REVIEW OF BASIC DATABASE CONCEPTS, REAL-TIME DATABASES, CHARACTERISTICS OF TEMPORAL DATA, CONCURRENCY CONTROL IN REAL-TIME DATABASES, COMMERCIAL REAL-TIME DATABASES.

REFERENCES:

1. RAJIB MALL "REAL TIME SYSTEM THEORY & PRACTICE" PEARSON EDUCATION ASIA.
2. JANE W.S. LIU "REAL TIME SYSTEM", PEARSON EDUCATION ASIA-200 I
3. R. BENNETT, "REAL-TIME COMPUTER CONTROL". PRENTICE-HALL, 1994
4. SHEM TOY LEVI & ASHOK K. AGRAWALA, "REAL TIME SYSTEM DESIGN" MCGRAW HILL PUBLISHING COMPANY-1990.
5. C.M. KRISHNA AND KANG 0. SHIN, "REAL TIME SYSTEMS", MCGRAW HILL COMPANIES INC., 1997.

PGIT103: Advanced Computer Architecture [Compulsory]

Module – 1: The evolution of modern Computer systems – from DEC PDP-11, IBM 360/370 family, CDC Cyber 6600, Intel X86 architecture, Performance measurement parameters – MIPS, MFLOPS, SPEC ratings, CPI etc. (4L) Introduction to high performance Computing – Overview, Flynn's classifications – SISD, SIMD, MISD, MIMD, Examples from Vector & Array Processors, Performance comparison of algorithms for Scalar, Vector and Array Processors, Fundamentals of UMA, NUMA, NORMA architectures, Performance measurement for parallel architectures – Flynn,s measure, Feng,s measure, Handler's measure, Amadahl's law of limitation for parallel processing, Gustafson's law. (8L)

Module – 2: Pipelined processor design, Pipeline performance measurement parameters – speedup factor, efficiency, throughput of a linear pipeline, comparing performance of a N stage pipeline with a N processor architecture, Pipeline design principles – Uniform subcomputations, Identical computations, Independent computations, Examples from design of Arithmetic pipelines – Floating point Adders, Multipliers, Dividers etc.,Classifications of Unifunction, Multifunction & Dynamic pipelines, Scheduling in a pipelines with feedback , Pipeline hazards and their solutions(12L)

Module –3: RISC architecture, characteristics of RISC instruction set & RISC pipeline, its comparisons with CISC, necessity of using optimizing compilers with RISC architecture, Examples from POWER PC and SPARC architectures , Superpipelining (MIPS architecture), Superscalar architecture , Diversified pipelines and out of order execution, VLIW architecture, Hardware multithreading (Coarse grained, fine grained & simultaneous multithreading. (12L)

Module – 4: Memory hierarchy – Techniques for improving Cache memory performance parameters,(reduce cache miss rate, reduce hit time, reduce miss penalty), Main memory performance enhancement – interleaved memory, improvement of memory bandwidth, use of TLB for performance enhancement. (6L) References:

12. Computer Organization & Design – Patterson & Hennessy (Morgan Kaufmann)
13. Computer Architecture: A Quantitative Approach – Patterson & Hennessy (Elsevier)
14. Computer Architecture & Parallel Processing – Hwang & Briggs(TMH)
15. Computer organization and architecture, designing for performance – Stallings (PHI)
16. Modern Processor Design – Shen & Lipasti (TMH)
17. Advanced Computer Architecture – Hwang (TMH)
18. An Introduction to Intel family of Microprocessors – Antonakos (Pearson)
19. Computer Architecture – Flynn (Narosa)
20. Structured Computer Organization – Tanenbaum (PHI)
21. Computer Architecture & Organization – J P Hayes (McGraw Hill)
22. Computer Organization – Hamacher, Vranesic, Zaky(McGraw Hill)

PGIT104: Software Engg & Case Tools [Compulsory]

MODULE – 1: PRINCIPLES AND MOTIVATIONS: [8L]

DEFINITIONS AND NEED FOR ENGINEERED APPROACH TO SOFTWARE DEVELOPMENT; SOFTWARE DEVELOPMENT PROCESS MODELS FROM THE POINTS OF VIEW OF TECHNICAL DEVELOPMENT AND

PROJECT MANAGEMENT: WATERFALL, RAPID PROTOTYPING, INCREMENTAL DEVELOPMENT, SPIRAL **MODULE – 2:** MODELS, AND EMPHASIS ON COMPUTER-ASSISTED ENVIRONMENTS. [8L]
INTRODUCTION TO MODELING TOOLS BASICS OF OBJECT-ORIENTED APPROACH, OBJECT-ORIENTED PROGRAMMING AND LANGUAGES, OMT, VISUAL MODELING, UML, RATIONAL ROSE TOOL
MODULE – 3: SOFTWARE DEVELOPMENT METHODS [8L]
FORMAL, SEMI-FORMAL AND INFORMAL METHODS; REQUIREMENTS ELICITATION, REQUIREMENTS SPECIFICATION; DATA, FUNCTION, AND EVENT-BASED MODELING; SOME OF THE POPULAR METHODOLOGIES SUCH AS YOURDON'S SAD, SSADM ETC; CASE TOOLS-CLASSIFICATION, FEATURES, STRENGTHS AND WEAKNESSES; ICASE; CASE STANDARDS.
MODULE – 4: SOFTWARE PROJECT MANAGEMENT [8L]
PRINCIPLES OF SOFTWARE PROJECTS MANAGEMENT; ORGANIZATIONAL AND TEAM STRUCTURE; PROJECT PLANNING; PROJECT INITIATION AND PROJECT TERMINATION; TECHNICAL, QUALITY, AND MANAGEMENT PLANS; PROJECT CONTROL; COST ESTIMATION METHODS - FUNCTION POINTS AND COCOMO.
MODULE – 5: OBJECT MODELING AND DESIGN [8L]
CLASSES, OBJECTS, RELATIONSHIPS, KEY ABSTRACTIONS, COMMON MECHANISMS, DIAGRAMS, CLASS DIAGRAMS, ADVANCED CLASSES, ADVANCED RELATIONSHIPS, INTERFACES, TYPES, ROLES, PACKAGES, INSTANCES, OBJECT DIAGRAMS, INTERACTIONS, USE CASES, USE CASE DIAGRAMS, INTERACTION DIAGRAMS, ACTIVITY DIAGRAMS, EVENTS AND SIGNALS, STATE MACHINES, PROCESSES, THREADS, STATE CHART DIAGRAMS, COMPONENTS, DEPLOYMENT, COLLABORATIONS, PATTERNS AND FRAMEWORKS, COMPONENT DIAGRAMS, SYSTEMS AND MODELS, CODE GENERATION AND REVERSE ENGINEERING.

REFERENCES:

5. ROGER PRESSMAN; SOFTWARE ENGINEERING - A PRACTITIONER'S APPROACH, MCGRAW HILL, NEW YORK.
6. IAN SOMMERVILLE; SOFTWARE ENGINEERING, ADDISON-WESLEY PUBLISHING COMPANY, ENGLAND
7. PANKAJ JALOTE; AN INTEGRATED APPROACH TO SOFTWARE ENGINEERING, NAROSA PUBLISHING HOUSE, NEW DELHI.
8. 4. GRADY BOOCH, JAMES RUMBAUGH, IVAR JACOBSON, THE UNIFIED MODELING LANGUAGE USER GUIDE, PEARSON EDUCATION, NEW YORK.

Semester – 1: Electives.

PGIT105A: Communication Systems Total Lecture Hours: 44

1 Introduction: A layered view of digital communication [2 Lectures]
2 Discrete source encoding, Memory-less sources, prefix free codes, and entropy, Entropy and asymptotic equipartition property, Markov sources and Lempel-Ziv universal code. [6 Lectures]
3 Fourier series and Fourier transforms, Discrete-time Fourier transforms and sampling theorem, Quantization, highrate quantizers, and waveform encoding, Nyquist theory, pulse amplitude modulation (PAM), quadrature amplitude modulation (QAM), and frequency translation, Degrees of freedom, orthonormal expansions, and aliasing. [6 Lectures]
4 Signal space analysis, projection theorem, and modulation. [4 Lectures]
5 Random processes, Jointly Gaussian random vectors and processes and white Gaussian noise (WGN), Linear functional and filtering of random processes. [4 Lectures]
6 Introduction to detection, Detection for random vectors and processes, Theorem of irrelevance, M-ary detection, and coding. [4 Lectures]
7 Review of theorem of irrelevance and introduction to wireless communication, Discrete-time baseband models for wireless channels. [4 Lectures]
8 Doppler spread, time spread, coherence time, and coherence frequency. [4 Lectures]

9 Spread Spectrum modulation, properties of pseudo random sequences, M- sequences, Kasami sequences, Gold sequences, Principles of DSSS and FHSS, Code Division Multiple Access (CDMA).
[6 Lectures]

10 Detection for flat Rayleigh fading and incoherent channels, & Rake receivers.
[4 Lectures]

Books:

1 DIGITAL COMMUNICATION, 4TH ED. - J. G. PROAKIS, MGH INTERNATIONAL EDITION.
2 PRINCIPLE OF COMMUNICATION SYSTEMS – TAUB, SCHILLING, TMH
3 DIGITAL AND ANALOG COMMUNICATION SYSTEMS, 7TH ED. – LEON W. COUCH, PHI. 4 PRINCIPLES OF DIGITAL COMMUNICATION – HAYKIN 5 DIGITAL COMMUNICATION – ZEIMER, TRANTER.
6 COMMUNICATION SYSTEMS, 4TH ED. – A. BRUCE CARLSON, PAUL B. CRILLY, JANET C.
RUTLEDGE, MGH INTERNATIONAL EDITION.
7 DIGITAL COMMUNICATIONS, 2ND ED. – BERNARD SKLAR, PEARSON EDUCATION.
8 ELECTRONIC COMMUNICATIONS, 4TH ED. – DENNIS RODDY, JOHN COOLEN, PHI 9 MODERN DIGITAL AND ANALOG COMMUNICATION SYSTEMS– B.P.LATHI.
10 FUNDAMENTALS OF COMMUNICATION SYSTEMS – JOHN G. PROAKIS & MASOUD SALEHI

Image Processing
Code: PGIT105B
Contact: 4L
Credit: 4
Allotted Hrs: 40

Introduction [5L]

Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation [6L]

A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries [7L]

Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement [8L]

Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration [7L]

Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation – Spatial Transformation, Gray Level Interpolation.

Image Segmentation [7L]

Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection – Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

Books:

1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3.Digital Image Processing & Analysis,Chanda & Majumder,PHI 4.Fundamentals of Digital Image Processing, Jain, PHI
5.Image Processing, Analysis & Machine Vision, Sonka, VIKAS

Artificial Intelligence
Code: PGIT105C
Contact: 4L
Credit: 4
Allotted Hrs: 40

Introduction [2]
Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

Intelligent Agents [2]
Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

Problem Solving [2]
Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Search techniques [4]
Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies [3]
Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. **Adversarial search [3]**
Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening. **Knowledge & reasoning [3]**
Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. **Using predicate logic [2]**
Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules [3]
Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning [4]
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics. **Planning [2]**
Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Natural Language processing [2]
Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning [2]
Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Expert Systems [2]
Representing and using domain knowledge, expert system shells, knowledge acquisition.
Basic knowledge of programming language like Prolog & Lisp. [4] **Books:**

1) Artificial Intelligence, Ritch & Knight, TMH
2) Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3) Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI

4) Poole, Computational Intelligence, OUP
5) Logic & Prolog Programming, Saroj Kaushik, New Age International
6) Expert Systems, Giarranto, VIKAS
7) Artificial Intelligence, Russel, Pearson

VLSI Design
Code: PGIT105D
Contact: 4L
Credit: 4
Allotted Hrs: 40

Introduction to CMOS circuits [6L]
MOS Transistors, MOS transistor switches, CMOS Logic, The inverter, Combinational Logic, NAND gate, NOT Gate, Compound Gates, Multiplexers, Memory-Latches and Registers.

Processing Technology [11L]
Silicon Semiconductor Technology- An Overview, wafer processing, oxidation, epitaxy deposition, Ion-implantation and diffusion, The Silicon Gate Process- Basic CMOS Technology, basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator, CMOS process enhancement-Interconnect,circuit elements, 3-D CMOS. Layout Design Rule: Layer Representations, CMOS n-well Rules, Design Rule of background scribe line, Layer Assignment, SOI Rule

Power Dissipation [8L]
Static dissipation, Dynamic dissipation, short-circuit dissipation, total power dissipation. Programmable Logic, Programmable Logic structure, Programmable interconnect, and Reprogramable Gate Array: Xilinx Programmable Gate Array, Design Methods: Behavioural Synthesis, RTL synthesis.

Placement [5L]
Placement: Mincut based placement – Iterative improvement placement simulated annealing. Routing: Segmented channel routing – maze routing – routability and routing resources – net delays.

Verification and Testing [5L]: Verification Versus Testing, Verification: logic simulation design validation – timing verification – Testing concepts: failures – mechanisms and faults – fault coverage – ATPG methods – types of tests – FPGAs – programmability failures – design for testability.

Overview of VHDL [5L]
Text Book:
1.“Digital Integrated Circuit”, J.M.Rabaey, Chandrasan, Nicolic,
Pearson 2. “CMOS Digital Integrated Circuit”, S.M.Kang &
Y.Leblebici, TMH 3.”Modern VLSI Design” Wayne Wolf, Pearson
4.“Algorithm for VLSI Design & Automation”,
N.Sherwani, Kluwer 5.”VHDL”, Bhaskar, PHI References:
1. “ Digital Integrated Circuits” Demassa & Ciccone, Willey Pub.
2. “Modern VLSI Design: system on silicon” Wayne Wolf; Addison Wesley Longman Publisher
3. “Basic VLSI Design” Douglas A. Pucknell & Kamran Eshranghian; PHI
4. “CMOS Circuit Design, Layout & Simulation”, R.J.Baker, H.W.Lee, D.E. Boyee, PHI

Semester – 2:

PGIT201: Advanced DBMS [Compulsory]
Code:PGIT201
Contact: 4L
Credit: 4
Allotted Hrs: 40
(SYLLABUS REVISED)
Module 1 [8L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Lossless Decomposition ,Boyce-Codd Normal Form, 3NF, Normalization using multi-valued depedencies, 4NF, 5NF

Module 2 [5L]

Transaction processing, Concurrency control and Recovery Management, conflict and view serializability, lock base protocols, two phase locking. **Module 3 [9L]**

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design - fragmentation, allocation criteria.Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Module 4 [6L]

Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries.Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

Module 5 [2L]

Introduction to Oracle RDBMS

Books:

1. Leon & Leon, Essentials Of Dbms, Mc.Graw Hill

2. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.

3. Saeed K. Rahimi, Frank S. Haug*Distributed Database Management Systems: A Practical Approach,Willey*

PGIT202: Advanced Computer Network & Security [Compulsory] Total Lecture Hours: 44

Module – 1: INTRODUCTION TO INTERNETWORKING: HOW NETWORKS DIFFER, HOW NETWORKS CAN BE CONNECTED, CONNECTIONLESS INTERNETWORKING, TUNNELING, FRAGMENTATION, OVERVIEW OF UNDERLYING TECHNOLOGIES (ETHERNET, TOKEN RING, TOKEN BUS, FDDI, PPP). [6 L]

NETWORK LAYER PROTOCOLS: IPV4, IPV6, NAT, ARP, RARP, DHCP, ICMP, OSPF, BGP, IGMP, CIDR. [4 L]

TRANSPORT LAYER PROTOCOLS: UDP, REMOTE PROCEDURE CALL, RTP, TCP, TCP TAHOE, TCP RENO, TCP NEW RENO, TCP SACK. [4 Ls]

Module – 2: TELEPHONE SYSTEMS: INTRODUCTION TO WIRELESS NETWORKS AND CELLULAR TECHNOLOGY, AMPS, D-AMPS, GSM, GPRS, CDMA, BLUETOOTH. [4 L]

WIRELESS INTERNET: MIPV4, MIPV6, TCP PERFORMANCE, I-TCP, TCP SNOOP, FREEZE TCP, WWP, TCP REAL. [4 L]

Module – 3: WIRELESS NETWORKS: WLAN: INTRODUCTION, PROBLEMS AND SOLUTIONS, PROTOCOL STACK, ACCESS METHODS, SERVICES, WIMAX, WIFI, ZIGBEE. [4 L]

AD-HOC NETWORKS: INTRODUCTION, ROUTING CHALLENGES FOR AD-HOC NETWORKS, ROUTING PROTOCOLS (AODV, DSDV, DSR,), TRANSPORT PROTOCOLS (ATCP, TCP-F, TCP BUS). [4 L]

Module –4: CONGESTION CONTROL: GENERAL PRINCIPLES, CONGESTION PREVENTION POLICIES, CHOKE PACKET, RED, ECN, ELN, ELN-ACK. [4 L]

QOS PROVISIONING: DELAY GUARANTEES, NETWORK DELAY, DELAY JITTER, PLAY OUT DELAY, ADMISSION CONTROL, QOS OBJECTIVES, THE RSVP APPROACH. [4 L]

Module – 5: SECURITY: INTRODUCTION TO CRYPTOGRAPHY, SYMMETRIC KEY AND PUBLIC KEY ALGORITHMS, DIFFIE HELLMAN KEY EXCHANGE ALGORITHM, DIGITAL SIGNATURES, IPSEC, FIREWALL, VPN, VLAN, WIRELESS SECURITY, AUTHENTICATION PROTOCOLS. [6 L]

BOOKS

1. INTERNETWORKING WITH TCP/IP: PRINCIPLES, PROTOCOLS, AND ARCHITECTURE - DOUGLAS COMER.
2. COMPUTER NETWORKS –A.S.TANNENBAUM.
3. DATA AND COMPUTER COMMUNICATIONS – WILLIAM STALLINGS
4. WIMAX SECURITY & QOS-AN END-TO-END PERSPECTIVE: ISBN: 978-0-470-72197-1, WILEY PUBLICATION.

PGIT203:
Distributed Computing System [Compulsory] Allotted Hrs: 36
Code: PGIT203
Contact: 4L
Credit: 4

Distributed Systems [9L]

Computer architecture : CICS, RISC, Multi-core Computer networking : ISO/OSI Model Evolution of operating systems Introduction to distributed computing systems. DCS design goals, Transparencies, Fundamental issues

Distributed Coordination [7L]

Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection

Process synchronization [6L]

Distributed mutual exclusion algorithms, Performance matrix

Inter-process communication [6L]

Message passing communication, Remote procedure call, Transaction communication, Group communication; Broadcast atomic protocols

Distributed file systems [6L]

Deadlocks in distributed systems and Load scheduling and balancing techniques

Books:

12. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
13. Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill
14. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
15. Distributed Operating Systems, A.S. Tanenbaum, Prentice Hall
16. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International
17. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 1995.
18. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.
19. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
20. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
21. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.
22. Galli, D.L., Distributed Operating Systems: Concepts and Practice (ISBN 0-13-079843-6), Prentice-Hall 2000.

Electives - II

Cluster, Grid and Cloud Computing
Code: PGIT204C
Contact: 4L
Credit: 4
Allotted Hrs: 44

Cluster Computing [12L]

A general introduction to the concept of cluster based distributed computing.

Hardware technologies for cluster computing, including a survey of the possible node hardware and high-speed networking hardware and software.

Software and software architectures for cluster computing, including both shared memory (OpenMP) and messagepassing (MPI/PVM) models

MPI-2 extension, dynamic process creation, one-sided communication, parallel I/O.
Variants based on new low level protocols (MVAPICH), evaluation and tuning of system and software performance

Performance evaluation tools, HINT, netperf, netpipe, ttcp, Iperf.

Grid Computing [16L]

The Grid - Past, Present, Future, A New Infrastructure for 21st Century Science - The Evolution of the Grid - Grids and Grid Technologies, Programming models - A Look at a Grid Enabled Server and Parallelization Techniques – Grid applications

The concept of virtual organizations – Grid architecture – Grid architecture and relationship to other Distributed Technologies – computational and data Grids, semantic grids

Case Study: Molecular Modeling for Drug Design and Brain Activity Analysis, Resource management and scheduling, Setting up Grid, deployment of Grid software and tools, and application execution

Cloud Computing [16L]

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS

Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo.

Issues in cloud computing, Implementing real time application over cloud platform
Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment.

Text Book:

1. Cluster Computing by Rajkumar Buyya, Clemens Szyperski
2. High Performance Cluster Computing: Architectures and systems by Rajkumar Buyya
3. Grid and Cluster Computing by C.S.R Prabhu
4. Fran Bermn, Geoffrey Fox, Anthony Hey J.G., “Grid Computing: Making the
5. Global Infrastructure a Reality”, Wiley, USA, 2003
6. Joshy Joseph, Craig Fallenstein, “Grid Computing”, Pearson Education, New Delhi, 2004,
7. Ian Foster, Carl Kesselman, “The Grid2: Blueprint for a New Computing Infrastructure”. Morgan Kaufman, New Delhi, 2004
8. Ahmar Abbas, “Grid Computing: Practical Guide to Technology and Applications”, Delmar Thomson Learning, USA, 2004,
9. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
10. Enterprise Cloud Computing by Gautam Shroff,Cambridge
11. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Advance JAVA and Web Technology Allotted Hrs: 40
Code: PGIT204D
Contact: 4L
Credit: 4

Static Web Pages [4L]
Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWW-Basic concepts, web client and web server, http protocol (frame format), universal resource locator (url), HTMLdifferent tags, sections, image & pictures, listings, tables, frame, frameset, form.

Dynamic Web Pages [2L]
The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.

Active Web Pages [2L]
Need of active web pages; java applet life cycle, Java Swing.

Java Script [3L]
Data types, variables, operators, conditional statements, array object, date object, string object.

Java Servlet [4L]
Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

JSP [12L]
JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.

J2EE[7L]
An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI.

XML [6L]
Extensible Markup Language (XML), basics of XML, elements and attributes, document type definition, XML parsers, sequential and tree approach.

Books:

1. Web Technologies - Godbole A. S. & Kahate A., TMH.
2. Web Technology & Design - Xavier C., New Age Publication.
3. Java Server Programming, J2EE edition. (VOL I and VOL II); WROX publishers.

Data Warehousing and Data Mining
Code: PGIT204E
Contact: 4L
Credit: 4
Allotted Hrs: 40

Introduction [3L]
Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Data Marts [4L]
Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Online Analytical Processing [4L]
OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

Developing a Data Warehousing [4L]
Building of a Data Warehousing, Architectural strategies & organizational issues, design considerations, data content, distribution of data, Tools for Data Warehousing

Data Mining [4L]
Definitions; KDD(Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government.

Association Rules [4L]
A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP –tree growth algorithm; Generalized association rule.

Clustering Techniques [4L]
Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical clustering, STIRR, ROCK, CACTUS.

Decision Trees [4L]
Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

Web Mining [4L]
Web content Mining, Web structure Mining, Web usage Mining, Text Mining.
Temporal and Spatial

Data Mining [5L]
Basic concepts of temporal data Mining, The GSP algorithm, SPADE, SPIRIT, WUM.

Books:

1. Data Warehousing –Concepts, Techniques, products, application; Prabhu; PHI.
2. Data Mining Techniques; A. K. Pujari; Universities Press.
3. Data Warehousing, Data Mining and OLAP; Alex Berson and Stephen J Smith; TMH.
4. Data Warehousing in the real world; Anahory; Pearson Education.
5. Data Mining Introductory & Advanced Topic; Dunham; Pearson Education.

MULTIMEDIA TECHNOLOGY
PGIT204F

- INTRODUCTION & OVERVIEW: MULTIMEDIA TODAY, IMPACT OF MULTIMEDIA, MULTIMEDIA SYSTEMS, COMPONENTS AND ITS APPLICATIONS, ARCHITECTURES & ISSUES FOR DISTRIBUTED MULTIMEDIA SYSTEMS MEDIA & TIME:
- DIGITAL AUDIO REPRESENTATION AND PROCESSING: USES OF AUDIO IN COMPUTER APPLICATIONS, DIGITAL REPRESENTATIONS OF SOUND, TRANSMISSION OF SOUND, DIGITAL AUDIO SIGNAL PROCESSING, BRIEF SURVEY OF SPEECH RECOGNITION AND GENERATION.
- VIDEO TECHNOLOGY: RASTER SCANNING PRINCIPLES, SENSORS FORM TV CAMERAS, COLOR FUNDAMENTALS, COLOR VIDEO, ANALOG & DIGITAL VIDEO ARTIFACTS.
- DIGITAL VIDEO AND IMAGING COMPRESSION: VIDEO COMPRESSION TECHNIQUES, STANDARDIZATION OF ALGORITHMS, RECORDING FORMATS AND STANDARDS (JPEG, MPEG, H.261), DVI TECHNOLOGY.
- TIME BASED MEDIA REPRESENTATION AND DELIVERY: MODELS OF TIME, TIME AND MULTIMEDIA REQUIREMENTS, SUPPORT FOR SYSTEM TIMING ENFORCEMENT-DELIVERY.

MULTIMEDIA INFORMATION SYSTEMS:

- OPERATING SYSTEM SUPPORT FOR CONTINUOUS MEDIA APPLICATIONS, LIMITATIONS IN WORKSTATION OPERATING SYSTEMS, NEW OS SUPPORT, EXPERIMENTS USING REAL-TIME MACH
- MIDDLEWARE SYSTEM SERVICES ARCHITECTURE
- GOALS OF MULTIMEDIA SYSTEM SERVICES, SOME VIEWS OF THE MULTIMEDIA SYSTEM SERVICES ARCHITECTURE, A CLOSER LOOK AT THE CLASSES AND OBJECTS, MEDIA STREAM

PROTOCOL

- MULTIMEDIA DEVICES, PRESENTATION SERVICES, AND THE USER INTERFACE, MULTIMEDIA SERVICES, AND THE WINDOW SYSTEM, CLIENT CONTROL OF CONTINUOUS MEDIA, DEVICE CONTROL, TEMPORAL COORDINATION AND COMPOSITION
- MULTIMEDIA FILE SYSTEM AND INFORMATION MODELS, THE CASE FOR MULTIMEDIA INFORMATION SYSTEMS, FILE SYSTEM SUPPORT FOR MULTIMEDIA, DATA MODELS FOR MULTIMEDIA AND HYPERMEDIA INFORMATION
- MULTIMEDIA PRESENTATION AND AUTHORING, CURRENT TRENDS IN THE INDUSTRY, DESIGN PARADIGMS AND USER INTERFACES, BARRIERS TO WIDESPREAD USE.

MULTIMEDIA COMMUNICATIONS SYSTEMS:

- MULTIMEDIA SERVICES OVER THE PUBLIC NETWORK: REQUIREMENTS, ARCHITECTURES, AND PROTOCOLS.
- MULTIMEDIA INTERCHANGE, QMF FORMAT, OMFI, MHEG, TRACK MODEL AND OBJECT MODEL, REAL-TIME INTERCHANGE.

MULTIMEDIA APPLICATIONS:

- INTERACTIVE TELEVISION, VIDEO-ON-DEMAND, VIDEO CONFERENCING, EDUCATIONAL APPLICATIONS, INDUSTRIAL APPLICATIONS, MULTIMEDIA ARCHIVES AND DIGITAL LIBRARIES, MEDIA EDITORS.

REFERENCE BOOKS:

4. RALF STEINMETZ AND KLARA NAHRSTEDT, MULTIMEDIA: COMPUTING, COMMUNICATIONS & APPLICATIONS, PEARSON ED.
5. NALIN K. SHARDA, MULTIMEDIA INFORMATION SYSTEM, PHI.
6. FRED HALSALL, MULTIMEDIA COMMUNICATIONS, PEARSON ED.
7. KOEGEL BUFORD, MULTIMEDIA SYSTEMS, PEARSON ED.
8. FRED HOFFSTETTER, MULTIMEDIA LITERACY, MCGRAW HILL.
9. RALF STEINMETZ AND KLARA NAHRSTEDT, MULTIMEDIA FUNDAMENTALS: VOL. 1-
10. MEDIA CODING AND CONTENT PROCESSING, PHI.
11. J. JEFFCOATE, MULTIMEDIA IN PRACTICE: TECHNOLOGY AND APPLICATION, PHI.
12. PRABHAT K. ANDLEIGH & KIRAN THAKRAR, MULTIMEDIA SYSTEMS DESIGN, PHI.

Electives -III

Allotted Hrs: 40

Design and Analysis of Algorithm
Code: PGIT205E
Contact: 4L
Credit: 4

MODULE 1: [8L]

TIME AND SPACE COMPLEXITY. ASYMPTOTIC NOTATIONS. RECURRENCE FOR DIVIDE AND CONQUER AND ITS SOLUTION, THE SUBSTITUTION METHOD AND RECURSION-TREE METHOD FOR SOLVING RECURRENCES. THE MASTER METHOD: PROOF AND SOLVING RECURRENCE PROBLEMS, MERGE SORT, HEAP SORT, QUICK SORT AND THEIR COMPLEXITY ANALYSIS.

MODULE 2: [8L]

ADVANCED DATA STRUCTURE: ADT AND DATA STRUCTURE, LINEAR VS NON-LINEAR DATA STRUCTURE. TREE: TREE AS AN ADT, DEFINITION AND TERMINOLOGIES, THREADED BINARY TREE, BST. AVL TREE, BALANCE MULTI WAY SEARCH TREE: 2-3 TREE, RED- BLACK TREE, B TREE, B+ TREE, TRIES,SPATIAL DATA REPRESENTATION USING K-D TREE, QUAD TREE

MODULE 3 [12L]

GRAPH: DEFINITION, COMPUTER REPRESENTATION OF GRAPHS, GRAPH TRAVERSALS: BFS & DFS, SPANNING TREE. GRAPH COLOURING-CHROMATIC NUMBER, ALGORITHM FOR TRANSITIVE CLOSURE, TOPOLOGICAL SORT, AND CRITICAL PATHS

DYNAMIC PROGRAMMING : MATRIX-CHAIN MULTIPLICATION, ALL PAIR SHORTEST PATHS, SINGLE SOURCE SHORTEST PATH, TRAVELLING SALESMAN PROBLEM, 0-1 KNAPSACK PROBLEM, LCS PROBLEM.

GREEDY METHOD : KNAPSACK PROBLEM, JOB SEQUENCING WITH DEADLINES, ACTIVITY –

SELECTION, HUFFMAN CODES, MINIMUM SPANNING TREE BY PRIM'S AND KRUSKAL'S ALGORITHMS. DISJOINT SET MANIPULATION : SET MANIPULATION ALGORITHM LIKE UNION-FIND, UNION BY RANK, PATH COMPRESSION. TOPOLOGICAL SORTING
BACKTRACKING: USE IN SOLVING PROBLEM, 4 QUEEN AND 8-QUEEN PROBLEM, SUBSET SUM PROBLEM
BRANCH AND BOUND: BASIC METHOD, APPLICATIONS: THE 15-PUZZLE PROBLEM,
.**MODULE 4 [4L]**
COMPUTATIONAL GEOMETRY: ROBUST GEOMETRIC PRIMITIVES, CONVEX HULL, TRIANGULATION, VORONOI DIAGRAMS, NEAREST NEIGHBOR SEARCH, RANGE SEARCH, POINT LOCATION, INTERSECTION DETECTION, BIN PACKING, MEDIAL-AXIS TRANSFORM, POLYGON
partitioning, simplifying polygons, shape similarity, motion planning, maintaining line arrangements, minkowski sum.
MODULE 5 [8L]
SET AND STRING PROBLEMS: SET COVER, SET PACKING, STRING MATCHING, APPROXIMATE STRING MATCHING, TEXT COMPRESSION, CRYPTOGRAPHY, FINITE STATE MACHINE MINIMIZATION, LONGEST COMMON SUBSTRING/SUBSEQUENCE, SHORTEST COMMON SUPERSTRING.
ADVANCED AREAS: NOTION OF NP-COMPLETENESS: P CLASS, NP-HARD CLASS, NP-COMPLETE CLASS,
CIRCUIT SATISFIABILITY PROBLEM. approximation algorithms, randomized algorithms, multithreaded ALGORITHMS, PARALLEL ALGORITHMS.AMORTIZED ANALYSIS AND ITS APPLICATIONS,

REFERENCE BOOKS:

1. A.AHO, J.HOPCROFT AND J.ULLMAN “THE DESIGN AND ANALYSIS OF ALGORITHMS”, PE.
2. T CORMEN, C LEISERSON AND R RIVEST “INTRODUCTION TO ALGORITHMS”, PHI.
3. FUNDAMENTALS OF ALGORITHMS- G.BRASSARD,P.BRATLAY, PHI.
4. HOROWITZ ELLIS, SAHANI SARTAZ, R. SANGUTHEVAR " FUNDAMENTALS OF COMPUTER ALGORITHMS".

PatternRecognition **Allotted Hrs: 42**
Code: PGIT205F
Contact: 4L
Credit: 4

Introduction [6L]
Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Fundamentals of probability and statistics, linear algebra.

Metric and Non-Metric Proximity Measures [2L]
Dissimilarity Measures, Distance between Pattern Collections.

Classification [10L]
Linear and non-linear Discrimination functions,Bayesian decision theoryTwocategory classification, Minimum error rate classification, Error probability, error bound and Normal density,Density estimation, Minimum distance classifiers, k-NN rule.

Learning methodologies [6L]
Training and test sets, parametric and nonparametric learning, Neural network models for pattern recognition: learning, supervised and unsupervised classification.

Clustering [6L]
Process, Algorithms (basic hierarchical, Agglomerative, Partitional, K-means, divide and conquer)

Feature selection [6L]
Dimensionality reduction, similarity measures, feature selection criteria and algorithms, principal components analysis, branch and bound, and some applications.

Advance Topic [6L] Fuzzy logic- Linguistic variables, membership function, and basic operations (union, Intersection,Complement, De Morgans law, Associativity, Commutativity, Distributivity) on fuzzy set, Genetic algorithm**INTERNET & WEB TECHNOLOGY**

PGIT302G

LEARNING OUTCOMES:
BY THE END OF THE COURSE, STUDENTS WILL:

- HAVE AN UNDERSTANDING OF THE USER CENTRED DESIGN (UCD) DEVELOPMENT METHODOLOGY, THE IMPORTANCE OF GATHERING USER REQUIREMENTS AND THE IMPACT OF THESE ON SITE DESIGN.
- HAVE AN IN-DEPTH KNOWLEDGE AND UNDERSTANDING OF THE CURRENT AND EMERGING WEB TECHNOLOGIES.
- HAVE DEVELOPED THE KNOWLEDGE AND UNDERSTANDING NECESSARY TO WORK WITH A VARIETY OF WEB DEVELOPMENT ENVIRONMENTS.
- HAVE AN IN-DEPTH UNDERSTANDING OF SERVER SIDE AND CLIENT SIDE APPLICATION DEVELOPMENT ISSUES.
- HAVE THE SKILLS TO DEVELOP DATABASE CONNECTIVITY FOR WEB APPLICATIONS USING A VARIETY OF TECHNOLOGIES SPECIFICALLY PHP, AND JAVASCRIPT.

INDICATIVE CONTENT:

2. EMERGENCE OF THE INTERNET AND THE WWW.
3. ISSUES IN DEVELOPING APPLICATIONS FOR THE WWW.
4. THE USER CENTRED DESIGN (UCD) METHODOLOGY.
5. REQUIREMENTS GATHERING.
6. WEBSITE USABILITY.
7. HTML, XHTML AND CSS.
8. DEVELOPING SERVER SIDE APPLICATIONS USING PHP.
9. ADDING INTERACTIVITY TO WEB APPLICATIONS USING JAVASCRIPT.
10. DEVELOPING DATABASE-DRIVEN WEB SITES USING PHP.

REFERENCE BOOKS:

10. ULLMAN, LARRY ,'PHP AND MYSQL FOR DYNAMIC WEB SITES'

ULLMAN, LARRY, 'PHP ADVANCED FOR THE WORLD WIDE WEB's- introduction, Types of Operators (Selection, Crossover and Mutation), support vector machines and applications.

Text Books:

1. R. O. Duda, P. E. Hart and D. G. Stork: Pattern Classification, 2nd ed., Wiley.

2. J. T. Tou and R. C. Gonzalez: Pattern Recognition Principles, Addison-Wesley, London.

3. Pattern Recognition by S Theodoridis and K Koutroumbas, Academic Press.

4. Christopher M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press.

5. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer.

Wireless and Mobile Communication **Allotted Hrs:40**
Code: PGIT205G

Contact: 4L
Credit: 4

Fundamentals ot wireless communication and computer networking[5L] Electromagnetic spectrum; Characteristics of wireless channel; Modulation techniques; Multiple access techniques; Voice coding; Computer network architectures (reference models)

Fundamentals of wireless LANs, PANs, WANs, MANs and Wireless Internet[16L] IEEE 802.11 and ETSI, HIPERLAN standards; Bluetooth; HomeRF; Cellular concept and architecture; First, second, and third generation cellular networks; Wireless in local loop systems, standards, and future trends; Wireless ATM networks; IEEE 802.16 and ETSI HIPERACCESS standards; Issues and challenges in extending lnternet services over wireless networks; Mobile IP; TCP over wireless; Wireless application protocol; Optimizing Web over wireless.

Ad hoc wireless networks [5L]
Issues and challenges in intrastructure-less networks; MAC protocols; Routing protocols; Multicast routing protocols; Transport and security protocols; Quality of service provisioning; Energy management.

Hybrid wireless networks and wireless sensor networks [10L]
Architectures and routing protocols for hybrid wireless networks; Load balancing schemes; Pricing schemes for multihop wireless networks; Issues and challenges in wireless sensor networks: Architectures and routing protocols; MAC protocols; Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

Recent advances in wireless networks [4L]
Wide Band (UWB) communication; Issues and challenges in UWB communiation; Applications of UWB communication; Wireless Fidelity (Wi-Fi) systems; Issues in Wi-Fi Ssytems; Pricing/billing in Wi-Fi systems; Multimode 802.11; Optical wireless communications; Optical Wireless Wavelength Division Multiplexing (OWWDM)
BOOKS:
1. Kaveh Pahlavan, Prashant Krishnamoorthy, Principles of Wireless Networks, - A united approach - Pearson Education.
2. Jochen Schiller, Mobile Communications, Person Education .
3. .Wang and H.V.Poor, Wireless Communication Systems, Pearson education.
4. M.Mallick, Mobile and Wireless design essentials, Wiley Publishing Inc.
5. P.Nicopolitidis, M.S.Obaidat, G.I. papadimitria, A.S. Pomportsis, Wireless Networks, John Wiley & Sons. 6.*T. S. Rappaport*, "*Wireless Communications*: *Principles* & *Practice*," Prentice-Hall.
7. Feng Zhao , Leonidas Guibas ,"Wireless Sensor Networks :An Information Processing Approach",Elsivier.

Semester – 3.

PGIT301A: PROJECT MANAGEMENT & ENTREPRENEURSHIP
COURSE DESCRIPTION
THIS COURSE IS INTENDED TO BE AN INTRODUCTION TO THE FIELD OF PROJECT MANAGEMENT. THE
PRIMARY OBJECTIVE OF THIS COURSE IS TO ACQUAINT STUDENTS WITH A BROAD BASIC OVERVIEW OF PROJECT MANAGEMENT, AND THE ROLE OF A PROJECT MANAGER THROUGHOUT THE FIVE PRIMARY PROCESSES OF MANAGING PROJECTS. THE OTHER THREE REQUIRED CORE COURSES WILL PROVIDE A MORE COMPREHENSIVE COVERAGE. THIS IS A 15-HOUR COURSE.

SYLLABUS:
Module – 1: WHAT "PROJECT MANAGEMENT" MEANS. ABOUT THE CONTEXT OF MODERN PROJECT MANAGEMENT. HOW TO MANAGE PROJECTS THROUGHOUT THE FIVE MAJOR PROCESS GROUPS. HOW THE TRIPLE CONSTRAINT AFFECTS THE PROJECT MANAGER. HOW TO DEVELOP AN EFFECTIVE PROJECT PLAN. HOW TO GAIN COMMITMENT TO THE PROJECT PLAN. HOW TO EFFICIENTLY EXECUTE THE PROJECT PLAN. HOW TO MINIMIZE OR ELIMINATE SCOPE CREEP. HOW TO ORGANIZE AND DEVELOP SUCCESSFUL PROJECT TEAMS. HOW TO DEVELOP AN EFFECTIVE PROJECT

CONTROL SYSTEM. HOW TO DEVELOP REALISTIC PROJECT SCHEDULES. HOW TO EFFICIENTLY CLOSE OUT A PROJECT.

OBJECTIVES:

TO DEVELOP AN APPRECIATION FOR THE EVOLUTION OF ENTREPRENEURSHIP AS AN ACADEMIC DISCIPLINE. TO GAIN UNDERSTANDING OF THE ENTREPRENEURIAL PROCESS THROUGH ANALYSIS OF VARIOUS SITUATIONS. TO LEARN DIVERSE RESEARCH THEMES IN THE AREA OF ENTREPRENEURSHIP COURSE FORMAT:

SYLLABUS

Module -2: ENTREPRENEURSHIP IS AN INTENSIVE COURSE INVOLVING THE STUDY OF JOURNALS ARTICLES, ANALYSIS OF CASES, TO EVOLVE PERSPECTIVE ON ENTREPRENEURSHIP AS AN ACADEMIC DISCIPLINE

Module -3: ENTREPRENEURSHIP: AN INTRODUCTION, NEW VENTURE CREATION, FINANCING ENTREPRENEURIAL VENTURES AND THE BUSINESS PLAN, FAMILY BUSINESS MANAGEMENT, MANAGING A GROWING BUSINESS, VENTURE GROWTH STRATEGIES, ENTREPRENEURIAL SKILLS AND STRATEGIES, ENTREPRENEURIAL SKILLS AND STRATEGIES, INTRAPRENEURSHIP: ENTREPRENEURIAL VENTURES IN A CORPORATE SETTING, ENTREPRENEUR AS CHANGE AGENT, SUSTAINABLE INNOVATION AND ENTREPRENEURSHIP, SOCIAL ENTREPRENEURSHIP

REFERENCE BOOKS:

15. M. Y. YOSHINO AND U. S. RANGAN, STRATEGIC ALLIANCES: AN ENTREPRENEURIAL APPROACH TO GLOBALIZATION, HBS PRESS, 1995.
16. FOSTER, RICHARD N., INNOVATION: THE ATTACKER'S ADVANTAGE, LONDON, MACMILLAN, 1986.
17. HOWARD H. STEVENSON, MICHAEL J. ROBERTS, AMAR BHIDE, WILLIAM A. SAHLMAN (EDITOR), THE ENTREPRENEURIAL VENTURE (THE PRACTICE OF MANAGEMENT SERIES).
18. UDAYAN GUPTA (EDITOR), DONE DEALS: VENTURE CAPITALISTS TELL THEIR STORIES.
19. STEVE KEMPER, CODE NAME GINGER: THE STORY BEHIND SEGWAY AND DEAN KAMEN'S QUEST TO INVENT A NEW WORLD.
20. PAUL A. GOMPERS AND JOSH LERNER, THE MONEY OF INVENTION: HOW VENTURE CAPITAL CREATES NEW WEALTH.
21. LARRY BOSSIDY, RAM CHARAN AND CHARLES BURCK, EXECUTION: THE DISCIPLINE OF GETTING THINGS DONE.
22. JEFFRY TIMMONS AND STEPHEN SPINELLI, NEW VENTURE CREATION: ENTREPRENEURSHIP FOR THE 21ST CENTURY WITH POWERWEB AND NEW BUSINESS MENTOR CD.
23. THE ENTREPRENEUR'S GUIDE TO BUSINESS LAW, CONSTANCE E. BAGLEY AND CRAIG E. DAUCHY, WEST EDUCATIONAL PUBLISHING, 1998.
24. MARY COULTER, ENTREPRENEURSHIP IN ACTION, PRENTICE-HALL, 2001.
25. TRACY KIDDER, THE SOUL OF A NEW MACHINE, AVON BOOKS, 1990.
26. H. L. MORGAN, A. KALLIANPUR, AND L. M. LODISH, ENTREPRENEURIAL MARKETING: LESSONS FROM WHARTON'S PIONEERING MBA COURSE, JOHN WILEY & SONS, 2001.
27. RITA GUNTHER MCGRATH AND IAN MACMILLAN, THE ENTREPRENEURIAL MINDSET.
28. JAMES COLLINS, WILLIAM C. LAZIER, BEYOND ENTREPRENEURSHIP: TURNING YOUR BUSINESS INTO AN ENDURING GREAT COMPANY.

REFERENCE (LIST OF) CASES:

7. KODAK (A), HBS CASE # 703503
8. COMMERCE BANK, HBS CASE # 603080
9. HAUSSER FOOD PRODUCTS CO., HBS CASE: 402055
10. E INK IN 2005, HBS CASE # 705506
11. WHOLE FOODS MARKET, INC., HBS CASE # 705476
12. DISCIPLINED ENTREPRENEURSHIP, HBS CASE # SMR156

PGIT30B: Teaching & Research Methodology Total Lecture Hours: 44

MODULE A: TEACHING METHODOLOGY [16 Lectures]

Unit 1 Instruction:
Introduction to content, Elements of instruction, Learning objectives, Roles of the teacher and the learner in instruction. [4 Lectures]

Unit 2 Teaching and Learning:
Application of theories of learning to teaching and learning, Sequence of learning and Strategies of learning, Teaching methods, their merits and demerits, Use of ICT in teaching & learning, Classroom management, Individual differences. [4 Lectures]

Unit 3 Planning for teaching and learning
: Understanding the syllabus, Preparation of a scheme of work, Lesson plan preparation, Micro teaching. [4 Lectures]

Unit 4 Assessment and Evaluation
: Define measurement, assessment, test, evaluation, Purpose of assessment and evaluation, Types of tests, Grading and reporting the results assessment, Evaluating teaching and learning. [4 Lectures]

MODULE B: RESEARCH METHODOLOGY [28 Lectures]

Unit 1 Definition and explanation of research: Types and Paradigms of Research, History and Philosophy of Research (esp. Philosophical evolution, pathways to major discoveries & inventions), Research Process decision, planning, conducting, Classification of Research Methods; Reflective Thinking, Scientific Thinking.

Research problem formulation: Literature review- need, objective, principles, sources, functions & its documentation, problem formulation esp. sources, considerations & steps, Criteria of a good research problem, Defining and evaluating the research problem, Variables esp. types & conversion of concepts to variables. Research design esp. Causality, algorithmic, quantitative and qualitative designs, Various types of designs. Characteristics of a good research design, problems and issues in research design; Hypotheses: Construction, testing, types, errors; Design of experiments especially classification of designs and types of errors. [8 lectures]

Unit 2 Problem solving
: Understanding the problem- unknowns, data & conditions, conditions - satisfiability, sufficiency, redundancy & contradiction, separation of parts of the problem and conditions, notations; devising a plan- connection between data and unknown, similar/related problems, reuse of previous solutions, rephrasing/transforming the problem, solving partial or related problem, transforming data and unknowns; carrying out the plan- esp. correctness of each step in multiple ways; evaluation of solution and method- checking correctness of solution, different derivations, utility of the solution. [5 lectures]

Unit 3 Theoretical methods of research
: Algorithmic methods including probabilistic, soft computing, and numerical methods; Modeling and Simulation; Engineering Design & Optimization (techniques); Statistical methods in research: Central tendency, Dispersions, Skewness, Moments, Kurtosis, esp. Distributions, Time series, Overview of Non-parametric tests & Multivariate analysis; Emerging techniques in discrete mathematics, algorithms, probability-statistics, internet technology and software engineering, and their application to research in computer science and information technology. [8 lectures]

Unit 4 Foundation of Hypothesis: Meaning of assumption, postulate and hypothesis, nature of hypothesis, function and importance of hypothesis, Characteristics of good hypothesis, formulating hypothesis. [2 Lectures]

Unit 5 Data & Reports: Infrastructural setups for research; Methods of data collection esp. validity and reliability, Sampling; Data processing and Visualization espicially Classification; Ethical issues espicially. bias, Misuse of statistical methods, Common fallacies in reasoning. Research Funding & Intellectual Property; Research reports: Research Proposal & Report writing esp. Study objectives, study design, problems and limitations; Prototype microproject report implementing a major part of all the above (compulsory assignment) [5 lectures]

Course guidelines:

Faculty member will introduce the elementary ideas of most of the topics with emphasis on 3-5 topics preferably from those that are highlighted.

Books:

1. Teaching Methodology, Caroline W. Ndirangu, African Virtual University.
2. R. Paneerselvan: Research Methodology, Prenctice-Hall India
3. G. Polya, How to Solve It, Princeton University Press
4. Fundamental of Research Methodology and Statistics, Yogesh Kumar Singh, New Age International Publishers. **6.** Research Methodology Methods and Techniques (Second Revised Edition), C.R.Kothari, New Age International Publishers.

ELECTIVE – IV

Soft Computing
Code: PGIT302D
Contact: 4L
Credit: 4
Allotted Hrs:42

Introduction [3L]

Introduction to Soft Computing; Difference between Hard and Soft Computing; Introduction to Fuzzy Systems, Artificial Neural Network, Evolutionary Algorithms, Rough Set Theory; Hybrid Systems.

Fuzzy Sets & Logic [10L]

Introduction to Fuzzy Sets; Classical and Fuzzy Sets; Fuzzy Sets - Membership Function, Basic Operations, Linguistic Variable, Properties; Fuzzy relations - Cartesian product, Operations on relations; Crisp logic—Laws of propositional logic, Inference; Predicate logic—Interpretations, Inference; Fuzzy logic—Quantifiers, Inference; Fuzzy Rule based system; De-fuzzification methods; Basic Applications of Fuzzy Sets and Logics.

Artificial Neural Network [13L]

Neural Networks: Introduction, Mathematical Models, ANN architecture, Learning rules, Supervised, Unsupervised and reinforcement Learning, Multilayer Perceptron, Applications of Artificial Neural Networks. Competitive learning networks, Kohonen self organizing networks, Hebbian learning; Hopfield Networks, Associative Memories, The boltzman machine; Applications of ANN.

Genetic Algorithms [10L]

Introduction, Single and Multi-Objective Optimization, Encoding, Fitness Function, Genetic Operations, Genetic Parameters; Schema theorem; Convergence Theory; Multiobjective optimization using GA (MOGA); Non-Dominated Sorting Genetic Algorithm; Basic Applications.

Hybrid Systems [6L]

Hybrid systems, GA based ANN (Optimal Weight Selection); Neuro Fuzzy Systems, fuzzy Neuron, architecture, learning, application;

Text:

1. “Neuro-Fuzzy and Soft computing”, Jang, Sun, Mizutani, Pearson 2.
“Neural networks: a comprehensive foundation”, Haykin, Pearson
3. K. Deb, Multi-Objective Optimization Using Evolutionary Algorithms. Chichester, England: John Wiley, 2001.
4. “Genetic Algorithms”, Goldberg, Pearson

5. "Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, PHI.

Reference:

1. "An Introduction to Neural Networks", Anderson J.A., PHI, 1999.
2. "Introduction to the Theory of Neural Computation", Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California, 1991.
3. "An Introduction to Genetic Algorithm", Melanie Mitchell, PHI, 1998.
4. "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
5. "Neural Networks: Algorithms, Applications and Programming Techniques", Freeman J.A. & D.M. Skapura, Addison Wesley, Reading, Mass, (1992).

Bio-Informatics
Code: PGIT302E
Contact: 4L
Credit: 4
Allotted Hrs:35

INTRODUCTION TO MOLECULAR BIOLOGY [5L]

Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles.

Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept.

Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA.

Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation, Introduction to Metabolic Pathways.

Sequence Databases [2L]

Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed;

DNA SEQUENCE ANALYSIS [14L]

DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules.

DeBruijn Graph.

Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

Introduction Probabilistic models used in Computational Biology [8L]

Probabilistic Models; Hidden Markov Model : Concepts, Architecture, Transition matrix, estimation matrix.
Application of HMM in Bioinformatics : Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model :Architecture, Principle ,Application in Bioinformatics.

Biological Data Classification and Clustering [6L]

Assigning protein function and predicting splice sites: Decision Tree
Gene Expression Clustering. K Means Algorithm.

Books:

7. Vavid W. Mount: Bioinformatics:Sequenc and Genome analysis
8. Arther M. Leok: Introduction to Bioinformatics, Oxford
9. Rastogi et.al.:Bioinformatics-Methods and applications-enomics, Proteomics and Drug Discovery, Prentice Hall.
10. Dan Gasfield: Algorithms on Strings, Trees and Sequences, Computer Science and Computational Biology, Cambridge University Press
11. M. S. Waterman: Introduction to Computational Biology: Maps, Sequences and Genomes, 1995. 12. Gibas, Jambeck: Developing Bio-informatics Computer Skills, SPD

E-Business and ERP
Code: PGIT302F
Contact: 4L
Credit: 4
Allotted Hrs:45

Introduction to E-Business [3L]
What is E-Commerce? The Drivers of E-Commerce, Difference between E-Commerce & E-Business, Myths about E-Commerce, Advantages & Limitations of E-Commerce, Unique features of E-Business technology, Types of EBusiness, A Brief History of E-Business: E-Commerce Era 1995-2000, E-Business Era I-Consolidation 2001-2006, EBusiness Era II - Reinvention 2006-Present

E-Business Business Models [3L]
Major B2C business models, Major B2B business models, Other business models-C2C, P2P, M-Commerce, Case study – Priceline.com

E-Business Infrastructure [3L]
The Internet: Technology Background, The Internet today, Internet II:The Future Infrastructure
The Intranet : What is an Intranet, Applications of Intranet - Generic functions, Application areas, Industry-specific solutions, Intranet application cases
The Extranet: Basic concept, Structure, Applications of Extranet – Industry-Specific solutions

Online Security & Payment Systems [4L]
Security Threats in E-Business environment, Technology Solutions – Symmetric key and Public key encryptions, Digital signature, Digital Envelope, Digital Certificates, SSL, SET, S-HTTP, VPN
Online Payment Systems – Online Credit Card transactions, Digital cash, Online Stored Value Systems, Digital Accumulating Balance Payment Systems, Digital Checking Payment System, Wireless Payment Systems, Electronic Billing Presentation and Payment, Case Study of PayPal

E-Business Marketing Concepts and Communications [6L]
The Internet audience and consumer behaviour, Basic marketing concepts, B2C and B2B Marketing and Branding strategies – Advertising Networks, Permission Marketing, Affiliate, Viral, Blog and Social Network Marketing, Personalization and one-to-one marketing, Net Pricing Startegies – Free, Versioning, Bundling and Dynamic Pricing Online Advertising, Social Marketing – Blog advertising, Social Network advertising, Game advertising, targeted Marketing, Web Site as marketing communication tool, Search Engine Optimization
Case Study of Liquidation.com – a B2B marketing success story
Adware, Spyware, AdBombs, Ambush Marketing, Customer Hijacking – Growth of Invasive marketing Techniques on the Web

B2B E-Business - Electronic Data Interchange [2L]
Introduction to EDI, Benefits of EDI, EDI standard – EDIFACT, EDI communications, EDI implementations, EDI security

B2B E-Business: Supply Chain Management and Collaborative Commerce [5L]
B2B and Supply Chain Management – Evolution and growth of B2B E-Business, The Procurement process and the Supply chain, Trends in Supply Chain Management and Collaborative Commerce
Net Marketplaces – E-Distributors, E-Procurement, Exchanges, Industry
Consortia Private Industrial networks
Case Studies: (i) Ariba and (ii) Siemens' Click2procure

E-Tailing and Online Services [5L]
E-Tailing business models – Virtual merchants, Multi-channel merchants, Catalog merchants, Manufacturer-Direct, Case study of Amazon.com
Online Financial Services, Online Travel Services and Online Career Services

Online Content and Media [4L]

Content audience and market, Media Convergence – Technology, Content and Industry structure Online Content Revenue Models and Business Processes
The Online Publishing Industry – The Online Newspapers and E-Books
The Online Entertainment Industry – Content, Convergence and Revenue Models Case Study – Google and YouTube Together :The Next Advertising Platform

Social Networks, Auctions and Portals [4L]

Types of social networks and their business models, Features and Technologies, The Future of Social Networks

Online Auctions – Auctions as an E-Business business model, Types of Internet Auctions, Auctions and Dynamic Pricing
Portals – Growth and Evolutions, Types and Business Models

Enterprise Resource Planning [6L]

The Emergence of ERP Systems – The Evolution of ERP, Business Benefits of ERP, Different ERP Modules, How Information Technology facilitates ERP, ERP and Business Process Change
ERP Systems: Sales and Marketing – Management Control Processes in Sales & Marketing, Sales and Marketing Modules in ERP systems, ERP and Customer Relationship Management
ERP Systems : Production and Materials Management – Management Control Processes in Production and Manufacturing, Production Planning and Manufacturing Modules in ERP, Materials Management Modules in ERP sustems, The Future of ERP in Manufacturing and Supply Chain
Supply Chain Management and The eMarketplace – Impact of SCM on Productivity, E-Business & ERP, E-Supply Chain & ERP, Business Intelligence & ERP, Future Directions for ERP

Reference Books:

29. E-Commerce : Business, Technology, Society by Kenneth C. Laudon and Carol G.Traver, Prentice Hall, 4th Edition, 2008
30. Electronic Commerce 2010–A Managerial Perspective by Efraim Turban, David King, Jae Lee, Ting Liang, Deborrah Turban, 6th Edn., Pearson Education
31. e-Commerce: Strategy, Technologies And Applications By David Whiteley, McGraw Hill, 2000
32. Enterprise Resource Planning by Mary Sumner, Pearson Education, 2008

INTERNET & WEB TECHNOLOGY
PGIT302G

LEARNING OUTCOMES:
BY THE END OF THE COURSE, STUDENTS WILL:

- HAVE AN UNDERSTANDING OF THE USER CENTRED DESIGN (UCD) DEVELOPMENT METHODOLOGY, THE IMPORTANCE OF GATHERING USER REQUIREMENTS AND THE IMPACT OF THESE ON SITE DESIGN.
- HAVE AN IN-DEPTH KNOWLEDGE AND UNDERSTANDING OF THE CURRENT AND EMERGING WEB TECHNOLOGIES.
- HAVE DEVELOPED THE KNOWLEDGE AND UNDERSTANDING NECESSARY TO WORK WITH A VARIETY OF WEB DEVELOPMENT ENVIRONMENTS.
- HAVE AN IN-DEPTH UNDERSTANDING OF SERVER SIDE AND CLIENT SIDE APPLICATION DEVELOPMENT ISSUES.
- HAVE THE SKILLS TO DEVELOP DATABASE CONNECTIVITY FOR WEB APPLICATIONS USING A VARIETY OF TECHNOLOGIES SPECIFICALLY PHP, AND JAVASCRIPT.

INDICATIVE CONTENT:

11. EMERGENCE OF THE INTERNET AND THE WWW.

12. ISSUES IN DEVELOPING APPLICATIONS FOR THE WWW.
13. THE USER CENTRED DESIGN (UCD) METHODOLOGY.
14. REQUIREMENTS GATHERING.
15. WEBSITE USABILITY.
16. HTML, XHTML AND CSS.
17. DEVELOPING SERVER SIDE APPLICATIONS USING PHP.
18. ADDING INTERACTIVITY TO WEB APPLICATIONS USING JAVASCRIPT.
19. DEVELOPING DATABASE-DRIVEN WEB SITES USING PHP.

REFERENCE BOOKS:

11. ULLMAN, LARRY ,'PHP AND MYSQL FOR DYNAMIC WEB SITES'
12. ULLMAN, LARRY, 'PHP ADVANCED FOR THE WORLD WIDE WEB'