UNIVERSITY OF KALYANI

PART-II TO PART-IV

SYLLABUS

for

Bachelor of Technology

on

Information Technology

Department of Engineering and Technological Studies

PART -II, 1ST SEMESTER (Both EIE & IT)

NO. OF THEORETICAL SUBJECT	: 06	CREDITS ON THEORETICAL SUBJECTS	: 24
NO. OF SESSIONAL SUBJECT	: 03	CREDITS ON SESSIONAL	: 06
		TOTAL SEMESTER CREDITS	: 30

Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
A. THEORETICAL SUBJECTS							
1.	HU 301	Industrial Management & Organizational Behavior	3	1		4	4
2.	IT 301	Data Structure and Algorithms	3	1		4	4
3.	IT 302	Numerical Methods and Programming	3	1		4	4
4.	EC 301	Digital Electronics and Logic Design	3	1		4	4
5.	EC 302	Circuit Theory and Network	3	1		4	4
6.	M 301	Discrete Structure	3	1		4	4
		Total of Theoretical Subjects				24	24
B. SESSIONAL SUBJECTS							
7.	IT 391	Data Structure Lab			3	3	2
8.	IT 392	Numerical Methods and Programming Lab			3	3	2
9.	EC 391	Digital Electronics and Logic Design Lab			3	3	2
		Total of Sessional Subjects				9	6
		Total of Semester				33	30

Subject : INDUSTRIAL MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR
Paper Code : HU301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson	Contact Hours
1.	Introduction to Principles of Management: Concepts of Management and Organization; Evolution of Scientific Management Thoughts– Principles of Taylor, Fayol, Gantt, Weber and others; Functions of management; Planning– Planning Process, Types of plans– Short Term and Long Term Plans, Single-use and Standing Plans, Policies Procedures and Rules, Strategic Planning; Organizing, Staffing, Directing, Communicating, Coordinating, Controlling, Reporting, Budgeting; Leadership– The Traitist Approach, The Behavioural Approach; Managerial Philosophy– McGregor's Theory X and Theory Y, Likhert's four management system; Leadership styles– Autocratic, Participative, Free-rein; The Ohio state studies; The Managerial Grid. Motivation– Maslow's Hierarchy of Needs, Hertzberg's Two Factor Theory.	8*L* + 1*T*
2.	Personnel Management: Functions of Personnel Management; Staffing– Human Resource Planning, Job Analysis, Job Description and Job Specification, Merit Rating, Recruitment and Selection Process; Human Resource Development and Management– Wages and Salary Administration, Employees' Welfare, Training and Career Management; Collective Bargaining– Trade Unions; Introduction to Factory Act 1948, Payment of Wages Act 1948, Trade Union Act, Provident Fund Act; Introduction to Taxes– Sales Tax, Excise Duty, VAT, Income Tax.	5*L*+ 1*T*
3.	Plant Management: Plant Location, Plant Layout; Industrial Safety; Production Process and Planning; Maintenance– Breakdown, Preventive and Predictive maintenance; Work Study and Method Study.	3*L*+ 1*T*
4.	Materials Management: Objective; Materials– Its Classification and Codification; Inventory– Different Costs associated to Inventory, Classification and Control– ABC, VED, XYZ analyses, Factor affecting Inventory Control, Economic Order Quantity– Deterministic E.O.Q. models– Basic EOQ model, EOQ model with Gradual Inventory Build-up over a certain finite time, EOQ model with Instantaneous Inventory Build-up but Variable Order Cycle, EOQ models with Price Breaks– One Price Break, More than One Price Break; Store Management and Record Keeping; Purchase Management– Roles and Duties of a Purchase Manager, Purchase Process.	5*L*+ 3*T*
5.	Financial Management: Finance and its role; Cost of a business, Cost Control, Break Even Analysis; Capital– Working Capital; Budgets and Budgetary Control; Balance Sheet, Ratio Analysis, Profit and Loss Statement.	4*L*+ 2*T*
6.	Marketing Management: Objective and Scope; Sellers and Buyers Market; Monopoly, Oligopoly, Perfectly Competitive Market; Closed, Restricted and Open Market; Market Research; Products– Classification and its Life Cycle; Launching of New Product– Market Survey, Design and Development, Pricing, Distribution and Sales, Market Feed Back; Advertising.	3*L*+ 1*T*
7.	Quality Management: Objective and Scope, Quality Control and Inspection; Methods of Quality Control, Statistical Quality Control, Control Charts– R-Chart, p-Chart, c-Chart; Sampling– Random sampling; 3-Sigma Concept; Total Quality Management– Quality Assurance– ISO 9000 and BS 14000 series procedures.	3*L*+ 2*T*
8.	Organizational Behaviour: Organization and its structure, Organizational Chart; Organizational Behavior– Definition, Objective and Elements; Departmentation– Authority and Responsibility, Division of Work and Delegation of Power, Linking Pins, Centralization and Decentralization, The Span of Management, Bureaucracy; Types of Mechanistic and Organic Structures of Organization– Line Organization, Line and Staff Organization, Functional Organization, Committee Organization; Work and Professional Ethics– Concept of ethics and Professionalism, Requirement and Code of Professional Ethics; Responsibility of the organization to the society	5*L*+ 1*T*

	and environment.	

Recommended Books:

1.	"Industrial Engineering and Management", O. P. Khanna, *Dhanpat Rai Publ.*
2.	"Industrial Engineering and Production Management", Ms Mahajan, *Dhanpat Rai Publ.*
3.	"Production, Planning and Inventory Control", S. L. Narasimhan, D. W. McLeavy, P. J. Billington, *PHI*
4.	"Production Systems: Planning, Control and Analysis", R. L. Jiggs, *John Willy*
5.	"Business, Strategy, Policy and Planning", P. K. Ghosh, *Sultan Chand Publ.*
6.	"Industrial Engineering and Management Science", T. R. Banga, *Jain Book Depot*
7.	"Principles and Practice of Management", Haynes, *Central Publ.*
8.	"Personnel Management", A. Monappa, M. S. Saiyadain, *Tata Mc-Graw Hill*
9.	"Organizational Behaviour : Human Behavior at Work", J. Newstorm, K. Devis, *Tata Mc-Graw Hill*
10.	"Organizational Behaviour", L. M. Prasad, *Sultan Chand Publ.*
11.	"Human Resource Management", L. M. Prasad, *Sultan Chand Publ.*
12.	"Marketing Management", Kotler, *EEE*
13.	"Purchasing and Materials Management", P. Gopalakrishnan, *Tata Mc-Graw Hill*

Subject : DATA STRUCTURES AND ALGORITHMS
Paper Code : IT 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact hours
1.	Definitions of Information, Data – atomic and composite, Data type and Data Structure, Abstract data Type (ADT) definition, implementation, ADT's of Stack , Queue, Rational Number.	2*L* + 1*T*
2.	Time and Space analysis of Algorithms - Order Notations	1*L* + 1*T*
3.	Recursion Tower of Hanoi, generating permutations, Tail Recursion, When not to use recursion, Removal of recursion.	2*L* + 1*T*
4.	Linear Data Structures : Sequential representations -Arrays and Lists, Stacks, Queues and Dequeues,	5*L* + 1*T*
5.	Strings, Applications. Linked Representation - Linear linked lists, Circularly linked lists. Doubly linked lists, Application – Polynomial addition, High Precision arithmetic, Handling of sparse matrix.	5*L* + 1*T*
6.	Non-linear Data Structures: Trees – Tree terminologies, Binary Trees, Binary Tree Implementation, Binary Tree Traversals – recursive and non-recursive, Generation of BST from any tree, Full & complete binary tree and relation between different degree of notes in BST. Threaded Binary Tree, Binary Search Tree, Insertion and Deletion algorithms, Height-balanced Tree (AVL tree), B-tree, B+ -tree, Application of Binary Tree.	5*L* + 2*T*
7.	Graphs – Basic Definitions, Representations – matrix and list representations, Breadth-first and Depth-first Search, Spanning Tree, Shortage fact finding using Prims and Kruskal Algorithms.	2*L* + 1*T*
8.	Sorting Techniques : Introduction, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort, Performance and Comparison analysis of different sorting techniques.	6*L* + 2*T*
9.	Searching : Sequential Search, Indexed Sequential Search, Binary Search, Hash Table and Hashing, Hash Function, Hash Collision, Collision Resolution Techniques – Open Addressing, Separate Chaining, Coalesced Chaining, Bucket Hashing.	5*L* + 1*T*
10.	File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.	3*L* + 1*T*

Recommended Books:

1.	"Data Structures Using and C and C++",Langsam Y., Augenstein M. J. and Tanenbaum A. M., *Prentice-Hall.*
2.	"Data Structures", Lipschutz, *Tata Mc-Graw Hill*

3.	"Data Structures and Algorithms", Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., *Addison Wesley*
4.	"Data Structure Using C", Radhakrishnan M.and Srinivasan V., *ISTE/EXCEL BOOKS*
5.	"Algorithms, Data Structures, and Problem Solving with C++",Weiss Mark Allen, *Addison Wesley.*
6.	"Fundamentals of Data Structures", Horowitz E. and Sahni S., *Galgotia Publications.*
7.	"Data Structures and Algorithms", Drozdek, *Vikas*.
8.	"Data Structures Through C", Agarwal A., *Cybertech*

Subject : NUMERICAL METHODS AND PROGRAMMING
Paper Code : IT 302 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson	Contact Hours
1.	Introduction to Numerical Methods. Introduction to programming— logical flow of computational process, programming language, floating point concept, accuracy and error, convergence. Methods for solving transcendental equations– Bisection theorem, Successive Bisection method; Regula-falsi method; Newton-Raphson method; Approximate solution of polynomial equation–Relations between roots and coefficients, Descarte's rule of signs, Horner's Method. *Study of Algorithm of the methods and solution of sample problems.*	5*L*+2*T*
2.	Solution of Linear Simultaneous equation: Direct methods of solution– Gauss elimination, Pivoting and Ill-conditioning; Iterative methods of solution– Jacobi's iteration method, Gauss-Seidel iteration method. Solution of Non-linear Simultaneous equation: Newton-Raphson method. *Study of Algorithm of the above methods and solution of sample problems*.	6*L*+2*T*
3.	Finite Differences and Interpolation: When independent variable points are equally-spaced: Forward Difference Operator and Table– Newton's Forward Difference Formula; Backward Difference Operator and Table– Newton's Backward Difference Formula; Backward Difference Table– Stirling Central Difference Formula; When independent variable points are not equally-spaced: Lagrange's formula, Divided Difference Operator and Table– Newton's Divided Difference Formula; *Study of Algorithm of the above methods and solution of sample problems.*	7*L*+3*T*
4.	Numerical Differentiation; Numerical Integration– Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's ⅓-rd rule, Simpson's ⅜-th rule; *Study of Algorithm of the above methods and solution of sample problems.*	4*L*+1*T*
5.	Numerical solution of Ordinary Differential Equations: Picard's method, Taylor's Series method, Euler's method, Modified Euler's method, Runge's method, Runge-Kutta method, Predictor-Corrector methods– Milne's method; *Solution of sample problems.* Numerical solution of Simultaneous Linear Differential Equations and Second-order Differential Equations; *Solution of sample problems*.	8*L*+2*T*
6.	Numerical solution of Partial Differential Equations: Finite Difference Approximation to derivatives; Solutions of Elliptic equations, Parabolic equations, Hyperbolic equations; *Study of Algorithm of the above methods and solution of sample problems.*	6*L*+2*T*

Recommended Books

1.	"Higher Engineering Mathematics", B. S. Grewal, *Khanna Publ.*
2.	"Numerical Methods", E. Balagurusamy, *Tata Mc-Graw Hill Publ.*
3.	"Introductory Methods of Numerical Analysis", S. S. Sastry, *Prentice Hall India*
4.	"Numerical Methods for Engineers and Scientists", J. N. Sharma, *Narosa Publ House*
5.	"Computer Oriented Numerical Methods", Rajaraman, *Prentice Hall India*
6.	"Numerical Methods for Scientists and Engineers", K. S. Rao, *Prentice Hall India*
7.	"Numerical Mathematical Analysis", J. B. Scarborough, *John Hopkins Univ. Press*
8.	"Introduction to Numerical Analysis", F. B. Hildebrand, *Tata Mc-Graw Hill Publ.*
9.	"Numerical Methods and Analysis", J. L. Buchanan and P. R. Turner, *Mc-Graw Hill*

Subject : DIGITAL ELECTRONICS AND LOGIC DESIGN
Paper Code : EC 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Number systems: Decimal, binary, octal and hexadecimal number system and conversion, binary weighted codes, signed number binary order,1's and 2's complement codes, binary arithmetic.	3*L* + 1*T*
2.	Boolean algebra: binary logic functions, Boolean laws, truth tables, associative and distributive properties, demorgan's theorems, realization of switching functions using logic gates.	3*L* + 1*T*
3.	Combinational logic: Canonical logic forms, sum of product & product of sums, don't care terms Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine McCluskey minimization techniques.	5*L* + 1*T*
4.	Analysis and design of combinational logic: Introduction to combinational circuit ,code conversion, decoder, encoder , parity-bit generator and checker, priority encoder , multiplexers and demultiplexer, subtractor, BCD adder, binary comparator, arithmetic and logic units, application of decoder, multiplayer.	5*L* + 2*T*
5.	Sequential logic: Sequential circuits, flip flops, clocked and edge triggered flipflops timing specifications, counters asynchronous and synchronous, counter design with state equations registers, serial in serial out shift registers, tristate register , register transfer timing considerations.	7*L* + 2*T*
6	Sequential circuits: State diagrams and tables, transition table, excitation table and equations, examples using flip flops , simple synchronous and asynchronous sequential circuit analysis, construction of state diagram and counter design.	5*L* + 2*T*
7.	Programmable logic: Programmable logic devices, programmable logic arrays and programmable array logic.	3*L* + 1*T*
8.	Digital integrated circuits: Digital circuit logic levels ,propagation delay times, power dissipation , fan out and fan in, noise margin for popular logic families, TTL, 1LSTTL, CMOS and ECL integrated circuits and their performance comparisons, open collector and tri state gates and buffers.	5*L* + 2*T*

Recommended Books

1.	"Digital Design", Mano M M, *Prentice Hall India*
2.	"Digital Principles And Applications", Taub and Schilling, *Tata McGraw Hill*

Subject : CIRCUIT THEORY AND NETWORK
Paper Code : EC 302 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Passive and active circuit elements, Kirchoff's Laws, Concepts of independent voltage and current sources, controlled Sources. Node equation and Loop equation Techniques.	5*L* + 2*T*
2.	Differential equation representation of passive circuits. Solution of circuit differential equations for simple circuits, concept of impedance and reactance.	5*L* + 2*T*
3.	Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer & Tellegen's Theorem etc.	5*L* + 2*T*
4.	Graph of a network. Concept of tree, concepts of loop current and node pair voltage, circuits cut-set and cut-set matrices, formulation of equilibrium equations of the loop and node basis.	6*L* + 1*T*
5.	Laplace transform with Inversion formula. Application of Laplace transform in the solution of Circuit problems. Transient and steady state responses, Initial and final value theorems.	6*L* + 2*T*

6.	Passive 1-port and 2-port networks. Terminals and terminal pairs, driving point impedance, transfer functions, poles and zeros, restrictions on pole and zero locations in s-plane.	4*L* + 1*T*
7.	Resonance, Q and bandwidth of a circuit.	2*L* + 1*T*
8.	Introduction to synthesis of passive networks deferent forms	3*L* + 1*T*

Recommended Books

1.	"Network Analysis", V. Valkanburg, *Prentice Hall India*
2.	"Introduction to Modern Network Synthesis", V. Valkanburg, *John Wiley & Sons*
3.	"Network and Systems", D. Roy Chowdhuri, *New Age Int. Pvt. Ltd*
4.	"Basic Circuit Theory", C. A. Desoer & E. S. Kuh, *Tata McGraw Hill*
5.	"Elementary Linear Circuit Analysis", L. S. Bobro, *Oxford*

Subject : DISCRETE STRUCTURE
Paper Code : M 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Set Theory: Sets, Venn Diagrams, Set Memberships of tables; Laws of set Theory; Partitions of sets; Power sets.	4*L* + 1*T*
2.	Propositional Logic– Propositional equivalences-Predicates and quantifiers-Nested Quantifiers-Rules of inference-introduction to Proofs-Proof Methods and strategy	6*L* + 2*T*
3.	Mathematical inductions-Strong induction and well ordering-.The basics of counting-The pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.	7*L* + 3*T*
4.	Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism -connectivity-Euler and Hamilton paths	7*L* + 2*T*
5.	Algebraic system-Semi groups and monoids-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Ring & Fields (Definitions and examples)	6*L* + 2*T*
6.	Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems– Sub lattices– direct product and Homomorphism-Some Special lattices- Boolean Algebra	6*L* + 2*T*

Recommended Books

1.	"Elements of Discrete Mathematics", C. I. Liu, *Tata McGraw Hill*
2.	"Discrete Mathematical Structures", B. Kolman, R. C. Busby, S. Ross, *Prentice Hall India*
3.	"Discrete Mathematics". W. M. Dymacek & H. Sharp (Jr.), *McGraw Hill*

Subject : DATA STRUCTURE LAB.
Code : IT 391 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Recursive routines for Tower of Hanoi, Generation of permutations.
2.	Implementation of Stack and Queue in C using array and linked list, Insertion, Deletion of Stack and Queue, Application of Stack – Conversion of Infix to Postfix expression, Evaluating a Postfix expression.
3.	Implementation of linked list using dynamic memory allocation, Insertion and deletion, printing the elements, counting the number of elements in a linked list, Application of linked list – Polynomial addition, Circular linked list, Doubly linked list- Application in High precision arithmetic, Sparse matrix multiplication.

4.	Implementation of Binary Tree, Generation of Binary Search Tree, Tree traversal, Heap Generation-recursive and nonrecursive.
5.	Graph Program to be developed Using C/C++ Applications: Implementation of BFS, DFS. Prims & Kruskal Algorithm.
6.	Sorting using Merge sort, Quick sort, Heapsort.

Subject : NUMERICAL METHODS AND PROGRAMMING LAB.
Code : IT 392 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Introduction to Programming Language– FORTRAN, C++, MATLAB Programming of Successive Bisection method, Regula-falsi method, Secant method; Newton-Raphson method.
2.	Program development for the solution of Linear Simultaneous equation: Using Gauss elimination method including the modification for Pivoting and Ill-conditioning and using Gauss-Seidel iteration method.
3.	Program to interpolate the value using: a) Newton's Forward Difference formula; b) Newton's Backward Difference formula; c) Lagrange's formula, d) Newton's Divided Difference formula.
4.	Program for Numerical Integration– Trapezoidal rule, Simpson's ⅓-rd rule, Simpson's ⅜-th rule
5.	Program to solve Ordinary Differential Equations numerically using: a) Euler's method, c) Runge-Kutta method, d) Milne's method.
6.	Program to solve Partial Differential Equations numerically: Poisson's equation

Subject : DIGITAL ELECTRONICS AND LOGIC DESIGN LAB.
Code : EC 391 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	To study NAND IC chip and to realise different logic functions using only NAND gates.
2.	To study NOR IC chip and to realise different logic functions using only NAND gates.
3.	To design a full adder using IC 7486 and 7400
4.	To study 4-bit parallel adder and subtractor using IC 7483 and 7486.
5.	To design a J-K flip-flop using NAND and NOR gate and to study dual J-K master-slave flip-flop (IC 74107)
6.	To study left, right and programmable shift register
7.	To study synchronous and asynchronous counters.

PART -II, 2ND SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 06	CREDITS ON THEORETICAL SUBJECTS	: 24
NO. OF SESSIONAL SUBJECT	: 03	CREDITS ON SESSIONAL	: 06
		TOTAL SEMESTER CREDITS	: 30

Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
A. THEORETICAL SUBJECTS							
1.	IT 401	Operation Research & Decision Technique	3	1		4	4
2.	IT 402	Computer Organization and Architecture	3	1		4	4
3.	IT 403	Object Technology and UML	3	1		4	4
4.	IT 404	Analysis, Design and Management of Information System	3	1		4	4
5.	IT 405	Formal Language and Automata	3	1		4	4
6.	EI 401	Microprocessor and Microcontroller Application	3	1		4	4
		Total of Theoretical Subjects				24	24
B. SESSIONAL SUBJECTS							
7.	IT 491	Operations Research Lab			3	3	2
8.	IT 493	Object Technology and UML Lab			3	3	2
9.	EI 491	Microprocessor and Microcontroller Lab			3	3	2
		Total of Sessional Subjects				9	6
		Total of Semester				33	30

Subject : OPERATIONS RESEARCH AND DECISION TECHNIQUE
Code : IT 401 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson	Contact Hours
1.	Introduction to Operations Research and Decision Technique– Application to real life situation; Modeling Approach of Operations Research (O. R.) – Deterministic model, Stochastic model; Introduction to Linear Programming (L.P.), its limitation – Formulation of a mathematical model; Introduction to Objective Function, Constraints, and Variable– slack, surplus, unrestricted; Graphical Solution Method and Sensitivity Analysis– Unit Worth of a Resource.	1*L*+1*T*
2.	Simplex solution method of L. P. Problems; Introduction to Artificial variables in L. P. problem; Solution methods– Big-M Method, Two-phase method; Revised Simplex method.	3*L*+1*T*
3.	Duality– Primal and Dual problems; Economic interpretation of duality; Relationship between the optimal solutions of Primal and Dual problems– Dual Simplex method.	2*L*
4.	Introduction to transportation problem– Generalized Mathematical Form; Balanced and Unbalanced problems; Independency and Degeneracy– Removal of degeneracy; Basic Feasible Solution, Methods of finding Initial Basic Feasible Solution– North-West Corner method, Least Cost method, Vogel's Approximation method; Optimality Test and Iterative modification of solution using MODI method (Method of Multipliers).	3*L*+2*T*
5.	Introduction to Assignment problem– Generalized Mathematical Form; Transportation and Assignment problems– their relationship and differences; Hungarian method of solution.	1*L*
6.	Network Analysis– Introduction to different terms; Minimal Spanning Tree Algorithm; Shortest Route problems– Dijkstra's Algorithm, Floyd's Algorithm; Maximal Flow Algorithm; CPM and PERT analysis– their relationship and differences, Activity and Event, Network Development, Different time elements in CPM and PERT analyses; Event Slacks and Activity Floats, Critical Path.	5*L*+2*T*
7.	Queueing Theory– Introduction to different terms and axioms; Poisson and Exponential Distributions– Pure Birth Model, Pure Death Model, Inter-arrival Time; Specialised Poisson Queues–Kendall's notation and Lee and Taha's modification; Single Server models– [(*M/M/1*):(*GD/∞/∞*)]; Multiple Server models– [(*M/M/c*):(*GD/∞/∞*)]	4*L*
8.	Simulation– Continuous model, Discrete model– Discrete Event Simulation; Monte-Carlo Simulation; Random Number, Pseudorandom Number, Generation of Random Number– Multiplicative Congruential method.	3*L*+2*T*
9.	Dynamic Programming Concept– Deterministic Dynamic Programming; Characteristics of Dynamic Programming; Forward and Backward Recursion; Bellman's Optimality; Selected Applications of D. P.– Travel Plan Schedule model, Cargo Loading model, Equipment Replacement model.	3*L*+2*T*
10.	Integer Programming Concept; Solution of Integer Programming Problems– Cutting Plane method, Branch & Bound method.	1*L*
11.	Decision Analysis– Decision making process; Decision making under certainty– Analytic Hierarchy Approach, Determining the weights, Decision (Comparison) Matrix and Consistency analysis; Decision making under risk– Expected Utility Criterion, Expected Opportunity Loss Criterion, Decision Tree Analysis; Decision making under uncertainty– Laplace Criterion, The Maximin or Minimax Criterion, The Savage Regret Criterion; Decision making under ignorance– The Hurwicz Criterion; The Demarcation of Decisions, Decision Instability– Conditionalised Expected Utility, Newcomb's Paradox.	3*L*
12.	Introduction to Game Theory– Assumptions and terminology; Concept of Dominance; Two-person-zero-sum game– Pure Strategic Game– Solution by Maximin or Minimax principle, Mixed Strategic Game– Solution processes of 2×2, 2×n games, Generalized form of Two-person-zero-sum game– Simplex method of solution.	3*L*+1*T*

Recommended Books

1.	"Operations Research– An Introduction", H A Taha, *Prentice Hall India*
2.	"Tracts in Operations Research", K Swarup, P K Gupta, M Mohan, *Sultan Chand & Sons*

Subject : COMPUTER ORGANIZATION AND ARCHITECTURE
Code : IT 402 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact hours
1.	Concepts & Terminology: Digital computer concepts; Von-Neumann concept; Hardware & Software and their dual nature, Role of operating system (OS). Features of PCs, Minis, Workstations and Mainframes.	3*L* + 1*T*
2.	Memory Unit: Memory classification, characteristics; Organization of RAM, address decoding, Registers and Stack, ROM/PROM/EEPROM basic cells: Organization and erasing schemes, Magnetic memories, recording formats & methods, Concept of memory map, memory hierarchy, Associative memory organization; Cache introduction, techniques to reduce cache misses, concept of virtual memory & paging. Bipolar and MOS storage cells. Instruction sequencing with examples. Microprogramming concept and variation in microprogramming configuration.	9*L* + 2*T*
3.	CPU Design: ALU organization, Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address; Multiplication of signed binary numbers- Booth's algorithm; Divide algorithms- Restoring & Non-Restoring; Floating point number arithmetic; Overflow detection, status flags.	9*L* + 3*T*
4.	Control Design– Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro-programmed, CISC & RISC characteristics.	3*L* + 2*T*
5.	Parallel Processing: Pipelining-general concept, speed up, instruction & arithmetic pipeline; Examples of some pipeline in modern processors, pipeline hazards; Flynn's classification – SISD ,SIMD , MISD , MIMD architectures-Vector and Array processors & their comparison , Concept of Multiprocessor; Centralized & distributed architectures.	9*L* + 3*T*
6.	Instruction Set Architecture- Choice of instruction set; Instruction word formats; Addressing modes. Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O, DMA.	3*L* + 1*T*

Recommended Books

1.	"Computer Architecture & Organization", Hayes, 3/e, *McGraw Hill*
2.	"Computer Architecture (Schaum Series)", Carter, *Tata McGraw Hill*
3.	"Computer System Architecture", Mano M. M., *Prentice Hall India*
4.	"Computer Organization & Design", Chaudhury P. Pal, *Prentice Hall India*
5.	"Computer Organization", Hamacher, 5/e, *McGraw Hill*

Subject : OBJECT TECHNOLOGY AND UML
Code : CS403 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	**Introduction**: Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language, difference between OOPs and other conventional programming advantages and disadvantages.	4*L* + 2*T*
2.	**Object oriented design and programming technique using C++:** Major and minor elements, Object, Class, Encapsulation, Data Hiding, Constructor, Destructor, relationships among objects, polymorphism, Inheritance, aggregation, links relationships among classes-association, meta-class, grouping constructs, Pointers in C++, Stack, Queue, Linked list, Tree representation in C++, Error handling, Template and application of STLs,	20*L* + 5*T*
3.	**Fundamentals of Object Oriented design in UML:** Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram,	12*L* + 5*T*

	sequence diagram, state chart diagram, activity diagram, implementation diagram, UML extensibility- model constraints and comments, Note, Stereotype.	

Recommended Books

1.	"The C++ Programming Language", Bjarne Stroustrup, *Addition-Wesley*
2.	"Object-Oriented System Development", Ali Bahrami, *McGraw Hill*
3.	"Object Oriented Modelling and Design", Rambaugh, J. Michael, Blaha, *Prentice Hall India*/*Pearson Edu.*
4.	"Foundations of Object Oriented Languages", Bruce, *Prentice Hall India*
5.	"The Complete Reference-Java2", Patrick Naughton, Herbert Schildt, *Tata McGraw Hill*
6.	"Practical Object Oriented Design using UML", Priestley, *Tata McGraw Hill*
7.	"C++ & Object Oriented Programming", Jana D., *Prentice Hall India*
8.	"Fundamentals of Object Oriented Design in UML", Page-Jones, Meiler, *Addition-Wesley*
9.	"Object Oriented Programming and C++", Rajaramn, *New Age International*
10.	"Instant UML", Muller, *Shroff Publishers/Wrox*
11.	"Object Oriented Analysis & Design Using UML", Srimathi, *Scitech*
12.	"UML In A Nutshell", Alhir, *Shroff Publishers/O'reilly*

Subject : ANALYSIS, DESIGN AND MANAGEMENT OF INFORMATION SYSTEM
Code : CS404 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson	Contact Hours
1.	**Introduction of management, Management analysis and design, System:** components of a system, environment, Models – Level of models, types of models	1*L*
2.	**Information System:** Systems development, life cycle, Structured System – Its analysis and design; Management Information System – MIS function in organization; Requirements Analysis – Personal and automation requirements in MIS.	3*L*
3.	**Introduction to Data-** Types of data **,** Dataflow – Physical and logical Data Flow Diagrams; Data Modeling, data dictionary, entity relationship diagram, Structure charts, Transform and Transaction Analysis, Coupling and Cohesion, Process Specification.	3*L* + 1*T*
4.	**Managerial Decision Making –** Characteristics of types of decision, Structured English ,Decision tables, Choice – CASE tools, structured programming, System implementation, Module programming, Chief Programmer Teams – Work distribution and coordination, Role of intelligence and coding; Evaluating the decision – planning for testing, verification and validation, Effectiveness and efficiency, Change-over phase, Project review and walk through, Alternate life cycles, Evolutionary Design and prototyping.	7*L* + 3*T*
5.	**Feasibility Study –** Cost estimation, cost benefit analysis, Input-output design, Form design, Dialogue design, File design, Security and control information, Documentation, report generation.	3*L* + 2*T*
6.	**Transaction Processing & Management Reporting Systems –** A management information system frame work : transaction processing framework, Management reporting system, Decision support system, Knowledge base system, Office systems.	4*L* + 1*T*
7.	**Transaction Processing –** Nature, Function, Role of IT in transaction processing, processes cycles, Transaction processing subsystem.	2*L*
8.	**Management Reporting System –** Evaluation of Management Reporting System, Types of reports, Structuring report content.	2*L* + 1*T*
9.	**Decision Support System –** Component of DSS, DSS development, DSS products, DSS development tools, User interfaces, Executive information system (EIS), Executive roles & decision making, Executive decision making environment	3*L* + 1*T*
10.	**MIS in the functional areas of business –** Financial information system, Marketing MIS, Manufacturing MIS	2*L* + 1*T*

11.	**Enterprise resource planning –** Materials Requirement planning (MRP), Closed loop MRP, Manufacturing resource planning (MRP-II), Enterprise resource planning, Functional architecture of ERP, Benefits of ERP, Business process Reengineering and ERP, ERP implementation	3*L* + 2*T*
12.	**Supply Chain Management –** Introduction, definition of SCM, Feature of SCM, SCM stages	1*L*
13.	**Cases in MIS –** case study method, Analytical Case, Issue case, Written case analysis, Illustrations	2*L*

Recommended Books

1.	"Analysis and Design of Information Systems", Senn J., *McGraw Hill*
2.	"Integrated Approach To Software Engineering", P. Jalote, *Narosa Book Distr. Pvt. Ltd.*
3.	"System Analysis & Design", Nike Kishore,
4.	"Management Information System", Davis, *Tata McGraw Hill*
5.	"Management Information Systems – A Concise Study", Kelkar, *Prentice Hall India*
6.	"Management Information Systems", Post & Anderson, *Tata McGraw Hill*
7.	"Introduction to System, Analysis and Design", Hawryszkiewycz, *Prentice Hall*
8.	"System Analysis & Design Methods", Whitten, 5/e, *Tata McGraw Hill*
9.	"Systems Analysis and Design", Rajaraman V., *Prentice Hall India*
10.	"Information systems for Modern management", Murdic RG., Rose J. and Claggtt JR., *Prentice Hall India*
11.	"Management Information Systems, Managing the Digital Firm", Laudon & Laudon, *Prentice Hall India*
12.	"Enterprise Resource Planning", Leon, *Tata McGraw Hill*

Subject : FORMAL LANGUAGE AND AUTOMATA
Code : CS405 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson	Contact Hours
1.	**Finite State Machines:** Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and liner sequential machines.	3*L* + 1*T*
2.	**Finite Automaton:** Preliminaries (strings, alphabets & languages, graphs & trees, set & relations), definition, recognition of a language by an automata - idea of grammars, Chomsky hierarchy of languages, DFA, NDFA, equivalence of DFA and NDFA, NDFA with Є-moves, regular sets & regular expressions: equivalence with finite automata, NDFA from regular expressions, regular expressions from DFA, two way finite automata equivalence, applications of finite automata	12*L* + 3*T*
3.	**Finite State Models:** Basic definition, mathematical representation, Moore versus Mealy machines, capability & limitations of FSM, state equivalence & minimization, machine equivalence, incompletely specified machines, merger graph & compatibility graph, merger table.	6*L* + 2*T*
4.	**Closure Properties of Regular Sets:** Pumping lemma & its application, closure properties, minimization of finite automata: minimization by distinguishable pair.	4*L* + 1*T*
5.	**Context Free Grammars Closure Properties of CFLs:** Introduction, definition, derivation trees, simplification, CNF & GNF, ogden's lemma, closure properties, decision algorithms.	3*L* + 1*T*
6.	**Pushdown Automata:** Definition, moves, instantaneous descriptions, language recognized by PDA, deterministic PDA, acceptance by final state & empty stack, equivalence of PDA and CFL.	4*L* + 2*T*
7.	**Lower Bound Automata:** Definition, Context sensitive languages, language recognized by LBA. **Turing Machine:** Variation of Turing machine model, Turing computability, Languages, Church Turing hypothesis, recursive & recursively enumerable sets, Universal Turing machine	4*L* + 2*T*

	and undecidable problem	

Recommended Books

1.	"Introduction to Automata Theory, Languages & Computation", Hopcroft J. E. and Ullman JD., *Narosa*
2.	"Theory of Computer Science", K.L.P. Mishra & N. Chandrasekharan, *Prentice Hall India*
3.	"Elements of the Theory of Computation", Lewis H. R. and Papadimitrou C. H., *Prentice Hall India*
4.	"Introduction to Languages and Theory of Computation", Martin, *McGraw Hill*.
5.	"Automata Theory", Peter Linz,
6.	"Switching & Finite Automata", Kohavi ZVI, 2/e, *Tata McGraw Hill*.
7.	"An Introduction to Formal Languages and Automata", Linz Peter, *Narosa*

Subject : MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS
Code : EI 401 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	Introduction to Microprocessors: Evolution of Microprocessors, Timing and control, memory devices.	5*L* + 1*T*
2.	8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Assembly Language programming. 16-bit Microprocessors (8086): Architecture, Physical address, segmentation, memory organization, Bus cycle, Addressing modes, Assembly Language Programming of 8086.	13*L* + 4*T*
3.	Data Transfer Schemes: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Priority Controller (8259), Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications. DAC, ADC and memory Interfacing.	12*L* + 4*T*
4.	Advanced Microprocessors: Introduction to 32-bit and 64-bit microprocessors, power PC.	3*L* + 2*T*
5.	Microcontroller (8051): Introduction, Architecture, Instruction sets, Application in embedded system design.	3*L* + 1*T*

Recommended Books

1.	Microprocessor - Architecture, Programming and Applications with the 8085 (5/e)– R. S. Gaonkar, *Penram Int. Publ. Pvt. Ltd.*
2.	Microprocessors And Interfacing: Programming and Hardware (3/e)– D. V. Hall, *Tata McGraw Hill*
3.	The 8051 Microcontroller– K. Ayala, *Delmar Cengage Lerning Publ.*
4.	The 8051 Microcontroller And Embedded Systems– Md. Ali Mazidi, J. Gillispie Mazidi, *Pearson Edu.*

Subject : OPERATIONS RESEARCH LAB.
Code : CS491 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

	Details of the lesson
1.	Program development for Simplex algorithm for– a) Balanced constrain equations, b) Unbalanced constrain equations introducing slack and surplus variables.
2.	Program development introducing artificial variables– a) Big-M method, b) Two-phase Simplex method.
3.	Program development to solve transportation problems using VAM and MODI method.
4.	Program for Assignment problems– Implementation of Hungerian algorithm

5.	Program related to Network Analysis: Implementation of Dijkstra's algorithm, Floyd's algorithm, Finding Critical Path using CPM and PERT analysis.

Subject : OBJECT TECHNOLOGY AND UML LAB.
Code : CS493 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

	Details of the lesson
1.	Assignments on class, object, constructor, destructor, overloading, inheritance, overriding, Template Classes
2.	Assignments on wrapper class, vectors, arrays
3.	Assignments on developing interfaces- multiple inheritances, extending interfaces
4.	Assignments on creating and accessing packages
5.	Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming

Note: Use C++ and Java for programming.

Subject : MICROPROCESSOR AND MICROCONTROLLER LAB.
Code : EI 491 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

	Details of the lesson
1.	Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.
2.	Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical)
3.	Familiarization with 8085 simulator on PC.
4.	Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.
5.	Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding.

PART -III, 1ST SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 08
		TOTAL SEMESTER CREDITS	: 28

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	IT 501	Operating System	3	1		4	4
2.	IT 502	Database Management System	3	1		4	4
3.	IT 503	Language Processor	3	1		4	4
4.	EC 501	Control Theory	3	1		4	4
5.	EC 502	Analog Communication Theory	3	1		4	4
		Total of Theoretical Subjects				20	20
B. SESSIONAL SUBJECTS							
6.	IT 591	Operating System Lab			3	3	2
7.	IT 593	DBMS Lab			3	3	2
8.	EC 591	Control Lab			3	3	2
9.	EC 592	Analog Communication Lab			3	3	2
		Total of Sessional Subjects				12	8
		Total of Semester				32	28

Subject : OPERATING SYSTEM
Code : IT 501 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to OS. Operating system functions, evaluation of OS, Different types of OS: batch, multi-programmed, time-sharing, real-time, distributed, parallel.	3*L* + 1*T*
2.	Computer System Operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), OS services, system calls.	2*L* + 1*T*
3.	Process management	
	Processes: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.	2*L* + 1*T*
	Threads: overview, benefits of threads, user and kernel threads.	2*L* + 0*T*
	CPU scheduling: scheduling criteria, preemptive and non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, Priority), algorithm evaluation, multi-processor scheduling.	3*L* + 1*T*
	Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.	4*L* + 1*T*
	Deadlocks: system model, deadlock characterization, methods of handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.	3*L* + 1*T*
4.	Storage Management	
	Memory Management: background, logical versus physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.	4*L* + 2*T*
	Virtual Memory: background, demand paging, performance, page replacement algorithms (FCFS, LRU, optimal), allocation of frames, thrashing.	2*L* + 1*T*
	File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.	3*L* + 1*T*
	I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.	3*L* + 1*T*
	Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.	2*L* + 1*T*
5.	Protection & Security: goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.	2*L* + 0*T*
6.	Advance Topic: Basic architectural model and working principles of distributed OS	1*L* + 0*T*

Recommended Books

1.	"Operating System Concepts", Silberschatz A., Galvin P. B. and Gagne. G., *John Wiley & Sons*
2.	"Operating System: Concept & Design", Milenkovie M., *McGraw Hill.*
3.	"Operating System Design & Implementation", Tanenbaum A. S., *Prentice Hall, NJ*
4.	"Operating System", Dhamdhere, *Tata McGraw Hill*
5.	"Operating Systems", Stalling, William., *Maxwell McMillan International edition, 1992*
6.	"An Introduction to Operating Systems", Dietel H. N., *Addision Wesley*

Subject : DATABASE MANAGEMENT SYSTEM
Code : IT 502 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Basic concepts, Advantages of Database systems over traditional file processing system. Database System Architecture: Data Abstraction, Data Independence, Concept of Data Definition and Data Manipulation Languages. Database Administrator, Database Users.	3*L* + 1*T*
2.	Data Models: Basic concepts, Design Issues, Mapping Constraints, Keys, Weak Entity Sets, Entity-Relationship, Network, Relational and Object Oriented Data Models, Integrity Constraints, and Data Manipulation Operations. Extended E-R features.	4*L* + 2*T*
3.	Relational Query Languages: Structure of relational Databases, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE, Extended Relational Algebra Operations, DDL, DML, DCL, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, views, Nested Sub queries, Database security application development using SQL, Host language interface and embedded SQL programming, 4GLs, Forms management and report writers, Cursors, Stored procedures and triggers.	9*L* + 3*T*
4.	Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Functional Dependency, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF. Dependency Preservation, Lossless design.	9*L* + 2*T*
5.	Query Processing and Optimization: Query Equivalence, Join strategies, Query Optimization Algorithms.	2*L* + 0*T*
6.	Storage Strategies: Indices, B-trees, B+ tree, Hashing. Transaction Processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control schemes.	4*L* + 2*T*
7.	Advanced Topics; Object-oriented and Object Relational Databases, Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.	5*L* + 2*T*

Recommended Books

1.	"Database System Concepts", Henry F. Korth and Silberschatz Abraham, *Mc.Graw Hill.*
2.	"Fundamentals of Database Systems", Elmasri Ramez and Novathe Shamkant, *Benjamin Cummings Publishing Company.*
3.	"Database Management System", Ramakrishnan, *Mc.Graw Hill.*
4.	"Compiler Design Using C", Holub
5.	"Introduction to Database Management System", C. J. Date, *Narosa*

Subject : LANGUAGE PROCESSOR
Code : IT 503 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Review of grammars and languages, Compilers and Interpreters—basic concepts, Analysis of the source program, The phases of the compiler	3*L* + 1*T*
2.	The role of the lexical analyzer, Tokens, Patterns, Specifications of a token, Recognition of a tokens, The scanning process, Design using finite state m/cs, Scanner generator (LEX), Lexical errors. LEX construction technique.	6*L* + 2*T*

3.	The role of a parser, Top-down and bottom-up strategies: general considerations, Handles, Top down Parsing: LL(1), Recursive-decent. Bottom up parsing: Operator precedence parsing and simple precedence, LR parsers: LR(0), SLR(1), canonical LR(1) and LALR(1) parsers. Error Recovery strategies for different parsing techniques. Syntax directed translation. Symbol tables: organizations for non-block structured languages (unordered/ordered/tree/hash) and block structured languages (stack tables and stack implementations), Runtime storage management: static allocation, dynamic allocation – activation records and their usage, recursive procedures, heap allocation: storage request and release strategies. Parser generators (YACC). Parser construction technique.	15*L* + 4*T*
4.	Semantic analysis: basic concepts, attributed translation, Intermediate codes, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).	3*L* + 2*T*
5.	Code optimization: Introduction, Basic blocks & optimization, Loop optimization, flow graphs analysis, Transformation of basic blocks, Dag representation of basic blocks, Loops in flow graph, Machine Dependent optimization, Peephole optimization.	6*L* + 2*T*
6.	Issues in the design of code generator, a simple code generator, Register allocation & assignment. Error handling: Detection, reporting, recovery and repair,	3*L* + 1*T*

Recommended Books

1.	"Principles of Compiler Design", Alfred Aho and Jeffrey D. Ullman
2.	"Advanced Compiler Design & Implementation", Steven Muchnick
3.	"Lex & yacc", Brown & Levin
4.	"Compiler Design Using C", Holub
5.	"Compiler Principles, Techniques and Tools", Aho, Ullman, Sethi, *Pearson Edu.*
6.	"Compiler Construction", D. M. Dhamdhare, *BPB*

Subject: : CONTROL THEORY
Code : EC 501 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	Introduction: control systems, feedback and its effects, types of feedback control systems, transfer function and signal flow graph, transfer function of linear systems impulse response of linear systems, block diagram, signal formula using block diagram reduction.	6*L* + 1*T*
2.	Time domain analysis: transient response of a single input single output linear feedback control system control system, steady state error, steady state error constants dynamic error constants, proportional derivative and integral control systems.	5*L* + 1*T*
3.	State variable analysis of control system: state representation of systems, solving time invariant state equation, state transition equation and transfer function, state diagram, from state diagram to state transition equation.	5*L* + 2*T*
4.	Stability of control system: characteristic equation, methods of determining linear control systems, Routh-Hurwitz criterion, Nyquist criterion, application of Nyquist criterion, application of Nyquist criterion, effects of addition of poles and zeros of G(s), H(s) on the shape of Nyquist locus.	5*L* + 2*T*
5.	Root locus method: root locus plots, summery of general rules for construction root loci, root locus analysis of control systems.	4*L* + 1*T*
6.	Frequency domain analysis of control systems: frequency domain characteristics, peak response, repose frequency and bandwidth of a second order system, Bode plot, gain margin, phase margin, constant M locus, constant N locus, Nichol's chain.	5*L* + 2*T*
7.	Compensation techniques: lead compensation, lag compensation, lead-lag compensation.	4*L* + 2*T*
8.	Introduction to sample data (S.D.) control system, Digital control system— its transfer function, Zero Order Hold (ZOH) for S.D. control system	2*L* + 1*T*

Recommended Books

1.	"Control System", Nagraj and Gopal

Subject: : ANALOG COMMUNICATION THEORY
Code : EC 502 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Signal Transmission through Linear Systems:** Condition for distortionless transmission of signals through networks. Different types of distortion and their effect on the quality of out put signals. Transmission of transient signals, distortion analysis.	4*L* + 2*T*
2.	**Fourier transform:** Introduction, Existence of F.T. F.T. of some standard signals, properties of F.T., F.T. of a periodic signal, Analysis of Comm. System with F.T. **Amplitude Modulation:** Modulation principle and definitions, spectrum and power considerations, DSB, SSB, VSB and AM principles. Different type of modulator circuits, Square law modulator, Balanced modulator. Different circuits for generation of SSB and VSB. Basic principle of coherent detections. Square law detectors, Average envelope and peak envelope detectors. Carrier recovery.	18*L* + 4*T*
3.	**Frequency and Phase Modulation:** Principles and definitions, Relationship between frequency and phase modulations. Circuit for realization of FM and PM. Different type of demodulator, discriminator, use of PLL etc. Basic block diagram of radio transmitter (AM and FM) , basic block diagram of a radio receiver, Super-heterodyne principle, its advantages. Mixer principle and circuit, AGC.	10*L* + 4*T*
4.	**System Noise:** Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection n, Threshold effect. Signal to noise calculation for FM and threshold.	4*L* + 2*T*

Recommended Books

1.	"Analog & Digital Communication", B.P. Lathi

Subject : OPERATING SYSTEM LAB.
Code : IT 591 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Shell Programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).
2.	Process: starting new process, replacing a process image, duplicating a process image, waiting for a process.
3.	Signal: signal handling, sending signals, signal interface, signal sets.
4.	Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5.	Inter process Communication: pipes (use functions pipe, popen, pclose), named pipes (FIFO, accessing FIFO).

Subject : DATABASE MANAGEMENT SYSTEM LAB.
Code : CS 593 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
Part: A– SQL	
1.	Defining Schema for populating sample databases.
2.	Creating, altering and dropping tables with integrity constraints.
3.	Retrieving and modifying data from a database.
4.	Retrieving data from database using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING clause.
5.	Use of scalar and aggregate functions.
6.	Retrieving data from a database using Join and using sub queries.
7.	Use of views.
Part: B– PL/SQL	
8.	Introduction to PL/SQL.
9.	Use of implicit & explicit cursors in data handling.
10.	Use of stored procedures & functions in data manipulation.
11.	Use of trigger in data manipulation.
12.	Use of host language interface with embedded SQL. Use of forms and report writer packages typically available with RDBMS products.

Recommended Books

1.	"SQL , PL /SQL – The Programming Language of Oracle" , Ivan Bayross , BPB Press
2.	"Oracle PL/SQL Programming", Steven Feuerstein, Shroff Publishers ,Calcutta.

Subject : CONTROL LAB.
Code : EC 591 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Temp. Control System
2.	Liquid level system
3.	Position Control system
4.	Stability analysis by Bode Plot
5.	Stability analysis by Polar plot
6.	Application of root locus technique

Subject : ANALOG COMMUNICATION LAB.
Code : EC 592 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Amplitude modulation,
2.	Frequency modulation
3.	Position Control system
4.	Stability analysis by Bode Plot
5.	Stability analysis by Polar plot
6.	Application of root locus technique

PART -III, 2ND SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 08
		TOTAL SEMESTER CREDITS	: 28

A. THEORETICAL SUBJECTS								
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1	IT 601	Computer Graphics	3	1		4	4
2	IT 602	System Software and Administration	3	1		4	4
3	IT 603	Design and Analysis of Algorithm	3	1		4	4
5	EC 601	Digital Communication	3	1		4	4
4	EI 602	Digital Signal Processing	3	1		4	4
		Total of Theoretical Subjects				20	20
B. SESSIONAL SUBJECTS							
6	IT 691	Computer Graphics Lab			3	3	2
7	IT 692	System Software and Administration Lab			3	3	2
8	EC 691	Digital Communication Lab			3	3	2
9	HU 691	Group Discussion			3	3	2
		Total of Sessional Subjects				12	8
		Total of Semester				32	28

Subject : COMPUTER GRAPHICS
Code : IT 601 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Objectives, applications, implementations, Graphic resolution, Coordinate system, Display Technologies and kinds of display systems, Aspect Ratio, Object and Background, 4-neighborhood and 8-neighborhood, Storing Drawings (and Images) in 2-d Arrays and Files,	3*L* + 1*T*
2.	Points and lines, Digital Straight Line Segments (DSS) - Incremental Algorithm, Scan Line Algorithm by Bresenham. Dashed Lines, Dotted Lines, Thick Lines. Digital Circles, Ellipse - Bresenham Algorithm. Thick Circles, Arcs, Pie Charts (Refer Filling), Curve Drawing - applications. Different Types of Curves and Comparisons. Quadratic & Cubic Curves: Need for Cubic Curves. Conditions for Smooth Curves. Parametric Continuity and Geometric Continuity. Lagrange, Bezier, Hermite, and B-Spline Curves. Basis Matrix and Blending Function. 3-D Surface Generation.	7*L* + 2*T*
3.	Filling Simple Figures, viz. rectangles, triangles, convex polygons, circles, etc. Recursive Flood Fill Algorithm and its Stack-based Improvement. Scan Line Fill Algorithm with IN/OUT Flag. Special Treatment for Vertex, Horizontal Edges, Slivers for Polygons. Scan Line Algorithm with Edge Tables. Filling With Patterns.	6*L* + 2*T*
4.	Clipping a Point, a Line, a Polygon, and Other Figures, w.r.t. a Window. Sutherland-Cohen Line Clipping Algorithm. Parametric Line Clipping Algorithm.	3*L* + 1*T*
5.	2D and 3D Transformations: Translation T, Rotation R, Scaling S. Homogeneous Coordinate System. Rotation about an arbitrary point.	4*L* + 1*T*
6.	Planar Projections: Definitions, Conventions, Applications. Types of Projections and Examples. Parallel vs. Perspective Projections. Orthographic Projections and Multiviews. Isometric Projection. Vanishing Point: 1, 2, 3.	4*L* + 2*T*
7.	Hidden surface removal: Object Precision Algorithm vs. Image Precision Algorithm. Z-buffer Algorithm. Ray Tracing Algorithm. Rendering: Illumination Models and Applications. Lambert's Cosine Law, Attenuation, Specular Reflection. Phong Illumination Model. Goraud Shading (Linear Intensity Interpolation Model). Phong Shading (Normal Vector Interpolation Model).	5*L* + 2*T*
8.	Animation: Applications, Examples, Implementation Techniques, Tweening, Morphing, Color Dissolve. Advanced topics: Detection of Straight Lines from a Point Set Using Hough Transform. Convex Hull: Applications and Algorithms. Fundamental Topics of Image Processing Related with Computer Graphics.	4*L* + 1*T*

Recommended Books

1.	"Computer Graphics (C version 2nd Ed.)", Hearn, Baker, *Pearson Education*
2.	"Schaum's outlines Computer Graphics (2nd Ed.)", Z. Xiang, R. Plastock, *Tata McGraw Hill*
3.	"Mathematical Elements for Computer Graphics (2nd Ed.)", D. F. Rogers, J. A. Adams, *Tata McGraw Hill*
4.	"Fundamentals of Computer graphics & Multimedia", Mukherjee, *PHI*
5.	"Multimedia –A Practical Approach", Sanhker, *Jaico*
6.	"Multimedia Systems", Buford J. K., *Pearson Education*
7.	"Multimedia", Andleigh & Thakrar, *PHI*
8.	"Introduction to Computer Graphics", Mukherjee Arup, *Vikas Publ.*
9.	"Computer Graphics using open GL", Hill, *Pearson Education*
10.	"Computer Graphics principles (2nd Ed.)" Foley, Vandam, Feiner, Hughes, *Pearson Education*
11.	"Principles of Interactive Computer Graphics", W. M. Newman, R. F. Sproull, *Tata McGraw Hill*
12.	"Principles of Interactive Multimedia", Elsom Cook, *McGraw Hill*

Subject : SYSTEM SOFTWARE AND ADMINISTRATION
Code : IT 602 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Assemblers: General design procedures, Algorithm of one pass and two pass assemblers, Data structure and implementation details, relocatable assembler, Cross Assemblers, Macro Processors –Definition, Expansion, macro instruction arguments, conditional macro expansion, macro calls within macros, Data structure and implementation details, A two pass algorithm of Macro Assemblers.	6*L* + 1*T*
2.	Loaders: Compile and go loaders, Bootstrap loader, absolute and relocating loader implementation, Linker: Linking definition, Public and external table, Reallocation- static & dynamic linking, Direct linking loaders, Binders, Overlays, device diverse, monitor programs, dynamic binders, Working principle of Editors: Data Structure and implementation details, Debuggers: Types of error, debugging techniques, debugging aids for low and high level languages.	9*L* + 3*T*
3.	Duties of the Administrator, Administration tools, Overview of permissions. Processes: Process status, Killing processes, process priority. Starting up and Shut down: Peripherals, Kernel loading, Console, The scheduler, init and the init tab file, Run-levels, Run level scripts.	3*L* + 1*T*
4.	Managing User Accounts: Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users. Managing Unix File Systems: Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Boot disks.	4*L* + 1*T*
5.	Configuring the TCP/IP Networking : Kernel Configuration; Mounting the proc File system, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration. TCP/IP Firewall: Methods of Attack, What Is a Firewall? What Is IP Filtering? Setting Up Linux for Firewalling Testing a Firewall Configuration; A Sample Firewall Configuration: IP Accounting, Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IP Accounting Results	7*L* + 3*T*
6.	IP Masquerade and Network Address Translation: Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade Module IV, The Network Information System: Getting Acquainted with NIS, NIS Versus NIS+, The Client Side of NIS, Running an NIS Server, NIS Server Security. Network file system: Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File. System Backup & Recovery: Log files for system and applications; Backup schedules and methods (manual and automated).	7*L* + 3*T*

Recommended Books

1.	"System Software (3rd Ed.)", L. L. Beck, *Pearson Education*
2.	"PC System Programming", Michel Ticher, *Abacus*
3.	" Linux Network Administrator's Guide (2nd Ed.)", Kirch, *O'Rielly*
4.	"Unix System Administration", Maxwell, *Tata McGraw Hill*
5.	"The Practice of System & Network Administration"-, Limoncelli, *Pearson Education*
6.	"LINUX Installation & Administration", Wells, *Vikas Publ.*
7.	"Unix Network Programming, Vol. 1(2nd Ed.)", W. R. Stevens, *Pearson Education/ PHI*
8.	"TCP/IP Illustrated, Vol. 1", W. R. Stevens, *Pearson Education/ PHI*
9.	"Internetworking with TCP/IP, Vol. 1(4th Ed.)", Comer, *Pearson Education/ PHI*

Subject : DESIGN AND ANALYSIS OF ALGORITHM
Code : IT 603 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Models of Computation, Algorithm Analysis, Order Notations, time & Space Complexities, Average & Worst case analysis, Upper & lower Bounds.	6*L* + 2*T*
2.	Algorithm Design Techniques: divide-and-conquer, search & traversals, dynamic programming, backtracking, branch and bound.	6*L* + 2*T*
3.	Sorting & Searching algorithms, Combinatorial algorithms, Algebraic algorithms, Set algorithms, Graph algorithms, Traveling salesperson problem, Hard Problems & Approximation algorithms.	18*L* + 6*T*
4.	Problem Classes: P, NP, NP Hard and NP Complete, Deterministic and Non-deterministic, Polynomial time algorithms, Approximation algorithms for some NP-complete problems.	6*L* + 2*T*

Recommended Books

1.	"Fundamentals of Computer Algorithms", Horowitz E., Sahni S. and Rajasekharan S, *Galgotia Publ. Pvt. Ltd.*
2.	"The Design and Analysis of Algorithms", Aho A., Hopcroft J. And Ullman J., *Pearson Education*.
3.	"Introduction to Algorithms", Corman T., Leiserson C. And Rivest R., *PHI*.

Subject : DIGITAL COMMUNICATION
Code : EC 601 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Pulse code modulation: linear and nonlinear quantization, calculation of quantization errors, inter symbol interference, eye pattern and equalization, delta modulation, calculation of quantization error, limitation of delta modulation – slop overload, adaptive delta modulation, differential PCM, linear predictive encoding.	10*L* + 2*T*
2.	Base band signal receivers, optimum filtering, matched filter, coherent reception, correlation, ASK, PSK, DPSK, FSK and MSK principles, error analysis of coherent detection of PSK and FSK signals, QPSK, MSK principle and system.	8*L* + 1*T*
3.	Time division multiplexing, pulse stuffing and word stuffing, frequency division multiplexing and concept of code division multiplexing.	8*L* + 2*T*
4.	Need for synchronization, bit synchronizer, frame synchronization	4*L* + 1*T*
5.	Fixed equalizer, linear equalizers and decision directed equalizer, partial response signaling.	4*L* + 1*T*
6.	Block codes, definitions, generator and parity check matrix error control capacity, standard array, cyclic codes – description, encoding with an (n-k) stage shift register and (k) stage shift register, syndrome calculation and error detection.	6*L* + 1*T*

Recommended Books

1.	"Analog & Digital Communication", B.P. Lathi
2.	"Digital Communication", A.B. Carlson

Subject: : DIGITAL SIGNAL PROCESSING
Code : EI 602 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Basic elements of digital signal Processing, Concept of frequency in continuous time and discrete time signals, Sampling theorem, Discrete time signals. Discrete time systems, Analysis of Linear time invariant systems, Z-transform, Convolution and correlation.	9*L* + 4*T*
2.	Introduction to DFT, Efficient computation of DFT Properties of DFT, FFT algorithms– Radix-2 and Radix-4 FFT algorithms– Decimation in Time– Decimation in Frequency algorithms.	8*L* + 2*T*
3.	Structure of IIR filter, System Design of Discrete time IIR filter from continuous time filter, IIR filter design by Approximation derivatives– Impulse Invariance– Bilinear transformation– Matched Z-transform, Realization of digital filters– Direct form I– Direct form II– Transposed structure– Cascade form– Parallel form.	9*L* + 3*T*
4.	Symmetric & Antisymmetric FIR filters, Linear phase filter, Fourier series method of designing FIR filter - Windowing technique, Frequency sampling techniques, Structure for FIR systems.	6*L* + 2*T*
5.	Application of DSP – Model of Speech Wave Form, Vocoder.	4*L* + 1*T*

Recommended Books

1.	"Digital Signal Processing Principles, Algorithms and Application", John G Proakis and Dimtris G Manolakis, PHI/Pearson Education.
2.	" Digital Signal Processing", P. Ramesh Babu, Scitech Publication Pvt. Ltd.

Subject : COMPUTER GRAPHICS LAB
Code : IT 691 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Grid: Construct a square grid with origin (0,0) at center of the display screen. Use (0,0,0) as the background color and (200, 200, 200) as the grid color.
2.	In the above show the x-axis and the y-axis with color (0,0,200).
3.	Digital Straight Line
4.	Digital Circle, Ellipse
5.	Cubic Spline
6.	Mini Project on Clipping / Filling / Digital Geometry / 3D Projections / Hidden Surface Removal / Rendering /Illumination / Animation.

Subject : SYSTEM SOFTWARE AND ADMINISTRATION LAB
Code : IT 692 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Packet Monitoring software (TCP dump, snort, ethereal)
2.	Trace route, Ping, Finger, Nmap
3.	Server configuration (FTP, SMTP, DNS)
4.	NFS Configuration
5.	Firewall Configuration using iptables/ipchains (Linux only)
6.	Experiments using Turbo C Assembler
Note: All the above experiments may be performed in both Unix /Linux & Windows	

Subject : DIGITAL COMMUNICATION LAB
Code : EC 691 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	ASK
2.	PSK
3.	FSL
4.	PCM
5.	PAM
6.	ASK

Subject : GROUP DISCUSSION
Code : HU 691 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Discussion Topic will be given in the class.

PART -IV, 1ST SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 10
		TOTAL SEMESTER CREDITS	: 30

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	HU 701	Engineering Economics & Financial Management	3	1		4	4
2.	IT 701	Internetworking	3	1		4	4
3.	IT 702	JAVA Programming and Web Technology	3	1		4	4
4.	IT 703	Multimedia Technology and Application	3	1		4	4
5.	IT 704	Software Engineering	3	1		4	4
		Total of Theoretical Subjects				16	20
B. SESSIONAL SUBJECTS							
6.	IT 791	Internetworking Lab			3	3	2
7.	IT 792	JAVA Programming and Web Technology Lab			3	3	2
8.	IT 793	Multimedia Technology Lab			3	3	2
9.	IT 794	Project			6	6	4
		Total of Sessional Subjects				15	10
		Total of Semester				31	30

Subject : ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT
Code : HU 701 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
Gr.-A : Engineering Economics		
1.	An Introduction of Economics— Definition of Economics; Nature of Economic Problem and Production Possibility Curve; Production— Interaction between Economic Theory and Production; Concepts of Firm, Industry and Economy	2*L* + 0*T*
2.	Demand and Supply Analysis— Demand and its determinants, Demand Function, Law of demand, Demand curve, Factors influencing demand curve, Elasticity of demand; Different concepts of Revenue; Supply and its determinants, Law of supply, Supply Function, Supply curve.	3*L* + 0*T*
3.	Theory of Costs— Classification of cost; Concepts of Total Cost, Average Cost and Marginal Cost.	2*L* + 1*T*
4.	Concepts of Competition and Markets— Introduction to Perfect Competition; Short run and Long run equilibrium under perfect competition; Classification of Market— Monopoly and Oligopoly Markets; Equilibrium under monopoly and oligopoly; Price and output determination under monopoly.	3*L* + 1*T*
5.	Theory of Production— Factors of production; Production Function; Laws of Returns; Returns to Scale; Cobb-Douglas production function and its properties.	3*L* + 2*T*
6.	Product Pricing— Price Leadership model; Average Cost Pricing; Cost-plus or Mark-up Pricing; Marginal Cost Pricing and Variable Cost Pricing.	3*L* + 1*T*
7.	Nature of Indian Economy— Introduction to Indian Economy; Concepts of Public Sector, Privatization and Globalization — Their merits and demerits; Basic concepts of GATT, WTO and TRIPS.	2*L* + 0*T*
Gr.-B : Financial management		
8.	Basic Concept— Meaning and definition of Financial Management; Financial Planning and Capitalization.	2*L* + 0*T*
9.	Financial Statement— Meaning of Financial Analysis— Ratio Analysis	2*L* + 0*T*
10.	Theory of Costs— Classification of cost; Concepts of Total Cost, Average Cost and Marginal Cost.	2*L* + 1*T*
11.	Capital Budgeting— Concept, importance and Process of Capital Budgeting; Nature of Investment Decision— Investment Criterion; Payback period; Accounting and Discounting; Different methods used— Rate of Return method, Fund Flow method, Net Present Value method, Internal Rate of Return method, Cost-Ratio method.	3*L* + 2*T*
12.	Management of Working Capital— Concepts of Working Capital and its management; Importance of Working Capital; Financing and Investment Analysis; Cost of Capital.	3*L* + 1*T*
13.	Budgeting Control Techniques— Concepts of budget, budgeting and budgeting control— its objectives, functions, merits and demerits; Master Budget and Report.	3*L* + 1*T*
14.	Financial Control— Posting of Ledgers and Preparation of Trial Balance; Preparation of Balance Sheet; Preparation of Profit and Loss Accounts; Controlling other departments by Financial Accounting	3*L* + 2*T*

Recommended Books

1.	"Macroeconomics", Paul Samuelson, William Nordhaus, Sudip Chaudhuri, *Tata McGraw Hill*
2.	"Economics for Engineers", T.R. Jain, M.L. Grover, V.K. Ohri and O.P. Khanna, *V.K. Enterprise*
3.	"Engineering Economy", W.G.Sullivan, *Pearson Education*
4.	"Engineering Economics and Costing", S. Mishra, *Prentice Hall India*
5.	"Engineering Economics", R. Panneerselvam, *Prentice Hall India*
6.	"Economics", Campbell McConnell, Stanley Brue, Sean Flynn, *Tata McGraw Hill*
7.	"Microeconomics", D. N. Dwivedi, 2011, *Pearson Education*
8.	"Financial Management Theory and Practice"< Prasanna Chandra, *Tata McGraw Hill*
9.	"Financial Management Text and Problems", Khan and Jain, *Tata McGraw Hill*

Subject : INTERNETWORKING
Code : IT 701 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Introduction**: The need for computer network and Internet, Internet services, Internet protocols and standardization, Review of Network technologies, Wired and Wireless LAN, MAN, WAN	3*L* + 0*T*
2.	**Internetworking Concepts:** Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet, Multiplexing, Transmission Media, Multiple Access	7*L* + 2*T*
3.	**Internet Address:** Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing, IPv_4, IPv_6.	5*L* + 2*T*
4.	**Internet Protocol:** Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).	5*L* + 2*T*
5.	**Routing:** The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.	5*L* + 2*T*
6.	**Enterprise Networking:** Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.	5*L* + 2*T*
7.	**Internet Servers:** DNS, DHCP Servers, FTP, TELNET, E-Mail	3*L* + 1*T*
8.	**Firewall & Networking:** Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.	3*L* + 1*T*

Recommended Books

1.	"Computer Networks and Internets", Douglas E. Comer; *Pearson Edition*.
2.	"Data Communications and Networking (3rd Ed.)", Behrouz A. Forouzan, *Tata McGraw Hill*
3.	"Internetworking with TCP / IP" Douglas E .Comer, *Pearson Edition*.
4.	"TCP/IP protocol suite", Behrouz A. Forouzan, *Tata McGraw Hill*
5.	"The Complete reference of Networking", Craig Zacker, *Tata McGraw Hill*
6.	"Data and Computer Communication (5th Ed.)", William Stallings, *Prentice Hall India*.
7.	"Computer Networks", Andrew S. Tanenbaum, *Prentice Hall India*.

Subject : JAVA PROGRAMMING AND WEB TECHNOLOGY
Code : IT 702 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Object oriented programming in Java:** Object, class, message passing, encapsulation, polymorphism, Inheritance, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages.	

	Java Script: Data types, variables, operators, conditional statements, array object, date object, string object.	15*L* + 4*T*
2.	**Static Web Pages**: 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), HTML different tags, sections, image & pictures, listings, tables, frame, frameset, form. **Dynamic Web Pages:** 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:** Need of active web pages; java applet life cycle.	4*L* + 2*T*
3.	**Java Servlet**: Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions. **JSP:** 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:**An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI. **XML:** Extensible Markup Language (XML), basics of XML, elements and attributes, document type definition, XML parsers, sequential and tree approach.	12*L* + 4*T*
4.	**Applications:** Introduction to .Net, .NET framework, CLR, CTS, CLS, garbage collection, namespace, Introduction VB.NET, C#.NET, ASP.NET. Developing windows program using VB.NET. Developing Web based application using VB.NET and ASP.NET.	5*L* + 2*T*

Recommended Books

1.	"Web Technologies", A. S. Godbole and A. Kahate, *Tata McGraw Hill.*
2.	"Web Technology & Design" C. Xavier, *New Age Int. Publ.*
3.	"Java Server Programming, J2EE edition. (VOL I and VOL II)", *WROX Publ.*
4.	"Win32 API Programming With VB", S.P.D. Roman, *O'Reilly Media, Inc.*
5.	"Learn Microsoft VB 6.0 Now", Halvorson, *PHI/MSP*
6.	"JAVA Server Pages", Hans Bergstein, *O'Reilly Media, Inc.*
7.	"Web Technology & Design", Xavier C., *New Age Int. Publ.*

Subject : MULTIMEDIA TECHNOLOGY AND APPLICATION
Code : IT 703 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	**Introduction**: Multimedia Today, Impact of Multimedia, Multimedia Systems, Evolution of Multimedia Structure and Components of Multimedia, Multimedia Presentation, Applications of Multimedia.	3*L* + 1*T*
2.	**Text**: Types of Text, Aspect of Text Design, Character, Character Set, Unicode, Encryption, Hypermedia.	2*L* + 1*T*
3.	**Audio and Speech**: Basic Sound Concept, Data Acquisition, Digitizing Sound, Computer Representation of Sound, Sampling and Quantization, Audio Formats, Audio Tools, MIDI, Electronic Music and Synthesizer, Human Speech Production Mechanism, Digital Model of Speech Production, Analysis and Synthesis, Low bit rate Speech Compression, MPEG Audio Compression.	5*L* + 2*T*

4.	**Image and Video**: Image Acquisition and Representation, Formats, Image Colour Scheme, Image Enhancement, Image Compression Techniques, JPEG Image Compression Standards, Analogue and Digital Video, Standards- MPEG, H.261, Problem in Transmitting Video Signals, Generation of YC Signal from RGB, Television Broadcasting Standards, MPEG Video Compression Standards, Computer Based Animation, Different Animation Techniques, HDTV.	9*L* + 2*T*
5.	**Storage Models and Access Techniques**: Magnetic Media, Optical Media, Multimedia Devices – CD ROM, CRT, DVD, Scanner, Digital Camera, CCD, Evolution of Compact Disk Technology.	2*L* + 1*T*
6.	**Image and Video Database**: Image representation, Segmentation, Indexing k-d trees, R-trees, Quad trees.	4*L* + 1*T*
7.	**Multimedia Synchronization**: Temporal Dependence in Multimedia Presentation, Inter-object and Intra-object Synchronization, Reference Model and Specification.	3*L* + 1*T*
8.	**Multimedia Document Architecture**: Concept, Open Document Architecture (ODA), MHEG, SGML, Document Type Definition (DTD), HTML, HTML Web Publishing, Open Media Framework.	4*L* + 2*T*
9.	**Multimedia Authoring**: Overview, Authoring Tools, Authoring Language, Authoring Techniques.	4*L* + 2*T*
10.	**Multimedia Applications**: Video-on-Demand, Video Conferencing, Educational Applications, Industrial Applications, Digital Libraries, Media Editors.	2*L* + 1*T*

Recommended Books

1.	"Multimedia: Computing, Communications and applications", Ralf Steinmetz and Klara Nahrstedt, *Pearson Ed.*
2.	"Multimedia", Ranjan Parekh, *Tata McGraw Hill.*
3.	"Multimedia Communications", Fred Harshall, *Pearson Ed.*
4.	"Multimedia Fundamentals: vol. 1, Media Coding and Content Processing", Ralf Steinmetz and Klara Nahrstedt, *Prentice Hall India*.
5.	"Multimedia System Design", Prabhat K. Andleigh and Kiran Thakrar, *Prentice Hall India*.
6.	"Introduction to Data Compression", K. Sayood, *Morgan-Kaufmann*.

Subject : SOFTWARE ENGINEERING
Code : IT 704 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to Software Engineering: Objective and Scope of Software Engineering, Introduction to System, Software Definition, Characteristics of Software, Evolution of Software, Software Quality, Software Problems, Software Engineering Definition, Software Engineering Problem, Software Development Methodologies;	6*L* + 2*T*
2.	Software Process: Introduction to Software Process, Components of Software Process, Characteristics of Software Process, Software Development Process, Software Development Models, Project Management Process, Software Configuration Management Process, Process Management Process;	7*L* + 2*T*
3.	Object Oriented Modeling & Design: Object Modeling, Dynamic Modeling, Functional Modeling, Object Oriented Design Methodology;	2*L* + 1*T*
4.	Software Requirements Analysis: Introduction, Problem Analysis, Data Flow Diagram, Use-Case Diagram, Requirement Specifications, Requirement Validation, Metrics;	2*L* + 1*T*
5.	Planning a Project: Cost Estimation, Project Scheduling, Staffing and Personnel Planning, SCM Plans, Quality Assurance Plans, Project Monitoring Plans, Risk Management;	6*L* + 2*T*
6.	Designing a Project: Introduction, Function-Oriented Design, Object-Oriented Design, Detailed Design, Design Validation and Verification, Metrics;	5*L* + 2*T*

7.	Coding: Coding Process, Structured Programming, Programming Principles and Guidelines, Common Programming Errors, Metrics;	2*L* + 1*T*
8.	Testing: Testing Fundamentals, Types of Testing, Levels of Testing, Test Plans, Test-Cases and Test Scripts.	2*L* + 1*T*

Recommended Books

1.	"An Integrated Approach to Software Engineering", Pankaj Jalote, *Narosa Publishing House*
2.	"Software Engineering", R.G. Pressman, *Tata McGraw Hill*
3.	"Software Engineering Fundamentals", Behforooz, *Oxford Univ. Press*
4.	"Fundamentals of Software Engineering" C. Ghezzi, M. Jazayeri and D. Mandrioli, *Prentice Hall India.*
5.	"Software Engineering", I. SomerVille, *Pearson Education*

Subject : INTERNETWORKING LAB.
Code : IT 791 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Implementation of protocols (eg. Sliding window, Go-back-N etc. using rmi / TCP/UDP socket Programming).
2.	Implementation of Routing algorithms (eg. Flooding, Distance-vector Routing, Linkstate Routing etc.).
3.	Configuration of DNS, DHCP, FTP.
4.	Implementation of firewall & proxy server (Winproxy)/ SQUID.
5.	Configuration of firewall.
6.	Telnet connection and chatting between two clients.
7.	Web server configuration and Host (PWS/IIS4).
8.	Control of access privilege in server.
9.	Browser configuration

Subject : JAVA PROGRAMMING AND WEB TECHNOLOGY LAB.
Code : IT 792 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Assignments on developing interfaces- multiple inheritances, extending interfaces
2.	Assignments on creating and accessing packages
3.	Assignments on multithreaded programming, handling errors and exceptions, and graphics programming
4.	Web Programming languages such as JAVA, ASP, JSP
5.	Basic use of html tag, linking image table, frame, form design.
6.	DHTML- inline styles, creating style sheets with the style element, linking external style sheet, Positioning elements, user style sheet.
7.	Creating event handler that respond to mouse and keyboard event: On load, on mouse over, on

	mouse out, on focus, on blur, on submit, on result, on click, on change.
8.	Structuring data with xml, xml parser, extensible style language (xsl); customizing markup language.
9.	Configuring apache-tomcat server.
10.	Building simple JSP: Declaring variables and methods in JSP, inserting java expression in JSP,
11.	Processing request from user, generating dynamic response for the user. Accessing database from JSP, inserting applet into JSP.
12.	Development of Web site
13.	Creation of Dynamic Web Pages using different tools
14.	Development of an experimental search engine

Subject : Multimedia Lab.
Code : IT 793 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	**Details of the lesson**
1.	Configuring a windows workstation to play CD-audio and CD-video (Quick time and MPEG-4)
2.	Exercises on Hands on experience on sound capture (from microphone and CD) and editing using software tools.
3.	Exercises on image editing.
4.	Exercises on editing of motion Video/animation clips (using Adobe Premiere)
5.	Multimedia content creation exercises using Authoring tools.

PART -IV, 2ND SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 10
		TOTAL SEMESTER CREDITS	: 30

A. THEORETICAL SUBJECTS								
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1	IT 801	Image Processing	3	1		4	4
2	IT 802	Distributed Computing	3	1		4	4
3	IT 803	Elective – I (IT 803A/ IT 803B/ IT 803C/ IT 803D/ IT 803E)	3	1		4	4
4	IT 804	Elective – II (IT 804A/ IT 804B/ IT 804C/ IT 804D/ IT 804E)	3	1		4	4
		Total of Theoretical Subjects				16	16
B. SESSIONAL SUBJECTS							
5	IT 891	Image Processing Lab			3	3	2
6	IT 892	Elective – I Lab (IT 892A/ IT 892B/ IT 892C/ IT 892D/ IT 892E)			4	2	1
7	IT 894	Grand Viva			–	–	2
8	IT 895	Project with Presentation and Interaction			9	9	6
		Total of Sessional Subjects				16	12
		Total of Semester				32	28

Elective – I	Elective – II
IT 803A: Soft Computing	IT 804A: Mobile Computing
IT 803B: Artificial Intelligence	IT 804B: VLSI Design
IT 803C: Bioinformatics	IT 804C: Real Time and Embedded System
IT 803D: E-Commerce	IT 804D: Parallel Processing

Subject : IMAGE PROCESSING
Code : IT 801 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Digital Image Fundamentals:** A simple image model, Sampling and Quantization, Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images, Image processing steps.	3*L* + 0*T*
2.	**Bilevel Image Processing:** Neighbour of pixels. Basic concepts of digital distances, distance transform, medial axis transform, component labeling, thinning, morpho-logical processing, extension to grey scale morphology.	5*L* + 1*T*
3.	**Binarization and Segmentation of Grey level images:** Histogram of grey level images, Optimal thresholding using Bayesian classification, multilevel thresholding, Segmentation of grey level images, Water shade algorithm for segmenting grey level image. Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	7*L* + 2*T*
4.	**Detection of edges and lines in 2D images:** First order and second order edge operators, multi-scale edge detection, Canny's edge detection algorithm, Hough transform for detecting lines and curves, edge linking.	5*L* + 2*T*
5.	**Images Enhancement:** Point processing, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing, Smoothing - Image Averaging, Spatial Filtering, Frequency domain filtering, multispectral image enhancement, image restoration.	5*L* + 2*T*
6.	**Color Image Processing:** Color Representation, Laws of color matching, chromaticity diagram, color enhancement, color image segmentation, color edge detection. Processing based on Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform	5*L* + 2*T*
7.	**Image compression:** Lossy and lossless compression schemes, prediction based compression schemes, vector quantization, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme.	3*L* + 1*T*
8.	**Image Registration and depth estimation:** Registration Algorithms, Stereo Imaging, Computation of disparity map.	3*L* + 1*T*

Recommended Books

1.	"Digital Image Processing", Gonzalez and Woods, *Prentice-Hall India*.
2.	"Digital Image Processing and Analysis", B. Chanda and D. Dutta Majumder, *Prentice-Hall India*.

Subject : DISTRIBUTED COMPUTING
Code : IT 802 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Fundamentals: Introduction, Models and Features, Concept of distributed operating system, Issues in design of a distributed operating system.	2*L* + 1*T*
2.	Message Passing: Good message passing system, IPC, Synchronization, Buffering, Multi datagram messages, Encoding & decoding techniques, Process addressing, Failure handling, Group communication; Remote procedure calls (RPC) - Models, Communication protocols, RPC, Lightweight RPC.	6*L* + 2*T*
3.	Client/Server Computing: Socket for Client/Server communication, The socket API background, The metaphor in IPC, The datagram socket API- the connectionless datagram socket API, the connection oriented datagram socket API, The stream mode socket API,	3*L* + 1*T*

	Socket with non-blocking I/O operation, Secure socket API.	
4.	Distributed Shared Memory: Architecture, Thrashing, Granularity, Advantages.	3*L* + 1*T*
5.	Synchronization: Introduction, Clock Synchronization, Event handling, Mutual Exclusion; Deadlock – Conditions, Avoidance, Prevention, Recovery.	3*L* + 1*T*
6.	Resource & process Management Features of a good scheduling algorithm, Task assignment approach, Load balancing & load sharing approach, Introduction to process management, Process migration, Threads.	6*L* + 2*T*
7.	Distributed Files Systems: Introduction, Features, Models, Accessing models; sharing Semantics & caching schemes, replication, Fault Tolerance, Atomic transactions.	6*L* + 2*T*
8.	Naming: Introduction, Features, Fundamental Terminologies & concepts, System oriented names, Human oriented names, Name caches.	4*L* + 1*T*
9.	Security: Potential attacks to computer system, Cryptography, Authentication, digital signatures, Access Control.	3*L* + 1*T*

Recommended Books

1.	"Distributed Operating Systems, Concepts & Design", Sinha Pradeep K., *PHI*
2.	"Distributed Operating System", Tanenbaum Andrews, *Pearson Educatuion*
3.	"Distributed Systems, Concepts & Design", Coulouris George, Dollimore Jean, Kindberg Tim, *Pearson Educatuion*
4.	"Operating System Concepts (5th Edition)", Silberschatz Galvin, *John Wiley*.
5.	"Distributed Computing, Principles and Applications", Liu M.L., *Pearson Educatuion*.

Subject : Elective – I SOFT COMPUTING
Code : IT 803A **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	**Genetic Algorithm:** Genetic algorithms(GAs),Evolution strategies(ESs), Evolutionary programming(EP), Genetic Programming(GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models, constrain handling, multi-objective and multimodal optimization.	9*L* + 3*T*
2.	**Fuzzy Logic:** Introduction to Fuzzy Logic, Classical and Fuzzy Sets, Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets, Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy rule based systems, Fuzzy control systems.	9*L* + 3*T*
3.	**Neural Networks:** History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms: Supervised, Unsupervised and reinforcement Learning, ANN training Algorithm perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonen self organizing networks, Hebbian learning, Hopfield Networks, Feed forward and feedback networks.	8*L* + 3*T*
4.	**Advanced Topics in Soft Computing:** Discussion and Overview	2*L* + 0*T*
5.	**Applications:** Overview of different application areas of Soft computing in engineering, science, business, economics, biology, robotics, hardware	8*L* + 3*T*

Recommended Books

1.	"Neuro-Fuzzy and Soft computing", Jang, Sun, Mizutani, *Pearson Education*
2.	"Neural networks: a comprehensive foundation", Haykin, *Pearson Education*
3.	"Genetic Algorithms", Goldberg, *Pearson Education*
4.	"Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, *Prentice Hall India*.
5.	"An Introduction to Neural Networks", Anderson J.A., *Prentice Hall India*..
6.	"Principle of Soft Computing", 2nd edition, S. N. Sivanandam, S. N. Deepa, *Wiley India*

Subject : Elective – I ARTIFICIAL INTELLIGENCE
Code : IT 803B **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Introduction**: Overview of AI, Problems of AI, AI techniques; Problem Solving - Problem space and search, Defining the problem as state space search, Problem characteristics; Tic-Tac-Toe problem.	2*L* + 0*T*
2.	**AI languages**: Basic knowledge of programming languages like Prolog and Lisp.	4*L* + 1*T*
3.	**Basic Search Techniques**: Solving problems by searching; Uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing search strategies in terms of complexity.	4*L* + 2*T*
4.	**Special Search Techniques** [6L] : Heuristic Search- greedy best-first search, A* search; Hill climbing search, Simulated annealing search; Genetic algorithms; Constraint satisfaction problems; Adversarial search - Games, Optimal decisions and strategies in games, Minimax search, Alpha-beta pruning.	6*L* + 2*T*
5.	**Symbolic Logic**: Syntax and semantics for propositional logic, Syntax and semantics of FOPL, Properties of WFF, Clausal form, Unification, Resolution.	5*L* + 0*T*
6.	**Reasoning Under Inconsistencies and Uncertainties**: Non-monotonic reasoning, Truth maintenance systems, Default reasoning & closed world assumption, Predicate completion and circumscription, Fuzzy logic.	3*L* + 0*T*
7.	**Probabilistic Reasoning**: Bayesian probabilistic inference, Representation of knowledge in uncertain domain, Semantics of Bayesian networks, Dempster-Shafer theory.	3*L* + 0*T*
8.	**Structured Knowledge**: Associative networks, Conceptual graphs, Frame structures.	4*L* + 0*T*
9.	**Expert Systems**: Rule based systems, Nonproduction systems: decision tree architectures, blackboard system architectures, neural network architectures.	4*L* + 0*T*
10.	**Learning**: Types of learning, general learning model, Learning by induction: generalization, specialization; example of inductive learner.	4*L* + 0*T*

Recommended Books

1.	"Artificial Intelligence", Ritch & Knight, *TMH*
2.	"Introduction to AI & Expert Systems", Patterson, *PHI*
3.	Artificial Intelligence: A Modern Approach, Russel and Norvig, *PE*
4.	Logic & Prolog Programming, Saroj Kaushik, *New Age*

Subject : Elective – I BIO-INFORMATICS
Code : IT 803C **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Introduction to Genomic data and Data Organization:** Sequence Data Banks - Introduction to sequence date banks -protein sequence data bank. NBFR-PIR, SWISSPROT, Signal peptide data bank, Nucleic acid sequence data bank -GenBank, EMBL nucleotide sequence data bank, AIDS virus sequence data bank. RRNA data bank, structural databanks - protein Data Bank (PDB), The Cambridge Structural Database (CSD) : Genome data bank - Metabolic pathway data: Microbial and Cellular Data Banks.	9*L* + 3*T*
2.	**Introduction to MSDN (Microbial Strain Data Network):** Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; other important Data banks in the area of	9*L* + 3*T*

	Biotechnology/life sciences/biodiversity. Sequence analysis: Analysis Tools for Sequence Data Banks; Pair wise alignment -NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to analyze sequence data: Sequence patterns motifs and profiles.	
3.	Secondary Structure predictions; prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking. Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking.	9*L* + 3*T*
4.	Applications in Biotechnology: Protein classifications, Fold libraries, Protein structure prediction: Fold recognition (threading), Protein structure predictions: Comparative modeling (Homology), Advanced topics: Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.	9*L* + 3*T*

Recommended Books

1.	"Introduction to Bio Informatics", Lesk, *OUP*
2.	"Introduction to Bioinformatics", Atwood, *Pearson Education*
3.	"Developing Bioinformatics Computer Skills", Cynthia Gibas and Per Jambeck, 2001 *SPD*
4.	"Statistical Methods in Bioinformatics", *Springer India*
5.	"Beginning Perl for Bio-informatics", Tisdall, *SPD*
6.	"Biocomputing: Informatics and Genome Project", Smith, D.W., 1994, *Academic Press, NY*
7.	"Bioinformatics: A practical Guide to the Analysis of Genes and Proteins", Baxevanis, A.D., Quellette, B.F.F.,*John Wiely & Sons*.
8.	"Bioinfornmatics", CSV Murty , *Himalaya*.

Subject : Elective – I E-COMMERCE
Code : IT 803D **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	Introduction to E-Commerce: Definition, Scope of E-Commerce, Hardware requirements, Ecommerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.	6*L* + 1*T*
2.	Business to Business E-Commerce: Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.	7*L* + 2*T*
3.	Legal issues: Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract	5*L* + 1*T*
4.	Security Issues: Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security	6*L* + 1*T*
5.	Business to Consumer E-Commerce: Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.	8*L* + 2*T*
6.	E-business: Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet	7*L* + 2*T*

Recommended Books

1.	"E-Commerce-Strategy, Technologies & Applications", David Whitley, *TMH*
2.	"E-Commerce- The cutting edge of business", Kamlesh K. Bajaj, *TMH*
3.	"E-Commerce through ASP", W Clarke, *BPB*
4.	"Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS", Mathew Reynolds, *Wrox Publishers*
5.	"Global Electronic Commerce- Theory and Case Studies", J. Christopher Westland and Theodore H. K Clark, *University Press*

Subject : Elective – II MOBILE COMPUTING
Code : IT 804A **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Cellular Network:** Introduction, Personal Communications Services (PCS) Architecture, GSM Architecture, Mobility management, GPRS Architecture, GPRS Network Nodes. Frequency reuse, Cell design, Cellular architecture, Channel assignment, Hand offs, Location tracking, Load balancing, Query Processing.	15*L* + 4*T*
2.	**Wireless LAN:** Overview, Infrared LAN, Spread-spectrum LAN, Narrowband Microwave LAN, IEEE 802.11 protocol architecture, WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Medium Access Control, Physical layer. The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	10*L* + 4*T*
3.	**Infrastructured–less Network:** Mobile Ad-Hoc Network (MANET): Architecture, Self organization, Precomputed routing protocol, on-demand routing protocol, location assisted routing protocol.	6*L* + 2*T*
4.	**Sensor Network:** Overview, application areas, Sensor nodes, Architecture Data Aggregation, routing.	5*L* + 2*T*

Recommended Books

1.	"Pervasive Computing", Burkhardt, *Pearson Education*
2.	"Mobile Communication", J. Schiller, *Pearson Education*
3.	"Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, *John Wiley & Sons, 2001*
4.	"Mobile and Personal Communication systems and services", Raj Pandya, *Prentice Hall of India, 2001.*
5.	"Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, *Vikas Publishing House, 2001*
6.	"Wireless Web Development", Ray Rischpater, *Springer Publishing*
7.	"The Wireless Application Protocol", Sandeep Singhal, *Pearson Education*
8.	"Third Generation Mobile Telecommunication systems", by P.Stavronlakis, *Springer Publishers*

Subject : Elective – II VLSI DESIGN
Code : IT 804B **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Issues and challenges in Digital IC Design: general overview of design hierarchy, layers of abstraction, integration density and Moore's law. VLSI design styles, MOSFET fabrication: basic steps of fabrication, CMOS p-well processes, layout design rules, Bi-CMOS fabrication process; Latch-up immune designs;	7*L* + 2*T*
2.	CMOS Inverter: MOS device model with sub-micron effects, VTC parameter (DC characteristics), CMOS propagation delay, Parasitic capacitance estimation, Layout of an inverter Switching, Short-circuit and leakage Components of Energy and Power;	7*L* + 2*T*
3.	Interconnects: Resistance, "Capacitance Estimation, delays, Buffer chains, Low swing drivers, Power distribution, and performance optimization of digital circuits by logical effort sizing:	6*L* + 2*T*
4.	Combinational logic design: Static CMOS construction, Ratioed logic, Pass transistor, Transmission gate logic, DCVSL, Dynamic logic design considerations, Noise considerations in dynamic design, Power dissipation in CMOS logic, and multipliers (serial	6*L* + 2*T*

	– parallel, Booth's and systolic array multipliers:	
5.	Semiconductor memories: non-volatile and volatile memory devices, flash memories, SRAM cell design, Differential sense amplifiers, DRAM design,	5*L* + 2*T*
6.	Single ended sense amplifier: Testing in VLSI: Defects, Fault models, Path sensitization, Scan, Built-in-self Test (BIST), IDDQ	5*L* + 2*T*

Recommended Books

1.	"CMOS VLSI Design: A Circuits And Systems Perspective", Neil H. E. Weste, David Harris, Ayan Banerjee, *Pearson Education*
2.	"VLSI Technology", Sze S M, *Tata McGraw-Hill*
3.	"Basic VLSI Design", Pucknell A Douglas, Eshraghian Kamran, *Prentice Hall India*
4.	"Microelectronics", Jacob Millman, Arvin Grabel , *Tata Mc Graw Hill*
5.	"Fundamentals Of Microelectronics", Behzad Razavi, *Willey*

Subject : Elective – II REAL TIME AND EMBEDDED SYSTEM
Code : IT 804C **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Introduction:** Defining real time systems, Embedded Real time systems, Special characteristic of real time systems, A brief evolutionary history.	3*L* + 1*T*
2.	**Hardware Architecture of Real time system.**	3*L* + 1*T*
3.	**Software Architecture:** Concepts of interrupt driven activation, Need for real time monitor, Pseudo parallelism.	3*L* + 0*T*
4.	**System Development life cycle:** Characteristics of Real Time Software Design Methodology and life cycle, Specifying real time systems.	3*L* + 1*T*
5.	**Overview of Ward & Mellor methodology:** Ward & Mellor life cycle. The essential model step, The implementation model, Real time extensions to DFD.	3*L* + 1*T*
6.	**Environment model:** Contest diagram, disambiguation of transformation Schema, Leveling and balancing of schema. Describing the data Schema. Describing the Data transform and control transforms, State transition diagrams.	5*L* + 2*T*
7.	**Implementation Model steps:** Processor Environment model, software environment model, Code organization model, Translating STD's to structure Chart, Translating Data Transform based schemas to structure charts.	4*L* + 1*T*
8.	**Developing, testing and evaluation of real time systems**, Real time programming language issues and ADA.	2*L* + 1*T*
9.	**Real time O/S**: (facilities. UNIX/VENIX/POSIX. IRMX - historical reasons. Concepts of processes and threads. Communication among processes, Kernel services)	3*L* + 1*T*
10.	**Development systems**.	2*L* + 1*T*
11.	**External World Interfacing Issues**.	2*L* + 1*T*
12.	**Case Studies**: An automobile painting/welding Robot controller.	3*L* + 1*T*

Recommended Books

1.	"Computers as Components - Principles of Embedded Computer System Design", Wayne Wolf, *Morgan Kaufmann Publisher, 2006.*
2.	"An Embedded Software Primer", David E-Simon, Pearson Education, 2007.
3.	"Embedded Real-Time Systems: Concepts, Design & Programming", K.V.K.K.Prasad, *Dreamtech Press, 2005.*
4.	"An Introduction to the Design of Small Scale Embedded Systems", Tim Wilmshurst, *Pal Grave Publisher, 2004.*
5.	"Embedded Real Time Systems Programming", Sriram V Iyer, Pankaj Gupta, *Tata McGraw Hill, 2004.*
6.	"Embedded Systems Architecture", Tammy Noergaard, *Elsevier ,2006.*

Subject : Elective – II PARALLEL PROCESSING
Code : IT 804D **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Parallel Processing Architecture: Models of parallel computer design Processor Arrays Multiprocessors, Multicomputer	7*L* + 2*T*
2.	Pram Model: Concepts, Algorithms (e.g. Prefix sum, Preorder tree traversal, merging),	7*L* + 2*T*
3.	Introduction to parallel programming languages –Basic concepts and methodology	6*L* + 2*T*
4.	Parallel Computing Algorithms – (To be explained for different platforms):Summation, Matrix Multiplication, Linear systems Solving, Graph Algorithm, Fast Fourier Transform.	6*L* + 2*T*
5.	Parallel virtual Machine –Concepts, Case study, Using examples	
6.	Comparison with Message passing Interface (MPI).	

Recommended Books

1.	" Parallel Computing-Theory and Practice", Quinm , Michael J , *TMH*
2.	"PVM: User"s Guide", *PVM Press*
3.	"Scalable Parallel Computing", Kai Hwang & Zhiwei Xu. *Mcgraw Hill*

Subject : IMAGE PROCESSING LAB
Code : IT 891 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Enhancement techniques for digital image enhancement
2.	All types of Filter implementation in spatial and frequency domain
3.	Implementation of Hough Transform for edge linking
4.	Data compression techniques

Subject : Elective – I Lab: SOFT COMPUTING LAB
Code : IT 892A **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Implement GA for the suitable problem
2.	Assignment on Fuzzy applications
3.	Assignment on Neural Network applications
4.	Assignment on Advanced topics in Soft Computing.

Subject : Elective – I Lab: E- COMMERCE LAB
Code : IT 892D **Subject Category: Sessional**
Full Marks : 50
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Assignments on Designing and maintaining WebPages. Advertising in the Website, Portals.
2.	Assignments on E-Commerce Interaction
3.	Assignment on E-Commerce Applications like Online Store, Online Banking, Credit Card Transaction Processing.
Note: E-Commerce experiments are to be implemented using either VB, ASP, SQL or JAVA, JSP, SQL.	

Recommended Books

1.	"Professional Java Server Programming J2EE 1.3 Edition", Allamaraj

Subject : Elective – II Lab: MOBILE COMPUTING LAB
Code : IT 893A **Subject Category: Sessional**
Full Marks : 50
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Assignment on Channel assignment.
2.	Assignment on mobility and hand offs management.
3.	Assignment on protocol design for mobile.

Subject : Elective – II Lab : VLSI LAB
Code : IT 893B **Subject Category: Sessional**
Full Marks : 50
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Programming practice on hardware definition languages (HDL) like VHDL, Verilog etc
2.	To design different digital subsystem. Simulation of MOS circuits using SPICE, design of TPG and fault simulator.
3.	Familiarization of VLSI CAD tools.