

<b>M.Tech Information Technology</b>						
<b>Semester I</b>						
<b>S No.</b>	<b>Paper Code</b>	<b>Paper Name</b>	<b>Class Hours</b>			<b>Credit</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
		<b>Theory</b>				
1	PGIT101	Advanced Engineering Mathematics [Compulsory]	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) Artificial Intelligence D) VLSI Design	4	0	0	4
		<b>Total</b>	<b>19</b>	<b>1</b>	<b>0</b>	<b>20</b>
		<b>Practical</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
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
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>4</b>
		<b>Seminar</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
8	PGIT193	Seminar – Based on literature survey	0	2	0	1
		<b>Total</b>	<b>19</b>	<b>3</b>	<b>6</b>	<b>25</b>
<b>Semester II</b>						
<b>S No.</b>	<b>Paper Code</b>	<b>Paper Name</b>	<b>Class Hours</b>			<b>Credit</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
		<b>Theory</b>				
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 - II A) Web Technology B) Object Oriented Systems C) Cloud Cluster & Grid Computing D) Soft Computing 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
		<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>
		<b>Practical</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
6	PGIT291	Elective PART 1: Java & Web Tech Lab [BCRCE-Durgapur] PART 2: Dot Net Lab [BCRCE-Durgapur]	0	0	3	2

		Advanced Computer Network & Security Lab (IEM)				
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>
		<b>Seminar and Viva-voice</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
7	PGIT292	Seminar – Term paper leading to project	0	2	0	1
		<b>Total</b>	<b>20</b>	<b>2</b>	<b>3</b>	<b>23</b>
<b>Semester III</b>						
<b>S No.</b>	<b>Paper Code</b>	<b>Paper Name</b>	<b>Class Hours</b>			<b>Credit</b>
		<b>Theory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
1	PGIT301	A: Project Management & Entrepreneurship B: Teaching & Research Methodologies	4	0	0	4
2	PGIT302	Elective - IV A) Supply Chain Management B) BioMedical Informatics C) Human Computer Interaction D) Advance JAVA and Web Technology E) Bio-Informatics F) E-Business and ERP G) Internet & Web Technology	4	0	0	4
		<b>Total</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>
		<b>Seminar and Viva-voice</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
3	PGIT391	Project – Part 1 (Dissertation I + Defence of Project - I)	0	0	18	4+8=12
		<b>Total</b>	<b>8</b>	<b>0</b>	<b>18</b>	<b>20</b>
<b>Semester IV</b>						
		<b>Seminar and Viva-voice</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Pt.</b>
1	PGIT491	Project – Part 2 (Dissertation II + Defence of Project - II)	0	0	0	6+18=24
2	PGIT492	Comprehensive Viva Voice	0	0	0	4
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28</b>

## Detailed Syllabus of Information Technology

### **PGIT101: Advanced Engineering Mathematics**

**Contact: 4L**

**Credit: 4**

#### **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 (8 L)

#### **Module II:**

Advanced linear algebra: Vector spaces, linear transformations, eigenvalues, Eigenvectors, some applications of eigen value problems, symmetric, skew-symmetric And orthogonal matrices, similarity of matrices, basis of Eigen vectors, diagonalisation(8L)

#### **Module III:**

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

#### **Module IV:**

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:**

Combinatorics: Basic Combinatorial Numbers, Generating Functions and Recurrence Relations, Inclusion Exclusion Principles (8L)

#### **Module VI:**

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 VII:**

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 VIII:**

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

#### **Module IX:**

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)

#### **Module X:**

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 Wesley Professional, 2010
2. Uresh Vahalia, "UNIX Internals: The New Frontiers", 1st Edition, Prentice Hall, 1996
3. Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly, 2005
4. Jonathan Corbet, Alessandro Runini, Greg Kroah-Hartman, "Linux Device Drivers", 3rd Edition, O'Reilly, 2005
5. Sreekrishnan Venkateswaran, "Essential Linux Device Drivers", 1st Edition, Prentice Hall, 2008

### **PGIT103: Advanced Computer Architecture**

**Contact: 4L**

**Credit: 4**

#### **Module I:**

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)

#### **Module II:**

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 III:**

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 IV:**

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 V:**

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:

#### **Reference Books:**

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

### **PGIT104: Software Engg & Case Tools [Compulsory]**

**Contact: 4L**

**Credit: 4**

#### **Module I**

Introduction and over view, software development life-cycle models, software requirements analysis, identification and specification, formal requirements specification and verification - axiomatic and algebraic specifications [9L]

#### **Module II**

Function-oriented software design, DFD, data dictionary, structure chart, transform and transaction analysis, object-oriented design, UML diagrams, design patterns, user interface design, coding standards [11L]

### **Module III**

Testing: module, sub-system and system level testing, integration testing, stub, driver, test case and test suit design, system performance testing, verification & validation, debugging [6L]

### **Module IV**

Software quality : SEI CMM, ISO-9001 and Six Sigma. Software reliability and fault-tolerance, software project planning, monitoring, and control, Cost Estimation Model, Metrics, software maintenance [10L]

### **Module V**

Computer-aided software engineering (CASE), software reuse, component-based software development, extreme programming [4L]

### **Reference Books:**

1. Software Engineering: A Practitioner's Approach Paperback, Roger S Pressman
2. Software Engineering, Pearson Education, Ian Sommerville
3. Fundamentals of Software Engineering, Carlo Ghezzi , Mehdi Jazayeri , Dino Mandrioli
4. Software Engineering Theory and Practice, Paperback, Shari Lawrence Pfleeger

### **PGIT105A: Communication Systems**

**Contact: 4L**

**Credit: 4**

#### **Module I:**

Introduction: A layered view of digital communication[2L]

#### **Module II:**

Discrete source encoding, Memory-less sources, prefix free codes, and entropy, Entropy and asymptotic equipartition property, Markov sources and Lempel-Ziv universal code.[6L]

#### **Module III:**

Fourier series and Fourier transforms, Discrete-time Fourier transforms and sampling theorem, Quantization, high rate quantizers, and waveform encoding, Nyquist theory, pulse amplitude modulation (PAM), quadrature amplitude modulation (QAM), and frequency translation, Degrees of freedom, orthonormal expansions, and aliasing.[6L]

#### **Module IV:**

Signal space analysis, projection theorem, and modulation.[4L]

#### **Module V:**

Random processes, Jointly Gaussian random vectors and processes and white Gaussian noise (WGN), Linear functional and filtering of random processes.[4 L]

#### **Module VI:**

Introduction to detection, Detection for random vectors and processes, Theorem of irrelevance, M-ary detection, and coding.[4 L]

#### **Module VII:**

Review of theorem of irrelevance and introduction to wireless communication, Discrete-time baseband models for wireless channels.[4 L]

#### **Module VIII:**

Doppler spread, time spread, coherence time, and coherence frequency.[4L]

#### **Module IX:**

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

**Module X:**

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

**Reference 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 : PGIT105B**

**Contact: 4L**

**Credit: 4**

**Module I:**

Introduction [5L],Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

**Module II:**

Digital Image Formation [6L], A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

**Module III:**

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.

**Module IV:**

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.

**Module V:**

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.

**Module VI:**

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.

**Reference 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**

**Module I:**

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

**Module II:**

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

**Module III:**

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.

**Module IV:**

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.

**Module V:**

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.

**Module VI:**

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.

**Module VII:**

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

**Module VIII:**

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.

**Module IX:**

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

**Module X:**

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

**Module XI:**

Representing and using domain knowledge, expert system shells, knowledge acquisition. Basic knowledge of programming language like Prolog & Lisp. [4]

**Reference 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**

**Module I:**

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.

**Module II:**

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

**Module III:**

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

**Module IV:**

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

**Module V:**

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.

**Module VI:**

Overview of VHDL [5L]

**Reference 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

**Object Oriented Information System Design:PGIT105**

**Contact: 4L**  
**Credit: 4**

**Module I:**

General methodologies for information systems design, function oriented design, object oriented design, coupling, cohesion, life cycle models, rational unified process model.

**Module II:**



Introduction to object oriented design :why object orientation, history and development of object oriented programming language, concepts of object oriented programming language. Major and minor elements, object, class, relationships among

**Module III:**

Objects, aggregation, links, relationships among classes Association, aggregation, using, instantiation, meta-class, grouping constructs.

**Module IV:**

Object oriented design using uml, Fundamentals- an overview of object oriented systems development – object basics,object oriented systems development life cycle, Object oriented methodologies, rumbaugh methodology, booch methodology, jacobson methodology, patterns, frameworks, unified approach

**Module V:**

Unified modelling language: evolution, why unified, static and dynamic models, why modeling, uml diagrams: use case diagram, class diagram, object diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, component diagram, deployment diagram, uml extensibility-model constraints and comments, note, stereotype.

**PGIT-191:**

Basic shell (bash/zsh) commands and shell scripting.

Learn to use important Linux system calls related to I/O, Process Management, etc.

Learn to compile the latest Linux kernel and use it to boot the system.

Learn to use the basic tools such as: find, grep, cscope, lxr, oprofile, SystemTap, ltrace, strace, ftrace, perf, cflow, etc.

Learn to modify the kernel code so that some tweaks can be made to the arguments supplied to the kernel during boot using the bootloader (eg. grub).

Learn to add a system call to the Linux kernel.

Learn to create a basic hello world type of kernel module, and be able to compile it, load and unload it.

Learn and use the various data structures and API calls that is made available by the Linux kernel.

Learn to write increasingly complicated kernel modules touching the various kernel subsystems.

**References Books :**

1. Brian Kernighan, Rob Pike, “The UNIX Programming Environment”, 1 st Edition, Prentice Hall, 1983
2. Robert Love, “Linux System Programming: Talking Directly to the Kernel and C Library”, 2 nd Edition, O’Reilly, 2013
3. Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman, “Linux Device Drivers”, 3 rd Edition, O’Reilly, 2005
4. Sreekrishnan Venkateswaran, “Essential Linux Device Drivers”, 1 st Edition, Prentice Hall, 2008
5. Robert Love, “Linux Kernel Development”, 3 rd Edition, Addison Wesley Professional, 2010
6. Michael Kerrisk, “The Linux Programming Interface: A Linux and UNIX System Programming Handbook”, 1 st Edition, No Starch Press, 2010
7. Daniel P. Bovet, Marco Cesati, “Understanding the Linux Kernel”, 3 rd Edition, O’Reilly, 2005

**Semester – 2:**

**PGIT201: Advanced DBMS [ Compulsory ]**

**Code:PGIT201**

**Contact: 4L**

**Credit: 4**

**Module I:**

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 dependencies, 4NF, 5NF.[8L]

**Module II:**

Transaction processing, Concurrency control and Recovery Management, conflict and view serializability, lock base protocols, two phase locking. [5L]

**Module III:**

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. [9L]

**Module IV:**

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. [6L]

**Module V:**

Introduction to Oracle RDBMS[2L]

**Reference 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]**

**Contact: 4L**

**Credit: 4**

**Module I:**

Overview and Introduction, Fundamental of wireless networks and security [3L]

**Module II:**

Wireless LANS and PANS, Wireless WANS and MANS, AD HOC Wireless Networks, Wireless Sensor Networks, Wireless Body Area Networks [9L]

**Module III**

IEEE 802.11 MAC Layer Fundamentals: CSMA/CA, IEEE 802.11 MAC Layer, Advanced, Routing Protocols for AD HOC Wireless Networks, Routing Protocols for AD HOC Wireless Networks [6L]

**Module IV**

Energy Management in Wireless Networks, Network Lifetime Enhancement [3L]

**Module V**

Security: Introduction, Overview, Security techniques, Cryptography: Concepts & Techniques, Symmetric Key Algorithm, Asymmetric Key Algorithm, Digital Signature and RSA, Internet Security Protocols, User Authentication, Electronic Mail Security, Firewall [10L]

**Reference Books:**

1. Ad Hoc Wireless Networks, Pearson Education, C.Siva Ram Murthy, B.S. Manoj
2. Cryptography and Network Security, Tata McGraw-Hill, Atul Kahate
3. Protocols and Architectures for Wireless Sensor Networks, Paperback, Holger Karl, Andreas Willig

**Distributed Computing System [ Compulsory ]**

**Code: PGIT203**

**Contact: 4L**

**Credit: 4**

**Module I:**

Distributed Systems, 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 [9L]

**Module II:**

Distributed Coordination, Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection [7L]

**Module III:**

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

**Module IV:**

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

**Module V:**

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

**Reference 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.

**Cluster, Grid and Cloud Computing**

**Code: PGIT204C**

**Contact: 4L**

**Credit: 4**

**Module I**

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 message passing (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.

**Module II**

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

**Module III**

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.

**Reference Books:**

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 Beramn, Geoffrey Fox, Anthony Hey J.G., "Grid Computing: Making the
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

**Soft Computing: PGIT 204D**

**Contact: 4L**

**Credit: 4**

**Module I**

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

**Module II**

Neural Networks, Biological Neuron, Artificial Neuron, Artificial Neural Network, 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.

**Module III**

Heuristic and Meta-heuristic Search, Genetic Algorithm (GA), different operators of Genetic Algorithm, Analysis of selection operations, Hypothesis of building Blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Tabu Search, Swarm Intelligence, Particle Swarm Optimization, Applications.

**Module IV**

Fuzzy sets and Fuzzy logic, Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets, Extension principle, Fuzzy relations and relation equations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, Applications, Fuzzy Decision Making, Applications.

**Module V**

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

**Reference Books:**

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.
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.

**Data Warehousing and Data Mining**

**Code: PGIT204E**

**Contact: 4L**

**Credit: 4**

**Module I:**

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

**Module II:**

Data Marts, 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. [4L]

**Module III:**

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

**Module IV:**

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

**Module V:**

Data Mining, 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. [4L]

**Module VI:**

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

**Module VII:**

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

**Module VIII:**

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

**Module IX:**

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

**Module X:**

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

**Reference 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**

**Contact: 4L**

**Credit: 4**

**Module I:**

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.

#### **Module II:**

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

#### **Module III:**

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.

#### **Module IV:**

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.

#### **Module V:**

Multimedia applications:Interactive television, video-on-demand, video conferencing, educational applications, industrial applications, multimedia archives and digital libraries, media editors.

#### **Reference Books:**

1. Ralf steinmetz and klara nahrstedt, multimedia: computing, communications & applications, PEARSON ED.
2. Nalin k. Sharda, multimedia information system, PHI.
3. Fred halsall, multimedia communications, PEARSON ED
4. Koegel buford, multimedia systems, PEARSON ED.
5. Fred hoffstetter, multimedia literacy, MCGRAW HILL.
6. Ralf steinmetz and klara nahrstedt, multimedia fundamentals
7. Media coding and content processing, PHI.
8. J. Jeffcoate, multimedia in practice: technology and application PHI.
9. Prabhat k. Andleigh & kiran thakrar, multimedia systems design PHI.

#### **Design and Analysis of Algorithm**

**Code: PGIT205E**

**Contact: 4L**

**Credit: 4**

#### **Module I:**

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. [8L]

#### **Module II:**

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 [8L]

**Module III:**

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 . [12L]

**Module IV:**

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, min kowski sum. [8L]

**Module V:**

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, [8L]

**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".

**Paper Name: Pattern Recognition**

**Paper Code: PGIT205F**

**Contact: 4L**

**Credit: 4**

**Module I**

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

**Module II**

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

**Module III**

Principal Component Analysis (PCA), Kernel PCA

**Module IV**

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

**Module V**

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

**Module VI**

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

**Wireless and Mobile Communication**

**Code: PGIT205G**

**Contact: 4L**

**Credit: 4**

**Module I:**

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

**Module II:**

Fundamentals of wireless LANs, PANs, WANS, MANs and Wireless Internet 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 Internet services over wireless networks; Mobile IP; TCP over wireless; Wireless application protocol; Optimizing Web over wireless. [16L]

**Module III:**

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

**Module IV:**

Hybrid wireless networks and wireless sensor networks Architectures and routing protocols for hybrid wireless networks; Load balancing schemes; Pricing schemes for multi hop 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. [10L]

**Module V:**

Recent advances in wireless networks Wide Band (UWB) communication; Issues and challenges in UWB communication; Applications of UWB communication; Wireless Fidelity (Wi-Fi) systems; Issues in Wi-Fi Ssystems; Pricing/billing in Wi-Fi systems; Multimode 802.11; Optical wireless communications; Optical Wireless Wavelength Division Multiplexing (OWWDM) [4L]

**Reference 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**

**PGCSE301A: PROJECT MANAGEMENT & ENTREPRENEURSHIP COURSE DESCRIPTION**

**Module I:**

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.

**Module II:**



Entrepreneurship Is An Intensive Course Involving The Study Of Journals Articles, Analysis Of Cases, To Evolve Perspective On Entrepreneurship As An Academic Discipline

### **Module III:**

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. Jeffrey 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.

### **PGCSE30B: Teaching & Research Methodology**

**Contact: 4L**

**Credit: 4**

#### **Module I:**

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

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 L]

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

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 L]

#### **Module II:**

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. [8 L]

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 L]

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 L]

### **Module III:**

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 L]

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

Data & Reports: Infrastructural setups for research; Methods of data collection esp. validity and reliability, Sampling; Data processing and Visualization especially Classification; Ethical issues especially. 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) [5L]

### **Reference Books:**

1. Teaching Methodology, Caroline W. Ndirangu, African Virtual University.
2. R. Paneerselvan: Research Methodology, Prentice-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,

## **ELECTIVE – IV**

### **Advance JAVA and Web Technology**

**Code: PGIT302D**

**Contact: 4L**

**Credit: 4**

#### **Module I**

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. [4L]

#### **Module II**

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

#### **Module III**

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

#### **Module IV**

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

#### **Module V**

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

## **Module VI**

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. [12L]

## **Module VII**

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

## **Module VIII**

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

### **Reference 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.

## **Bio-Informatics**

**Code: PGIT302E**

**Contact: 4L**

**Credit: 4**

### **Module I**

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 Translation, Introduction to Metabolic Pathways. [5L]

### **Module II**

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; [2L]

### **Module III**

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. [14L]

### **Module IV**

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. [8L]

### **Module V**

Assigning protein function and predicting splice sites: Decision Tree Gene Expression Clustering. K Means Algorithm. [6L]

### **Reference 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. 12.
6. Gibas, Jambeck: Developing Bio-informatics Computer Skills, SPD

## **E-Business and ERP**

**Code: PGIT302F**

**Contact: 4L**

**Credit: 4**

### **Module I**

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 [3L]

### **Module II**

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

### **Module III**

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 [3L]

### **Module IV**

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 [4L]

### **Module V**

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 [6L]

### **Module VI**

Introduction to EDI, Benefits of EDI, EDI standard – EDIFACT, EDI communications, EDI implementations, EDI security [2L]

### **Module VII**

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 [5L]

### **Module VIII**

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 [5L]

### **Module IX**

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 [10L]

### **Module X:**

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 systems, 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 [8L]

### **Reference Books:**

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

### **Internet & Web technology**

**PGIT302G**

**Contact: 4L**

**Credit: 4**

### **Module I**

Understanding of the user centred design (ucd) development methodology, the importance of gathering user requirements and the impact of these on site design, in-depth knowledge and understanding of the current and emerging web technologies, knowledge and understanding necessary to work with a variety of web development environments. In-depth understanding of server side and client side application development issues, skills to develop database connectivity for web applications using a variety of technologies specifically php, and javascript.

### **Module II**

Emergence of the internet and the www.issues in developing applications for the www.the user centred design (ucd) methodology. Requirements gathering.website usability.html, xhtml and css.developing server side applications using php.adding interactivity to web applications using javascript.developing database-driven web sites using php.

### **Reference Books:**

1. Ullman, Larry, 'Php And Mysql For Dynamic Web Sites'
2. Ullman, Larry, 'Php Advanced For The World Wide Web'