# Department of Information Technology

## Course Structure and Syllabus for 2nd Year / 3rd Semester (Autonomy) B. Tech. in Information Technology

| SL. NO. | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| THEORY | | | | | | | |
| 01. | HS303 | ECONOMICS FOR ENGINEERS & FINANCIAL MANAGEMENT | 3 | 0 | 0 | 3 | 3 |
| 02. | BS(IT)306 | PROBABILITY AND STATISTICS | 3 | 1 | 0 | 4 | 3 |
| 03. | IT 301 | NUMERICAL METHODS | 3 | 1 | 0 | 4 | 3 |
| 04. | IT302 | COMPUTER ORGANIZATION | 3 | 1 | 0 | 4 | 3 |
| 05. | IT303 | DATA STRUCTURE & ALGORITHM | 3 | 1 | 0 | 4 | 3 |
| PRACTICAL | | | | | | | |
| 06. | IT391 | NUMERICAL METHODS LAB | 0 | 0 | 3 | 3 | 2 |
| 07. | IT392 | COMPUTER ORGANIZATION LAB | 0 | 0 | 3 | 3 | 2 |
| 08. | IT393 | DATA STRUCTURE LAB | 0 | 0 | 3 | 3 | 2 |
| 09 | IT394 | SOFTWARE LAB - I | 0 | 0 | 3 | 3 | 2 |
| | | **TOTAL** | **15** | **4** | **12** | **31** | **23** |
| 10. | MC303 | VALUE EDUCATION & HUMAN RIGHTS | 3 | 0 | 0 | 3 | 3 |

**Subject Name: Economics for Engineers & Financial Management**
**Code: HS-303**
**Contacts: 3L**
**Credits: 3**

## Module-I

**Making Economic Decision**: The Role of Engineering Economic Analysis, The Decision Making Process: **Engineering Cost and Cost Estimation**: Fixed, Variable ,Marginal, Average Cost, sunk- cost, opportunity cost, Recurring and Non-recurring cost, Incremental cost, Cash Cost versus Book Cost and Life cycle Cost, Cost Estimating: its various Types, Benefits and Difficulties in estimation, Cash Flow Diagram, Estimating Models: Per-Unit ,Segmenting ,Cost Indexes ,Power Sizing, Improvement and The Learning Curve

**Cash Flow, Interest and Equivalence**: Computing Cash Flows, Time Value of Money and Equivalence , Uniform Series compound Interest Formulas, Single Payment, Uniform Series, Arithmetic Gradient, Nominal and Effective Interest.

## Module-II

**Present Worth Analysis**: End of Year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Concept, Effect of Inflation & Deflation, Taxes, Economic Criteria Application of Present Worth Technique

**Cash Flow & Rate of Return Analysis**: Calculation, Treatment of Salvage Value Annual Cash Flow Calculation , Analysis Period, Internal Rate of Return ,Incremental Analysis ,Best Alternative Choosing An Analysis Method , Future Worth Analysis ,Benefit-Cost Ratio Analysis, Sensitivity and Break-even Analysis, Payback Period Incremental Analysis, Comparison of Mutually Exclusive Alternatives, Incremental Challenger-Defender Comparison

## Module-III

**Depreciation and Replacement Analysis:** Basic aspect of Depreciation and Capital Allowance Methods, Replacement Analysis Design Map, Minimum cost Life of A New Asset, Marginal Cost , Minimum Cost Life Problem Natural Resources , Allowances and Depletion

**Inflation and Price change**: Definition, Effects, Causes, Price Change With Indexes, Type of Indexes, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis
**Financial Management:** Introduction, Scope of Finance, Objectives & Goal,
Financial Decision, Financial Planning and Capitalization: Definition, Objectives, Changing Roles and functions of Financial Manager.

**Capital Budgeting**: Nature of Investment Decision, Importance of Capital Budgeting, The Capital Budgeting Process-Investment Criterion, Payback, Rate of Return (ROR)Method, Discounting Cash Flow Method, NPV,IRR, The Benefit-Cost Ratio Method

**Module-IV**

**Management of Working Capital**: Financing and importance of Working capital Investment Analysis, Cash Flow determination cost of capital, Capital Budgeting method

**Cost-Volume-Profit Analysis**: Classification of costs, Allocation, Apportionment ,Absorption, Cost Centers Different Costing systems, Cost analysis for Managerial decisions, Meaning of Linear CVP analysis Objectives, Assumptions Break-Even Analysis, Determining of Break Even point profit Volume Graph Profit, Volume ratio margin of safety

**Financial Control**: Posting of Ledgers and preparation of Trial Balance,
Preparation of balance Sheet and Profit and loss Accounts, Controlling of other Financial Accounting

***Readings***


1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. *Van Home,PE- Fundementals of Financial Management-*
*8. I.M. Pandey -Financial Management: ,Vikas*
*9 Khan &Jain-Financial Management, ,TMH*


**Subject Name: PROBABILITY AND STATISTICS**
**Code: BS(CS)306**
**Contacts: 3L +IT = 4**
**Credits: 3**

**Module I - Theory of Probability: [8 L]**

One dimensional random variable. Probability distributions-discrete and continuous. Expectation. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems. t, $\chi^2$ and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.

**Module II – Two Dimensional Distribution: [6 L]**

Two dimensional probability distributions. Discrete and continuous distributions in two dimensions. Uniform distribution and two dimensional normal distribution. Joint, marginal and conditional distributions .

**Module III - Sampling theory: [6 L]**

Random sampling: Parameter, Statistic and its Sampling distribution. Standard error of statistic. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems. Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal). Confidence intervals and related problems.

**Module IV - Testing of Hypothesis: [8 L]**

Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions. $\chi^2$ - test for goodness of fit.

Neyman-Pearson theorem (Statement only) and its application to normal population. Likelihood ratio testing and its application to normal population. Comparison of Binomial Populations; Normal Populations; Testing of Equality of Means;

**Module V - Linear Inference and Multivariate Analysis:** [8L]

Multiple Regression analysis, linear regression, curvilinear regression and orthogonal polynomials, discriminant analysis, canonical correlations, principal component analysis.

Text Books:


1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur & Sons.
2. De S.K. and Sen S.: Mathematical Statistics, U.N. Dhur & Sons.
3. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
4. Das N.G.: Statistical Methods, TMH.
5. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.
6. Multivariate Data Analysis: Joseph F. Hair, Rolph E. Anderson , Prentice Hall Higher Education, 2010.
7. Applied Multivariate Statistical Analysis: R. A. Johnson and D.W. Wichern, PHI.
8. Fundamentals of Statistics (Vol-1) ; A.M. Gun, M.K. Gupta and B. Dasgupta, World Press.
9. Probability and Statistics; D. Biswas, New Central Book Agency.
10. Probability, Statistics and Random Processes; T Veerarajan, Tata McGraw-Hill.


**NUMERICAL METHODS**

Code: CS301

**Contacts: 3L +1T = 4**

**Credits: 3**

**Approximation in numerical computation:** Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4)

**Interpolation:** Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. Central difference interpolation formula – Stirling and Bessels interpolation. Cubic Spline interpolation. (8)

**Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. Weddle's rule , Gaussian Quadrature. (3)

**Numerical solution of a system of linear equations:**
Gauss elimination method, Gauss Jordan method, Gauss-Seidel iterative method, LU Factorization method
(6)

**Numerical solution of Algebraic equation:**
Bisection method, Secant method , Regula-Falsi method, Newton-Raphson method. Order of convergence of the iterative methods.(4)

**Numerical solution of ordinary differential equation:**
Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6)

**Numerical solution of partial differential equation:**
Finite difference methods, Implicit and explicit schemes. (5)

**Text Books:**
1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
5. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
6. Balagurusamy: Numerical Methods, Scitech.

**References:**
1. Atkinson, Kendall E. Elementary Numerical Analysis New York, NY: John Wiley
2. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
3. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
4. Srimanta Pal: Numerical Methods, OUP.
5. Stoer, J. and Bulirsch, R. Introduction to Numerical Analysis New York, NY: Springer-Verlag,
6. Conte, Samuel D. and de Boor, Carl. Elementary Numerical Analysis: An Algorithmic Approach, New York, NY: McGraw-Hill,

## Subject Name: Computer organization

**Code: IT 302**
**Contacts: 3L + 1T = 4**
**Credits: 3**

### Module - 1: [6L]

Binary numbers & Boolean algebra , Venn diagram, Logic gates, Truth Tables and function minimization using algebraic method, Karnaugh map, Quine- Mcclusky method
BCD, ASCII, EBDIC, Gray codes and their conversions, Signed binary number representation with 1's and 2's complement methods, Maxterm, Minterm, Representation in SOPand POS

forms ; Realization of Boolean functions using NAND/NOR gates, two-level and multi-level logic circuit synthesis

**Module - 2: [10L]**
Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and checker
Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO,SIPO,PIPO,PISO) ,Ring counter, Johnson counter , Synchronous and Asynchronous counters ,Design of Mod N synchronous and ripple Counter , finite-state machine model, synthesis of synchronous sequential circuits, minimization and state assignment.

**Module – 3: [4L]**
A/D and D/A conversion techniques – Basic concepts : D/A : R-2-R,weighted register [2L]
A/D: successive approximation, Flash type [2L]

**Module – 4: [3L]**
**Introduction**
History of computing, von Neumann machine, Instruction and data, fixedpoint and floating-point numbers, errors, IEEE standards

**Module – 5: [7L]**
**Processor design:**
Instruction Set Architecture - Instruction format, opcode optimization; operand addressing; Instruction implementation - data movement, branch control, logical, Input/output and debugging instructions; arithmetic instruction implementation – addition and subtraction, multiplication-division, 2's complement multiplication; Booth's algorithm – theory and examples; bit-pair algorithm; high performance arithmetic.

**Module – 6: [3L]**
**Introduction to Memory subsystem:**
Memory technology, memory interfacing, Memory hierarchy – introduction to virtual memory system; cache memory.

**Module – 7: [7L]**
**Control unit design:**
hardwired control, micro-programmed control design – micro-instruction formats, control optimization.

Textbooks:


1. Digital Logic Design- Morries Mano- PHI
2. Digital Electronics - Kharate - Oxford
3. Digital Electronics - Logic & Systems by 1.Bigmell & R.Donovan; Cambridge Learning.
4. Digital Logic and State Machine Design (3rd Edition) - D.J.Comer, OUP
5. Mano, M.M., "Computer System Architecture", PHI.
6. BehroozParhami" Computer Architecture", Oxford University Press

Reference:

7.H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill.
8.D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
9.Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
10.J.Bignell & R.Donovan-Digital Electronics-Sle- Cenage Learning.
11.Leach & Malvino-Digital Principles & Application, Sle, Me Graw Hill
12. Floyed & Jain- Digital Fundamentals-Pearson.
13.P.Raja- Digital Electronics- Scitech Publications
14. R.P.Jain-Modern Digital Electronics, 2/e , Me Graw Hill
15. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
16. Hamacher, "Computer Organisation", McGraw Hill,
17. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
18. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
19. P N Basu- "Computer Organization & Architecture" ,Vikas Pub

**Subject Name: DATA STRUCTURE & ALGORITHM**
**Code: IT 303**
**Contacts: 3L + 1T = 4**
**Credits:3**

The problem solving process: algorithms and data structure; role of data structure in algorithm efficiency; example: design of an array without and with distinct subscript. [1]

Introduction to algorithms: definition, properties, types (only brute force, divide and conquer, greedy, iterative improvement and recursive); pseudo codes. Time and space complexity: asymptotic notations- Big-Oh and big Theta; properties, simple examples. [2]

Recurrence relations: substitution method. Example- development of recurrence relations from simple pseudo codes. [1]

Abstract Data Type (ADT): concepts of data types, ADT and data structure. Typical ADT: integer, array and list; primitive data types. [1]

Linear and non-linear data structures-definition and examples. [1]

Arrays as data structure: memory representation and implicit addressing; 1D and 2D, row major and column major representations, address translation; language dependence. Applications: polynomial and matrix representation. [2]

Linked Lists: explicit addressing in a node (pointer/reference); singly linked list, circular linked list, doubly linked list. Applications: polynomial (up to three variables) and matrix representation- advantages and disadvantages w.r.t array based representation; large integer arithmetic. Multi-list sparse matrices. [3]

Stack: definition, implementation with arrays and linked lists. infix, postfix and prefix notations- conversion and evaluation; palindromes. Use of stack in nested and recursive call of functions, differences between recursion and iteration, tail recursion. Application - The Tower of Brahma problem. [3]

Queue: circular queue, dequeue. Implementation of queue - linear and circular (using array and linked list); Application: well-formed parenthesis checking. [2]

Trees: basic terminologies, recursive nature; types: free tree, ordered and rooted tree, forest. Tree representation with array and linked list. Binary trees: definition; node, path, level, height; skewed and complete binary tree; extended binary tree. Basic properties of binary trees : height of a CBT, maximum and minimum number of nodes, degree of nodes and their relationship, number of distinct binary trees with n nodes (statement only). Binary tree traversal (pre-, in-, post- level-order); threaded binary tree (left, right, full) - non-recursive traversal using threaded binary tree, advantage; expression tree. Application: Huffman's algorithm. [5]

Binary search tree: definition; operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree and rotations for balancing, insertion and deletion of nodes (with examples only). Tries. Concept of balanced tree structures; B-tree. [3]

Graph: graph as: a mathematical structure, an ADT, a data structure. Representations of graphs in an algorithm - adjacency matrix, adjacency list, incidence matrix and incidence list; comparison. Graph traversal– DFS, BFS, and applications. Minimal spanning tree – Prim's and Kruskal's algorithm.[1] [5]

Sorting: inversion and unsortedness, definition. Classification - internal and external sorts; stability of a sorting algorithm. Sorting by comparison: calculation of lower bound; algorithms- Bubble sort, Insertion sort, Selection Sort, Quick sort, Merge Sort. Linear time sorting: Counting sort, Radix sort. Comparisons of different sorting algorithms.[2] [6]

Heap data structure: Binary heap (max and min). Use: priority queue. Heap sort.[1] [2]

Searching: sequential search using arrays and linked list.[2] Binary search (recursive and non-recursive) and comparison tree[3]; Interpolation search. Comparison of the three algorithms[1] [3]

Hashing: concept of key-to-address transformation, direct addressing, advantages and disadvantages: comparison with other search techniques. Hash functions- division remainder, multiplication, extraction, compression; brief comparison. Collision resolution techniques- open addressing (linear and quadratic probing), chaining; load factor and comparison[1]; applications. [3]

(***Note*****:** *examples should be given using pseudo codes; actual codes have to be developed in the practical classes. Preliminary knowledge of coding and executing some simple programs is required*)

**Notes:**

[1] Statement of time complexities only.

[2] Derivation of worst case and average case time complexities.

[3] Derivation of worst case time complexity, and mention of average case time complexity.

Text books:


1. **D.E. Knuth:** *The Art of Computer Programming* (Vol. 1& 3), Pearson, 1997.
2. **Horowitz, Sahni, Anderson-Freed**: *Fundamentals of Data Structures in C* (Second Edition), Universities Press, 2008.
3. **T.H. Cormen, C.E. Leiserson, R. Rivest and C. Stein**: *Introduction to Algorithms*, (Second/Third Edition), PHI, 2009.
4. **R. Sedgewick**: *Algorithms in C*, Pearson, 2004.


Reference book:


1. **Ronald L. Graham, Donald E. Knuth, and Oren Patashnik:** *Concrete Mathematics: A Foundation for Computer Science.* Addison-Wesley, 1988.


**Subject Name: NUMERICAL METHODS LAB**
**Code :IT 391**
**Contacts : 3P**
**Credits :2**

1. Assignments on Newton forward /backward, Lagrange's interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.

4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.

5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.

6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

**Subject Name: COMPUTER ORGANIZATION LAB.**
**CODE: IT 392**
**CONTACTS: 3P**
**CREDITS: 2**

1. Design of all gates using NAND/ NOR gate

2. Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.

3. Construction of simple Decoder & Multiplexer circuits using logic gates.

4. Design odd /even parity generator / checker

5. BCD to Excess -3 code conversion

6. GRAY to BCD code conversion and viceversa.

7. Realization of RS / JK / D flip flops using logic gates.

8. Design of Shift Register using J-K, D Flip Flop.

9. Realization of Synchronous Up/Down counter.

10. Design of asynchronous MOD- N Counter.

11. Design an Adder/Subtractor composite unit & BCD adder.
12. Design of a 'Carry-Look-Ahead' Adder circuit.
13. Use a multiplexer unit to design a composite ALU .
14. Implement read write operation using RAM IC.
15. Keypad interfacing with 7 segment displayi

**Subject Name: Data Structure & Algorithm Lab**
**Code: IT393**
**Contacts: 3P**
**Credits: 2**

1. Implementation of array operations:
2. Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem:
3. Evaluation of expressions operations on Multiple stacks & queues:
4. Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
5. Polynomial addition, Polynomial multiplication
6. Sparse Matrices: Multiplication, addition.
7. Recursive and Non-recursive traversal of Trees
8. Threaded binary tree traversal. AVL tree implementation
9. Application of Trees. Application of sorting and searching algorithms
10. Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

**Subject Name: Software Lab -I**

## Code: IT394

**Contacts: 3P**
**Credits: 2**

Introduction to Microsoft Visual Basic.

Basics of Project, Application, Forms, Tools, Toolbox,

Controls & Properties,
Labels, Buttons, Text Boxes.
Data Types, Type conversionss & their use in VB,
Branching & Looping
Sub-functions & Procedure details, Input box () & Msgbox ().
List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
Frames, buttons, check boxes, timer control,
Programming with data, ODBC data base connectivity. Data Form Wizard, query.
Menus in VB Applications,
GraphicsPrograming.

Case studies using any of the following mini projects with the help of visual programming aids.

Library management system.
Inventory management system.
University examination & grading system.
Tourist information system.
Flight reservation system.
Bookshop automation software.

## Value Education & Human Rights

**Code: MC303**
**Contacts: 3L**
**Credits: 3**

***Module 1:*** Values and Self Development-Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.
***Module 2:*** Personality and Behavior Development- Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and
77 religious tolerance, True friendship, Happiness vs. suffering love for truth, Aware of self destructive habits, Association and cooperation, Doing best, Saving nature.
***Module 3:***Character and Competence- Science vs. God, Holy books vs. blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively.
***Module 4:***Human Rights- Jurisprudence of human rights nature and definition, Universal protection of human rights, Regional protection of human rights, National level protection of human rights, Human rights and vulnerable groups.

**Text Books:**
1. Chakraborty, S.K., Values and Ethics for Organizations Theory and Practice, Oxford University Press, New Delhi, 2001.
2. Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.

3. Basu, D.D., Indian Constitution, Oxford University Press, New Delhi, 2002.

**Reference Books:**

1. Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.
2. Meron Theodor, Human Rights and International Law Legal Policy Issues, Vol. 1 and 2, Oxford University Press, New Delhi, 2000.

# Course Structure and Syllabus for 4th semester B.Tech. (IT) Course

| SL. NO. | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | |
| 01. | BS(IT)407 | OPTIMISATION TECHNIQUES | 3 | 1 | 0 | 4 | 3 |
| 02. | IT404 | COMMUNICATION ENGINEERING | 3 | 1 | 0 | 4 | 3 |
| 03. | BS(IT)408 | DISCRETE MATHEMATICS | 3 | 1 | 0 | 4 | 3 |
| 04. | IT405 | MICROPROCESSOR & INTERFACING | 3 | 1 | 0 | 4 | 3 |
| 05. | IT406 | FORMAL LANGUAGE & AUTOMATA THEORY | 3 | 1 | 0 | 4 | 3 |
| PRACTICAL | | | | | | | |
| 06. | BS(IT)497 | OPTIMISATION LAB | 0 | 0 | 3 | 3 | 2 |
| 06. | IT494 | COMMUNICATION ENGINEERING LAB | **0** | **0** | **3** | **3** | **2** |
| 07. | IT495 | MICROPROCESSOR LAB | 0 | 0 | 3 | 3 | 2 |
| 08. | IT496 | SOFTWARE LAB - II | 0 | 0 | 3 | 3 | 2 |
| **TOTAL** | | | **15** | **5** | **12** | **32** | **23** |

# Syllabus for 4th semester B.Tech. (IT) Course

## THEORY

**Optimization Techniques**
**Code: BS(IT) 407**
**Contacts: 3L +1T**
**Total = 40 L**
**Credits: 3**

**Module I**

**Introduction:** Historical Development, Engineering application of Optimization, Classification of optimization problems. (2L)

**Module II**

**LinearProgramming:**

Introduction to linear programming, formulation of linear programming model, Graphical method for solving LPPs with 2 variables, Simplex method,
Revised simplex method, Duality in Linear Programming,
Transportation problems, Assignment problems. (12 L)

**Module III**

**NonLinearProgramming:** Unconstrained optimization techniques, Direct search methods- Fibonacci Search Method, Golden section Search Method; Descent methods – Newton's Method, Steepest Descent Method; Constrained optimization- Method of Lagrange's multipliers(up to three variables),
Kuhn-Tucker condition (10L)

**Module IV**

**Dynamic Programming:** Basic Concepts, Bellman's optimality principles, Dynamic programming approach in decision making problems, optimal subdivision problem (4L)

**Module V**

**SequencingModels:** Johnson's Rule and its logic, method of solution;
Two machines and n jobs (no passing), Three machines and n jobs (no passing),Two jobs and m machines, n jobs and m machines (4L)

**Module VI**

**PERT/CPM:** Introduction to Network analysis, definition of a project, job and events, drawing of arrow diagrams; Project management origin and use of PERT,

Origin and use of CPM, Application of PERT and CPM, Project Network, Diagram representation, Critical path calculation by network analysis and critical path method (CPM), Determination of floats, Construction of time chart and resource labelling. (4L)

**Module VII**

**Simulation Techniques & Applications:** Definition and types, Generation and use of random numbers, Monte-Carlo technique and its uses, Applications of simulation models. (4L)

**Text Books:**

1. H.A. Taha, "Operation Research", Pearson
2. S.S.Rao,"Optimization Theory and Application", Wiley Eastern
3. Ghosh and Chakraborty, "Linear Programming", Central Book Agency

**Reference Books:**

4. Rajan,P.Balasubramani and A. Tamilarasi – "Operations Research", Pearson
5. D.Bertsekas,"Non-Linear Programming", Athena Scientific,Belmont,Mass.,1995
6. D.G.Luenberger,"Introduction to Linear and Non-Linear Programming"

   Addison-Wesley Publishing Co., London/Amsterdam

7. Gillett B.E., Introduction to Operation Research, Computer Oriented Algorithm approach

**Communication Engineering**
**Code: IT 404**
**Contacts: 3L +1T**
**Total = 38 L**
**Credits: 3**

**Module 1**

Elements of Communication systems, Introduction to Base band transmission and concept of linear and non-linear modulation, Sampling theorem, Sampling rate, Nyquist theorem, Reconstruction from samples, Aliasing effect, Time and frequency domain representation of continuous and discrete time signals. Time and frequency domain analysis of continuous and discrete linear systems, Fourier Series, Fourier Transform, Convolution, Transfer Function. (8L)

**Module 2**

Amplitude Modulation: Concept of AM, Calculation of Modulation Index, Total transmitted power of AM, DSB-SC Modulation, SSB- SC Modulation and their methods, Bandwidth and Power calculation, Demodulation of AM.

Frequency Modulation: Concept of FM, Direct & Indirect Method, Bandwidth and Power calculation, Demodulation of FM, Phase Modulation: Concept of Phase Modulation, generation of PM from FM.

Origin of noise and its effect, Importance of SNR in system design.

Pulse Modulation:

PAM (natural and flat topped sampling), PWM, PPM, Basic concept of pulse code modulation, Block diagram of PCM,Multiplexing : TDM, FDM. (10L)

**Module 3**

Digital transmission : Concept of quantization and quantization error, uniform quantizer, non-uniform quantizer, companding. Encoding, coding efficiency. (5L)

Data Formatting : Line coding & properties, NRZ and RZ, Manchester coding.
Baseband Pulse Transmission, Matched filter (only basic concept and importance) (5L)

**Module 4**

Digital carrier Modulation & Demodulation Techniques : Bit rate, Baud rate
Information Capacity, Shanon's Limit. M-ary encoding, Introduction to the different digital modulation techniques – ASK, FSK, PSK, BPSK, QPSK, mention 8 BPSK, 16 BPSK, Introduction to QAM, Mention 8 QAM, 16 QAM, Delta Modulation, Introduction to the concept of DPCM, Adaptive Delta Modulation (basic concept and importance only) (10L)

**Text Books :**

1. Modern Digital and Analog Communication systems by B. P. Lathi (Oxford university Press)
2. An Introduction to Analog and Digital Communications by Simon Haykin ( Wiley India )
3. Principles of Communication –Taub H, and Shilling D. L.

**Reference Books :**

4. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
5. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
6. Communication Systems by A. B. Carlson, Published by McGraw-Hill.

**Discrete Mathematics**
**Code: BS(IT)407**
**Contacts: 3L +IT = 4**
**Total = 40 L**
**Credits: 3**

**Module I**

Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Biconditional statements with truth table,
Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples. (8L)

**Module II**

Theory of Numbers: Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties ofG.C.D with simple examples; Congruences, Residue classes of integer modulo n (Zn) and its

examples.Order, Relation and Lattices: POSET, Hasse Diagram, Minimal, Maximal, Greatest and Least elements in a PO SET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices. (10L)

**Module III**

Pigeon- hole Principle, Principles of inclusion and exclusion; Recurrence relations: Formulation & Modeling of different counting problems in terms of recurrence relations,
Solution of linear recurrence relations with constant coefficients ( upto second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method. (6L)

**Module IV**

Planar and Dual Graphs. Kuratowski's graphs. Homeomorphic graphs. Eulers formula ( n - e + r = 2) for connected planar graph and its generalisation for graphs with connected components. Detection of planarity. Graph colouring. Chromatic numbers of Cn, K, , Km•n and other simple graphs. Simple applications of chromatic numbers. Upper bounds of chromatic numbers (Statements only). Chromatic polynomial. Statement of four and five colour theorems. Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring. Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems. (16 L)

**Text Books :**


1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH


**Reference Books:**


5. J.K. Sharma, Discrete Mathematics, Macmillan
6. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
7. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
8. Douglas B. West, Introduction to graph Theory, PHI


**Microprocessors and Interfacings**
**Code: IT405**
**Contact: 3L + 1T**
**Total = 38 L**
**Credits: 4**

**Module I**
Introduction to Microcomputer based system. History of evolution of Microprocessor and Introduction to Microcontrollers and their advantages and disadvantages.

Architecture of 8085 Microprocessor, Pin description of 8085.
Address/data bus Demultiplexing , Status Signals and the control signals.
Instruction set of 8085 microprocessor, Addressing modes,
Timing diagram of the instructions (a few examples). (10 L)

**Module II**
Assembly language programming with examples, Counter and Time Delays, Stack and Subroutine,

Interrupts of 8085 processor (software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O,Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer. (10 L)

**Module III**
The 8086 microprocessor- Architecture, Addressing modes, Interrupts (6 L)

**Module IV**
Memory interfacing with 8085, 8086,
Supporting IC chips- 8255 ,8251,8237/8257,8259
8255 PPI with 8085 (12 L)

**Text Books :**
1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press)
2. Fundamentals of Microprocessors and Microcomputers – B. Ram (Dhanpat Rai)
3. Microprocessor architecture, programming and Application with 8085 - R.Gaonkar (Penram international Publishing LTD.)
4.Microcontrollers:Principles&Applications , Ajit Pal, PHI 2011.
5.Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing"Dhanpat Rai, 2003
6. Microprocessor 8085 and its Interfacing—S Mathur(PHI)

**Reference Books :**
7. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)
8. The 8085 Microprocessor, Architecture, Programming and Interfacing- K Uday Kumar, B .S Umashankar (Pearson)
9. Advanced Microprocessors and Peripherals : Architecture, Programming and Interfacing – A. K. Ray and K. M. Bhurchandi (TMH)

**Formal Language and Automata Theory**
**Code: IT406**
**Contacts: 3L +IT = 4**
**Total = 40 L**
**Credits: 3**

**Module I**
Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (mapping of Automata to sequential circuit) Design of sequence detector, Introduction to finite state model
Finite state machine: Definitions, capability & state equivalent, kth- equivalent concept

Merger graph, Merger table, Compatibility graph
Finite memory definiteness, testing table & testing graph.
Deterministic finite automaton and non deterministic finite automaton.Transition diagrams and Language recognizers. (8 L)

**Module II**
Equivalence of deterministic and non-deterministic finite Automata.
Myhill-Nerode Theorem, Minimization of FSM.
Regular Languages &Regular expressions. Arden's theorem.
Constructing finite Automata for a given regular expressions, NFA/DFA
Pumping lemma of regular sets. Closure properties of regular sets
Grammar Formalism: Regular grammars-right linear and left linear grammars.
Equivalence between regular linear grammar and FA.
Inter conversion, Context free grammar.
Derivation trees, sentential forms. Right most and leftmost derivation of strings. (12 L)

**Module III**
Context free grammars(CFG) and languages (CFL), Derivations, Parse trees, Equivalence of parse tree and derivation.
Ambiguous, unambiguous and inherently ambiguous grammars. .
Normal forms (Chomsky and Greibach), Simplification of CFG .
Pushdown automata (deterministic and nondeterministic), Acceptance of language by empty stack, final state and their equivalence .
Properties of the class of CFLs, Proving a language to be context free language or not. Pumping lemma for CFG.
Decision algorithms of CFG. Membership checking (CYK algorithm) (10 L)

**Module IV**
Unrestricted grammar, Computable fuction
Turing machines (deterministic and nondeterministic). Equivalence of deterministic and non-deterministic TM. Extensions of TM and their simulations.
Church-Turing thesis, universal TM, Halting problem of TM, TM as enumerator.
Decidability, Un-decidablity/Non-computability, Complexity classes, Notion of reductions. (10 L)

**Text Books:**
1. Introduction to Automata Theory Language and Computation, Hopcroft H.E. and Ullman J. D., Pearson Education.
2.Theory of Computer Science , Automata Languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.
3.Formal Languages and Automata Theory, C.K.Nagpal, Oxford

**Reference Books :**
4.Switching & Finite Automata, ZVI Kohavi, 2nd Edn., Tata McGraw Hill
5.Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley
6.Introduction to languages and the Theory of Computation, John C Martin, TMH
7.Elements of Theory of Computation, Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

# PRACTICAL

**Optimization Lab**
**Code : BS(IT)497**
**Contacts : 3P**
**Credit : 2**

Software based lab using C

1. Assignment on Simplex method (Including Charns' Big-M Method)

2. Assignment on Duality

3. Assignment on Transportation problem

4 .Assignment on Assignment problem

5. Assignment on PERT/CPM

6. Assignment on Shortest Path by using Dijkstra's or Floyd's Algorithm

7. Implement Single Source Shortest Path for a graph using Bellman Ford Algorithm

8.Application of the algorithms of steepest descent Method.

9.Determination of optimum scheduling sequence of n jobs with 2 machines in sequencing problem & determination of idle time of each machine.

**Communication Engineering Lab**
**Code : IT494**
**Contacts : 3P**
**Credit : 2**

Practical Designs & Experiments:
Module - 1: Generation of Amplitude Modulation (Design using transistor or Balanced Modulator Chip (to v iew the wave shapes)
Module - 2: Generation of FM using VCO chip (to view the wave shapes)
Module - 3: Generation and detection of PAM
Module - 4: Generation and detection of PWM & PPM (using IC 555)

**Microprocessor Lab**
**Code : IT495**
**Contacts : 3P**
**Credit : 2**

Module – 1 : Study of Prewritten programs on 8085 trainer kit us ing the basic instruction set (data transfer, Load/Store, Arithmetic, Logical).
Or,
Familiarization with 8085 simulator on PC. Programs
using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.

Module – 2 : Programming using kit or Simulator for:
1. Table look up

2. Copying a block of memory
3. Shifting a block of memory
4. Arranging a block of numbers in ascending and descending order
5. Packing and unpacking of BCD numbers
6. Addition of BCD numbers
7. Binary to ASCII conversion and vice-versa (Using Subroutine Call)
8. BCD to Binary Conversion and vice-versa
9. String Matching, Multiplication
10. Program using IN/OUT instructions and 8255 PPI on the trainer kit e.g. subroutine for delay (Glowing all the LEDs one by one with particular delay)

**Software Lab**
**Code : IT496**
**Contacts : 3P**
**Credit : 2**

Assignments based on the following topics using Code Blocks/Visual C++ IDE.

1. Arrays & Pointers.
2. Dynamic memory allocation.
3. Standard I/O.
4. Classes & Objects.
5. Function Overloading.
6. Constructor, Copy Constructor & Destructor.
7. Operator Overloading.
8. Class Hierarchy, Inheritance.
9. Exception Handling.
10. File programming.
11. Namespace.
12. Template.
13. Data Structure Using C++

# Department of Information Technology

## Course Structure and Syllabus for 3rd Year / 1st Semester (Autonomy) B. Tech. in Information Technology

**SEMESTER-V**

| SL. NO. | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | |
| 01. | IT507 | COMPUTER ARCHITECTURE | 3 | 1 | 0 | 4 | 3 |
| 02. | IT508 | OPERATING SYSTEM | 3 | 1 | 0 | 4 | 3 |
| 03. | IT509 | DESIGN & ANALYSIS OF ALGORITHM | 3 | 1 | 0 | 4 | 3 |
| 04. | IT510 | OBJECT ORIENTED PROGRAMMING & SYSTEMS | 3 | 1 | 0 | 4 | 3 |
| 05. | OE(IT)501 | A. DIGITAL COMMUNICATION<br>B. DIGITAL SIGNAL PROCESSING<br>C. COMPUTER GRAPHICS | 3 | 0 | 0 | 3 | 3 |
| PRACTICAL | | | | | | | |
| 06. | IT597 | COMPUTER ARCHITECTURE & SIMULATION LAB | 0 | 0 | 3 | 3 | 2 |
| 07. | IT598 | OPERATING SYSTEM LAB | 0 | 0 | 3 | 3 | 2 |
| 08. | IT590 | OBJECT ORIENTED PROGRAMMING LAB | 0 | 0 | 3 | 3 | 2 |
| 09. | OE(IT)591 | A. DIGITAL COMMUNICATION LAB<br>B. DIGITAL SIGNAL PROCESSING LAB<br>C. COMPUTER GRAPHICS LAB | 0 | 0 | 3 | 3 | 2 |
| | | **TOTAL** | **15** | **3** | **12** | **30** | **23** |
| 10. | MC504 | TECHNICAL COMMUNICATION & SOFT SKILLS | 0 | 0 | 3 | 3 | 2 |

**Computer Architecture**
**Code: IT507**
**Contact: 3L + 1T**
**Credits: 3**
**Allocated Hours : 38L**

**Module – 1: [2L]**
Introduction: Review of basic computer architecture, Quantitative techniques in computer design, measuring and reporting performance. (2L)

**Module – 2: [8L]**
Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Exception handling . Pipeline optimization techniques; Compiler techniques for improving performance. (8L)

**Module – 3: [10L]**
Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies. (10L)

**Module – 4: [6L]**
Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures. Array and vector processors. (6L)

**Module – 4: [12 L]**
Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers . (8L)
Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures. (4L)

**TEXT BOOKS :**
[1] B. Parhami, “Computer Architecture” Oxford University Press.
[2] Stallings William, "Computer Organization and Architecture, Designing for Performance", Prentice Hall of India.
[3] J. L. Hennessy and D. A. Patterson, "Computer Architecture: a quantitative approach", Harcourt Asia, Singapore.
[4] V. Rajaraman and T. Radhakrishnan, “Computer Organization and Architecture” PHI Learning Pvt. Ltd.

**REFERENCE BOOKS :**
[1] Hwang and Briggs, “Computer Architecture and Parallel Processing”, TMH.
[2] Hayes, “Computer Architecture and Organization”, McGraw-Hill.

**Operating System**
**Code: IT 508**
**Contact: 3L + 1T**
**Credits: 3**
**Allocated Hours: 40L**

Introduction [2L]
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.
System Structure [3L]
Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.
Processes [3L]: Concept of processes, process life cycle, operations on processes, co-operating processes, interprocess communication.
Threads [2L]: overview, benefits of threads, user and kernel threads.
CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, and priority), multi-processor scheduling.
Process Synchronization [4L]: background, critical section problem, critical region, semaphores.
Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Banker's algorithm.
Memory Management [3L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.
Virtual Memory [3L]: background, demand paging, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.
File Systems [2L]: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management.
I/O Management [2L]: I/O hardware, polling, interrupts, DMA, application I/O interface, kernel I/O subsystem.
Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.
Protection & Security [4L]
Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.
Concept of Windows, Unix, Mac and Android operating system [2L]

Text Books / References :
1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
3. Silberschatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhere: Operating System TMH
5. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

**Design & Analysis of Algorithm**
**Code : IT 509**
**Contact: 3L + 1T**
**Credit: 3**
**Allotted Hrs.: 39L**

**Models of computation [3L]:** Random Access Machine, Relationship between Turing Machine and RAM, Time and Space Complexity.

**Complexity analysis [6L]:** Asymptotic notations, Recurrence for divide and conquer and its solution, Merge sort, Heap sort, Quick sort and their complexity, Linear search, Binary search and their complexity.

**Dynamic Programming [4L]:** Basic method, Matrix-chain multiplication, All pair shortest paths, Single source shortest path, Travelling Salesman problem.

**Greedy Method [4L]:** Basic method, Knapsack problem, Job sequencing with deadlines, Minimum spanning tree by Prim's and Kruskal's algorithms.

**Disjoint Set Manipulation [3L]:** Set manipulation algorithm like UNION-FIND, Union by rank.

**Graph Traversal Algorithms [2L]:** BFS and DFS, their complexity and comparison.

**String matching problem [3L]:** Different techniques – Naive algorithm, string matching using finite automata, and Knuth-Morris-Pratt (KMP) algorithm with their complexities.

**Network Flow [3L] :** Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration).

**Matrix Manipulation Algorithms [4L]:** Strassen's Matrix-multiplication algorithm and its applications in Solution of simultaneous linear equations using LUP decomposition, Inversion of Matrix and Boolean Matrix multiplication.

**Notion of NP-completeness [4L]:** P class, NP class, NP-hard class, NP-complete class-their interrelationship, Satisfiabilityproblem, Cook'stheorem (statement only), Clique decision problem.

**Approximation Algorithms [3L]:** Vertex cover problem, **Travelling salesman problem**, Set covering problem.

**Text Book:**


1. T.H.Cormen, C.E. Leiserson, R.L.Rivestand C. Stein "Introduction to Algorithms", PHI.

2.Horowitz Ellis, SahaniSartaz, R. Sanguthevar"Fundamentals of Computer Algorithms".

3. A.Aho, J.Hopcroft and J.Ullman "The Design and Analysis of algorithms", PE.

**Reference:**

1. D.E. Knuth: The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3.Vol. 1,2nd ed., Narosa /Addison-Wesley, New Delhi/London, 1973; Vol.2: 2nd ed., Addison-Wesley, London, 1981; Vol.3:Addison –Wesley, London, 1973.

2.. Fundamentals of Algorithms- G.Brassard, P.Bratley, PHI.

3.Goodman: Introduction to Design and Analysis of Algorithms TMH

4.S.Basse"Computer Algorithms".

5. SanjoyDasgupta,ChristosPapadimitriou,UmeshVazirani "Algorithms", TMH

**Object Oriented Programing & Systems**
**Code :IT-510**
**Contact: 3L + 1T**
**Credit : 3**
**Allotted Hrs: 40L**

**Module I [2L]**
**Introduction to Object Orriented Programming Concepts**
Historical development of Object Oriented Programming language, concepts & features of Object oriented programming language, Differences between Object Oriented Programming language and conventional programming languages, Major and minor elements in OOP.

**Module II[08L]**
**Introduction to C++**
Creation of Class, declaring instance variables & member functions, creation of objects, use of constructor, function overloading, operator overloading, introduction of friend functions, basics of inheritance-base class & derived class, virtual base class, overriding & polymorphism, resolving of method calls using overridden versions of method calls.

**Module III [10L]**
**Introduction to Java[5L]**
Advantages of Java, Data types & variables, Loops, Array, operators, basics of String handling using equals () length (), charAt() methods, basics of I/O operations using BufferedReader class, Control statements, constants., access specifiers.
**Class & Object proprieties of Java[5L] –**
Creation of class and objects, use of constructor, array of objects, overloading, this keyword, static variables & methods, command line arguments, use of objects as parameter & returning objects, call by value & call by reference, garbage collection, nested & inner classes.

**Module IV [10L]**
**Properties of Reusability in Java[5L] –**
Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super keyword and final keyword, dynamic method dispatch using method overriding. Use of abstract classes & interfaces with their properties, differences between

abstract classes & interfaces, dynamic method dispatch for interfaces, nested abstract classes & interfaces, extended interfaces.

**Properties of Packages in Java[1L]-**

Creation of packages, importing packages, member access for packages, simple package based programming.

**Exception handling in Java[4L]** –

Exception handling basics, different types of exception classes, use of try &catch with throw, throws & finally, creation of user defined exception classes.

**Module V [10L]**

**Multithreading in Java[6L]** –

Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, interthread communication, deadlocks for threads, suspending & resuming threads.

**Applet Programming in Java[4L]** –

Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing through applets, I/O in applets, use of repaint (), getDocumentBase() ,getCodetBase() & showDocument() methods.

**Textbooks/References:**

1. Ali Bahrami,-"Object Oriented System Development"-Mc Graw Hill
2. Patrick Naughton, Herbert Schildt-"The complete reference-Java2"-TMH
3. Sourav Sahay-"Object-Oriented Programming with C++"-Oxford
4. Java-Balaguruswamy,
5. OOP using C++, Balaguruswamy

**Digital Communication**
**OE(IT)501A**
**Contracts: 3L**
**Credits- 3**
**Allotted Hrs. – 36L**

**MODULE – I: [2L]**

Review of Probability Theory and Random Processes :

probability density function– Gaussian, Rayleigh and Rician, mean, variance, random process, stationary and ergodic processes, correlation coefficient, covariance, auto correlation function and its properties.

**MODULE – II: [8L]**

Signal Vector Representation:

Analogy between signal and vector, distinguishibility of signal, orthogonality and rthonormality, basis function, orthogonal signal space, message point , signal constellation, geometric nterpretat ion of signals, likelihood functions, Schwartz inequality, Gram-Schmidt orthogonalization Procedure, response of the noisy signal at the receiver, maximum likelihood decision rule, decision boundary, optimum correlation receiver; probability of error ,error function, complementary error function, Type- I and Type-II errors. [6L]

**MODULE – III: [10L]**

Digital Data Transmission:

Concept of sampling, Pulse Amplitude Modulation (PAM), interlacing and multiplexing of samples, Pulse Code Modulation (PCM), quantization, uniform and non-uniform quantization, quantization noise, binary encoding, A-Law and μ -law companding, differential PCM, delta modulation and adaptive delta modulation.

Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding – polar/unipolar/bipolar NRZ and RZ, Manchester, differential encoding and their PSDs, pulse shaping, Inter Symbol Interference (ISI), Eye pattern, Nyquist criterion for zero ISI, equalizer, zero forcing equalizer, timing extraction. [10L]

**MODULE –IV: [16L]**

Digital Modulation Techniques :

Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, basic digital carrier modulation techniques: ASK, FSK and PSK, Coherent Binary Phase Shift Keying (BPSK), geometrical representation of BPSK signal; error probability of BPSK, generation and detection of BPSK Signal, power spectrum of BPSK. Concept of M-ary Communication, M-ary phase shift keying, the average probability of symbol error for coherent M-ary PSK, power spectra of MPSK, Quadrature Phase Shift Keying (QPSK), error probability of QPS K signal, generation and detection of QPSK signals, power spectra of QPSK signals, Offset Quadrature Phase shift Queuing (OQPSK), Coherent Frequency Shift Keying (FSK), Binary FSK, error probability of BFSK signals, generation and detection of Coherent Binary FSK signals,

power spectra of BFSK signal, Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, basic concept of OFDM, constellation diagram, Some performance issues for different digital modulation techniques - Error Vector Magnitude (EVM), Eye Pattern and Relative Constellation Error (RCE). [16L]

**TEXT BOOKS:**

1. Digital Communications, S. Haykin, Wiley India.
2. Principles of Communication Systems, H. Taub and D.L.Schilling, TMH Publishing Co.
3. Wireless Communication and Networks : 3G and Beyond , I. Saha Misra, TMH Education.
4. Digital Communications, J.G.Proakis, TMH Publishing Co.

**REFERENCE BOOKS:**

1.Digital Communications Fundamentals and Applications, B. Sarkar and P.K.Ray, Pearson.
2. Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.
3. Digital Communication, A. Bhattacharya, TMH Publishing Co.

**Digital Signal Processing**
**Code : OE(IT) 501B**
**Contacts: 3L**
**Credits- 3**
**Allocated Hrs: 36L**

**MODULE – I:[10L]**

**Discrete-time signals [4L]**

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences.

**LTI Systems [ 6L]**

Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems.

**MODULE –II:[16L]**

**Z-Transform [6L]:**

Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises.

**Discrete Fourier Transform:[** 6**L]**

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises.

**Fast Fourier Transform[4L]**

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.

**MODULE – III: [6L]**

**Filter Design: [ 6L]**

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows.

**MODULE – IV: [4L]**

**Digital Signal Processor:[ 4L]**

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language.

**TEXT BOOKS:**

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
2. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.

**REFERENCE BOOKS:**

1.. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2.. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
3.. Digital Signal Processing, A. Nagoor Kani, TMH Education
4.Texas Instruments DSP Processor user manuals and application

**Computer Graphics**
**Code : OE(IT)-501C**
**Contacts: 3L**
**Credits: 3**
**Allotted Hrs: 36L**

**Introduction to Computer Graphics & Graphics Systems [4L]:**
Overview of CG, definitions of CG, types of CG, storage tubes displays, CRT technologies – Raster Scan Display, Computer graphics software.

**Scan Conversion [4L]:**
Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

**2D Transformation [6L]:**
Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines.

**Viewing [4L]:**
Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

**3D Transformation & Viewing [6L]:**
3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space; reflection through an arbitrary plane; general parallel projection transformation; clipping, Viewport clipping, 3D viewing, perspectives & Depth Cueing.

**Curves and Fractals [4L]:**
Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

**Hidden Surfaces [4L]:**
Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

**Color & Shading Models [4L]:**
Introduction, Modeling Light Intensities and Sources, Diffuse Reflection, Lambert's Cosine Law, Specular Reflection, Halftoning, Color Models - RGB Color, CMY Color.

**Reference Books:**

1. Computer Graphics (C version 2nd Ed.) – Hearn D, Baker M P , Pearson.
2. Computer Graphics –A programming Approach– Harrington,Steven; McGraw Hill
3. Computer Graphics – principles and practice - Foley, Van Dam, Feiner and Huges; Pearson.
4. Computer Graphics, Multimedia and Animation – Pakhira Malay K ; PHI Learning Pvt. Ltd.

5. Schaum's outlines Computer Graphics(2nd Ed)- Z. Xiang, R. Plastock; TMH
6. Introduction to Computer Graphics – A. Mukhopadhyaya, A. Chattopadhyay; Vikas Publishing House Pvt. Ltd

## 6Th Semester Syllabus

## (Dept of Information Technology)

| SL. NO. | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | |
| 01. | IT611 | COMPUTER NETWORK | 3 | 1 | 0 | 4 | 3 |
| 02. | IT612 | DATABASE MANAGEMENT SYSTEM | 3 | 1 | 0 | 4 | 3 |
| 03. | IT613 | SOFTWARE ENGINEERING | 3 | 1 | 0 | 4 | 3 |
| 04. | IT614 | MULTIMEDIA SYSTEMS | 3 | 0 | 0 | 3 | 3 |
| 05. | OE(IT)602 | A. INFORMATION & CODING THEORY<br>B. HUMAN RESOURCE MANAGEMENT<br>C. GAME THEORY<br>D. EMBEDDED SYSTEMS | 3 | 0 | 0 | 3 | 3 |
| **PRACTICAL** | | | | | | | |
| 06. | IT691 | COMPUTER NETWORK LAB | 0 | 0 | 3 | 3 | 2 |
| 07. | IT692 | DATABASE MANAGEMENT SYSTEM LAB | 0 | 0 | 3 | 3 | 2 |
| 08. | IT693 | SOFTWARE ENGINEERING LAB | 0 | 0 | 3 | 3 | 2 |
| 09. | IT694 | MULTIMEDIA SYSTEMS LAB | 0 | 0 | 3 | 3 | 2 |
| 10. | IT620 | SEMINAR | 0 | 0 | 3 | 3 | 2 |
| | | **TOTAL** | **15** | **3** | **15** | **33** | **25** |
| 11. | MC605 | GROUP DISCUSSION | 0 | 0 | 3 | 3 | 3 |

**Computer Network (IT 611)**
**Contact Hrs/Week: 3L+1T**
**Credit: 3**
**Allocated Hrs: 40L**

**Module I [12L]**

Overview of Data Communication and Networking: Introduction; Layered Network Architecture; Mode of communication, topology, Data and Signal; Transmission Media: Guided, Unguided, categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical Layer: Transmission Media: Guided, Unguided ; switching: time division & space division switch, TDM bus, Banyan switch; Interfaces-DTE-DCE, MODEM, Cable MODEM; The telephone network system and DSL technology.

Data link Layer:

Error Control: Types of errors, framing (character and bit stuffing), error detection & correction

Flow control: Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium Access sub layer: Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, Traditional Ethernet, fast Ethernet.

**Module II[10L]**

Network layer:

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway;

Addressing : IP addressing(IPV4,IPv6),masking, Classful and Classless Addressing, Subnetting, NAT, ; Routing : techniques, Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6;.

Mapping between IP and MAC address: ARP & RARP

Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; X.25; Frame Relay; ATM, SONET.

**Module III[8L]**

Transport layer: Process to Process delivery; UDP; TCP, Features, Segment, Three-Way Handshaking, socket, Flow Control, Error Control, Congestion Control: Open Loop, Closed Loop, choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

**Module IV[10L]**

Application Layer Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW;

Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls, IDS, Malware.

Modern topics: ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief Wireless LAN: IEEE 802.11, Introduction to blue-tooth.

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH

2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI

3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:

4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

5. Black, Data & Computer Communication, PHI

6. Miller, data Communication & Network, Vikas

7. Miller, Digital & Data Communication, Jaico

8. Shay, Understanding Data Communication & Network, Vikas

9. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education

10. Leon, Garica, Widjaja – "Communication Networks" – TMH

11. Walrand – "Communication Networks" – TMH. 4. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

## Database Management System (IT 612)

**Contact Hrs/Week: 3L+1T**

**Credit: 3**

**Allocated Hrs: 45L**

### Introduction [3L]

File & Data Base Concept, Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

### Entity-Relationship Model [4L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Strong & Weak Entity Sets ,EER model.

### Relational Model [5L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

**SQL and Integrity Constraints [8L]**

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Codd's rule,assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

**Functional Dependencies and Normalization [7L]**

Functional Dependency, Armstrong's axioms, Canonical Cover, Closure , Full and Partial Functional dependencies, Prime &Non Prime attribute , 1NF, 2NF, 3NF, BCNF, Multi valued Dependency , 4NF, 5NF.

**Transaction & Concurrency Control [8L]**

Transaction concept, ACID properties, serializabilty, Test for Conflict serializability, Concurrency Control, Lock base protocols, Two phase locking.

**Storage Strategies [4L]**

Single-Level Index (primary, secondary, clustering), Multi-level Indexes, Dynamic Multi-level Indexes, Hashing Techniques, B tree and B+ tree .

**Query Optimization [3L]**

Full Table scan, Indexed-based scan, Merge join, Nested loop join , Equivalence rules , Heuristic Optimization , Cost Based Optimization.

**Backup & Recovery [3L]**

Physical & Logical Backup , Transaction logs, Causes of failures , Recovery techniques.

**Text Books:**

1. Korth ,Silberschatz and Sudarshan, "Database System Concepts", Mc.Graw Hill.

2. Elmasri Ramez and Navathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing.Company.

3. Ramakrishnan and Gehrke: Database Management System , McGraw-Hill

## Software Engineering (IT 613)
**Contact Hrs/Week: 3L+1T**
**Credit: 3**
**Allocated Hrs: 40L**

**Module I**

Information System-Systems development life cycle, Structured Systems Analysis and Design, Design of New Systems, Software Engineering –Objectives, Definitions ,Software Process models - Waterfall Model , Prototype model, RAD, Evolutionary Models ,Incremental, Spiral model.[5L]

Software Requirements (SRS), Feasibility Analysis, Cost Benefit Analysis, COCOMO model, Structured Analysis. [3L]

**Module II**

Design Aspects : Context diagram and DFD, Physical and Logical DFDs ,Data Modeling, Data Dictionary, ER diagrams, Top-Down And Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis, Functional vs. Object- Oriented approach.[4L]

**Module III**

Software Testing – Levels of Testing, Unit Testing, White-box and Black-box Testing, Test Case Generation, Integration Testing, Bottom-up and Top-down Testing, System Testing, Function Testing, Performance Testing, Acceptance Testing, Software Validation, Static and Dynamic Analysis, Symbolic Evaluation, Mutation Analysis, Formal Verification, Test tools.[8L]

**Module IV**

Software Reliability , Hazard, MTTF, Repair and Availability, Reliability Models, Software Complexity, Cyclomatic Complexity, Halstead's Metrics. [4L]

**Module V**

Software Quality- Software Metrics, Software functional quality vs. Software structural quality, Risk Management , Cost Management ,Software Quality Assurance, Total Quality Management.[6L]

**Module VI**

Software Project Management – Software Project Planning, Project Scheduling, Staffing, Software Configuration Management, Project Monitoring Capability Maturity Model (CMM). [5L]

**Module VII**

UML diagrams: Class diagram, Use case diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, and implementation diagram. [5L]

Books:

1. Software Engineering : A practitioner's approach– R.G. Pressman (TMH)

2. Software Engineering- Pankaj Jalote (Wiley-India)

3. Software Engineering- Rajib Mall (PHI)

4. Software Engineering –Agarwal and Agarwal (PHI)

5. Software Engineering- I. SomerVille(Pearson Education)

6. Fundamentals of Software Engineering- C. Ghezzi, M. Jazayeri and D. Mandrioli(PHI )

7. Software Engineering Fundamentals- Behforooz(OUP)

**Multimedia Systems (IT 614)**
**Contact Hrs/Week: 3L**
**Credit: 3**
**Allocated Hrs: 40L**

**Introduction to Multimedia System: (2L)**

Multimedia Components and Structure, Hardware and Software Specifications, Application Domains

**Visual Display Systems (2L)**

Cathode Ray Tube, Liquid Crystal Display, Plasma Display

**Text (3L)**

Types of Text, Font, ASCII Character Set, Unicode, File Formats

**Audio (3L)**

Concept of Sound, Data acquisition, Sampling and Quantization, Audio Formats, Audio tools, MIDI

**Image (5L)**

Image acquisition and representation, Colour models (Device Dependent and Device Independent), Steps of Image Processing, File Formats

**Video (5L)**

Video Frame, Frame Rate, Composite video signal NTSC, PAL and SECAM Video Standards, Formats, Digital Video, Steps of Video Processing and Software, Computer based Animation.

**Compression (5L)**

Lossy and Lossless Compression, Run Length encoding, Huffman Encoding, Arithmetic Encoding, Differential Pulse Code Modulation, JPEG image compression standard, MPEG video compression, H.261

**Synchronization [4L]**

Intramedia and Intermedia Synchronization, Jitter, Skew, Delay, Error rate, Quality of Service

**Image and Video Database [8L]**

Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage, Video Content, querying, video segmentation, indexing

**Multimedia Applications [3L]**

Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications,Multimedia archives and digital libraries, media editors.

**Books:**

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.

2. Nalin K. Sharda , Multimedia Information System , PHI.

3. Koegel Buford , Multimedia Systems , Pearson Ed.

4. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.

5. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

6. Prabhat K. Andleigh & Kiran Thakrar , Multimedia Systems Design , PHI.

**Information and Coding Theory (OE (IT) 602A)**
**Contact Hrs/Week: 3L**
**Credit: 3**
**Allocated Hrs: 40L**

**Information Theory [4L]**
Review of probability theory, Uncertainty and Information, Self and Mutual Information, Entropy, Mathematical Properties of the Entropy Function.

**Source Coding [4L]**
Source Coding Theorem ,Entropy and Coding, Shannon-Fano Coding, Variable-Length Codes: Unique Decoding, Instantaneous Codes, Construction of Instantaneous Codes, Prefix tree for prefix code, The Kraft Inequality, Huffman codes.

**Channel Capacity and Coding [6L]**
Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

**Error Control Coding [7]**
Introduction, Matrix description of linear block codes , parity check matrix, Encoding and decoding of Linear Block-codes, Syndrome Decoding, Hamming Codes.

**Cyclic Codes [6]**
Polynomials, Method for generating Cyclic Codes, Matrix description of Cyclic codes, Golay codes, Reed Solomon Code.

**BCH Codes [6L]**
Properties of BCH codes, minimal polynomials, generator polynomials, check polynomials, examples of BCH codes.

**Convolutional Codes (7L)**
Introduction, Polynomial description of Convolutional Codes, Generating function, Matrix description of Convolutional Codes, Viterbi Decoding of Convolutional codes,Trellis codes, Turbo codes.

**Books:**
1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Coding and Information Theory – R. W. Hamming; Prentice Hall.
3. Information and Coding Theory - G. A. Jones and J. M. Jones ; Springer – Verlag.
3. Essentials of Error-Control Coding – Jorge C. Moreira and Patrick G Farrell; Wiley.
4. Introduction to Error Control Codes – S Gravano; Oxford.
5. Error Control Coding - Shu Lin and D J Costello Jr.; Prentice Hall.

**Game Theory (OE (IT) 602C)**
**Contact Hrs/Week: 3L**
**Credit: 3**
**Allocated Hrs: 40L**

**Module-1 (**L-4)
Introduction, Terminology, Basic Assumptions of Game Theory: Individualism, Rationality, Mutual interdependence, Classification of games: Zero Sum and Non Zero Sum Games, perfect and imperfect information games, Theory of rational choice

**Module-2 (**L-4)
**Static Game Theory and its solution techniques:** Normal form games, Extensive form games, Strict dominance, Weak dominance, Iterated strict dominance, Iterated weak dominance

**Module-3 (**L-8)
**Strategic Games and Nash Equilibrium**
Strategic games and related examples, Nash equilibrium: concept and examples, Best response functions, Dominated Actions, Symmetric games and symmetric equilibria

**Module-4 (**L-4)
**Mixed Strategy Nash Equilibrium**
Introduction, Strategic games with randomisation, Mixed strategy Nash equilibrium: concept and examples, Dominated Actions
.
**Module-5 (**L-8)
**Extensive Games and Nash Equilibrium**
Introduction to extensive games, Strategies and outcomes, Nash equilibrium, Subgame perfect Nash equilibrium, Backward induction, Infinitely repeated games, Finitely repeated games

**Module-5 (**L-8)
Modern topics and Applications.

**References:**
1. Osborne, M.J. An Introduction to Game Theory, Oxford University Press, 2004
2. Mas-Colell, A., M.D. Whinston and J.R. Green Microeconomic Theory, Oxford University Press, 1995
3. Gibbons, R. A Primer in Game Theory, Pearson Education, 1992

## EMBEDDED SYSTEMS (OE (IT) 602D)
**Contact: 3L**
**Credit: 3**
**Allocated Hrs: 40L**

**Introduction to Embedded Systems**
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**Typical Embedded System:**
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**Embedded Firmware**:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**RTOS Based Embedded System Design:**
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

**Task Communication:**
Shared Memory, Message Passing, Remote Procedure Call and Sockets,
Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

**TEXT BOOKS:**

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

**REFERENCE BOOKS:**

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

## COMPUTER NETWORK LAB (IT 691)

**Contact Hrs/Week: 3P**
**Credit: 2**

1.NIC Installation & Configuration (Windows/Linux)

2. Understanding IP address, subnet etc

3. Networking cables (CAT5, UTP) , Connectors (RJ45, T-connector)

4. Physical verification of existing LAN

5.TCP/UDP Socket Programming

i) UDP time client server program

ii) UDP echo client server program

iii) TCP time client server program

iv) TCP echo client server program

v) TCP chat client server program

Vi) Data Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)

6. Server Setup/Configuration FTP, TelNet, DNS.

## Database Management System Lab (IT692)

**Contact: 3P**
**Credits: 2**

**Structured Query Language**

1. **Creating Database**
    - Creating a Database
    - Creating a Table
    - Specifying Relational Data Types
    - Specifying Constraints
    - Creating Indexes

**2. Table and Record Handling**

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

**3. Retrieving Data from a Database**

1. The SELECT statement
2. Using the WHERE clause
3. Using Logical Operators in the WHERE clause
4. Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause
5. Using Aggregate Functions
6. Combining Tables Using JOINS
7. Sub queries

**4. Database Management**

- Creating Views
- Creating Column Aliases
- Creating Database Users
- Using GRANT and REVOKE

**Cursors in Oracle PL / SQL**

**Writing Oracle PL / SQL Stored Procedures**

## Software Engineering Lab (IT 693)

**Contact Hrs/Week: 3P**

**Credit: 2**

For Software Engineering Lab, design a project proposal which will be used throughout the lab for performing different experiments using CASE Tools.

Following projects can be used as dummy projects:

Library Management System, Railway Reservation System, Employee Payroll, Online Banking System, Online Shopping Cart, Online Examination etc.

1. Preparation of requirement document (SRS) for proposed project in standard format.

2. Project Schedule preparation. Prepare Gnatt and PERT chart from schedule. Prepare Project Management Plan in standard format.

3. Draw Use Case diagram, Class diagram, Sequence diagram and prepare Software Design Document using tools.

4. Estimate project size using Function Point (FP)/Use Case Point.

5. Design Test Script/Test Plan (both Black box and White Box approach) for a small component of the proposed project. (Develop that component using programming languages like c/Java/VB etc.)

6. Generate Test Result and perform defect root cause analysis.

**Multimedia Systems Lab (IT 694)**
**Contact Hrs/Week: 3P**
**Credit: 2**

1. Creation of Content using HTML and Style sheet DHTML
2. Image editing using tools like Adobe Photoshop
3. Creating/editing motion video/animation clips (using tools like Flash)
4. Sound capturing & editing using tools like SOUNDFORGE

**Books**

1. Adobe, Adobe Photoshop 6.0: Classroom in a book Pearson Ed.
2. Anushka Wirasinha, Flash in a Flash- Web Development, PHI
3. Macromedia Flash5 fast and easy Web Development, Design, PHI
4. Castro, HTML4 for the World Wide Web, Pearson Ed.

**SEMESTER VII**

| SL. NO. | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | |
| 01. | IT715 | INTERNETWORKING | 3 | 1 | 0 | 4 | 3 |
| 02. | IT716 | WEB TECHNOLOGY | 3 | 1 | 0 | 4 | 3 |
| 03. | PE(IT)701 | A. DATA WAREHOUSING &DATA MINING<br>B. SYSTEM SOFTWARE & ADMINISTRATION<br>C. SENSOR NETWORKS<br>D. COMPUTATIONAL GEOMETRY | 3 | 0 | 0 | 3 | 3 |
| 04. | PE(IT)702 | A. ARITFICIAL INTELLIGENCE<br>B. IMAGE PROCESSING<br>C. SOFT COMPUTING<br>D. VLSI DESIGN AND ALGORITHMS | 3 | 0 | 0 | 3 | 3 |
| 05. | PE(IT)703 | A. DISTRIBUTED COMPUTING SYSTEMS<br>B. CLOUD COMPUTING<br>C. BIO INFORMATICS<br>D. PATTERN RECOGNITION | 3 | 0 | 0 | 3 | 3 |
| PRACTICAL | | | | | | | |
| 05. | IT795 | INTERNETWORKING LAB | 0 | 0 | 3 | 3 | 2 |
| 06. | IT796 | WEB TECHNOLOGY LAB | 0 | 0 | 3 | 3 | 2 |
| 07. | PE(IT)792 | A. ARITFICIAL INTELLIGENCE LAB<br>B. IMAGE PROCESSING LAB<br>C. SOFT COMPUTING LAB<br>D. VLSI DESIGN AND ALGORITHMS LAB | **0** | **0** | 3 | 3 | 2 |
| 08. | IT721 | INDUSTRIAL TRAINING (4 WEEKS AFTER 6TH SEM | 0 | 0 | 0 | 0 | 2 |
| 09. | IT722 | PROJECT PART - I | 0 | 0 | 6 | 6 | 3 |
| | | **TOTAL** | **15** | **2** | **15** | **32** | **26** |

**Internetworking**

Code: IT 715

Credits: 3

Allotted Hrs: 40 L

**An Overview of the Internet** (4L)

Introduction, The need and scope, Accessing the Internet, Protocol Layering, The TCP/IP Internet, Internet services, Internet standards and administration.

**Internetworking Concepts** (5L)

Review of Network technologies: LAN, WAN, Switching Network; ISDN, BISDN and ATM services, Internet and Intranet , Introduction to Internet Architectural model , Application level and Network level interconnection, Interconnection through IP Gateways or routers.

**Internet Addressing** (5L)

Introduction, Universal identifiers, Classful and classless IP addresses, CIDR, Network and Broadcast addresses, Multicast addressing, Special addresses, subnet and supernet addressing, Mapping internet addresses to physical addresses (ARP), ARP protocol format, IPv6.

**Internet Protocols** (8L)

The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Default Routes, Error and control messages: ICMP; Natting.

The concept of reliable delivery: Connection oriented transport layer delivery, TCP services, TCP segments, TCP performance.

**Routing** (8L)

The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Routers,

Distance Vector (Bellman-Ford) routing, Link State Routing, Autonomous system concept, An Exterior Gateway Protocol: BGP, Interior Gateway Protocol (RIP, OSPF, HELLO), Routing with partial information, MPLS.

**Internet Servers and Applications** (4L)

DNS, DHCP Servers, www, E-Mail and SNMP.

**Internet Security and Firewall** (6L)

IP Security: IPSec, Authentication Header, ESP; SSL: Architecture, implementation (four protocols), Use of SSL; Introduction to Firewall, Activities of Firewall, Configuration of firewall, SSH, VPN.

**References:**

1. Computer Networks and Internets - Douglas E. Comer; PE.
2. Communication Networks - Leon-Garcia-Widjaja; TMH.
3. Internetworking with TCP / IP - Douglas E .Comer; PE.
4. TCP/IP protocol suite - Forouzan Behrouz A; TMH.
5. Computer Networks – Andrew S. Tanenbaum; PHI.
6. Data and Computer Communication - William Stallings; PHI.
7. The Complete reference of Networking - Craig Zacker; TMH.

**Web Technology**

Code: IT 716

Credits: 3

Allotted Hrs: 40 L

**Introduction to Web Application [5L]**

Web Client, Web server, Web Application Architecture, Web Client-Server Request-Response Paradigm, Executing Server Side Scripts / programs, Developing Server Applications, Server-side Technologies: Common Gateway Interface, Active Server Pages, Java Servlets and Java Server Pages, Connecting with Databases.

**Static and Active Web Pages [6L]**

Overview of HTML and DHTML, Cascading Stylesheet; Java Applets and its Life Cycle.

**Javascript [5L]**

Data types, Variables, Operators, Conditional Statements, Array Object, Date Object, String Object, Functions.

**Java Servlets [5L]**

Introduction to Servlets, Servlet Application Programming Interface, The Servlet Architecture, The Servlet Life Cycle, Creating Web Applications with Servlets, Servlets Vs CGI

**Java Server Pages [7L]**

Introduction To JSP, Life Cycle of a JSP Page, Template Text, JSP Elements: Directives, Scripting elements; Action elements: JavaBeans; Implicit Objects and Scope, JSP vs Servlet, JSP vs ASP

**Cookies and Sessions [4L]**

The Contents of a Cookie, Types of Cookies, Creating Cookies using Servlet, Lifecycle of HTTP Session, Session Tracking with Servlet API, Working with a Session

**Enterprise JavaBeans [5L]**

Introduction to EJB, Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Writing Enterprise Beans

**Overview of Android Platform** [3L]

**References:**


1. Java EE for Beginners, Sharanam Shah, SPD Publications
2. Professional Java Server Programming, Allamaraju, WROX Publishers
3. Beginning Java EE 5: From Novice to Professional, Mukhar and Zelenak, Apress


**Data Warehousing and Data Mining**

Code:PE(IT)701A

Credits: 3

Allotted Hrs: 36L

**Data Warehousing(17L)**

Overview and Concepts [2L]:

Need for data warehousing, The building blocks of a Data warehouse.

Architecture and Infrastructure [3L]:

Data Warehouse Architecture, Infrastructure and Metadata Management.

Principles Of Dimension Modelling[3L]:

Introduction to Dimensional Modelling, Advanced Concepts.

Extract Transform Load Cycle [3L]:

ETL overview, Extraction, Loading, Transformation techniques.

Information Access and Delivery [4L]:

Matching information to classes of users, OLAP – the need, Design of the OLAP database, OLAP operations: slice, dice, rollup, drill-down etc. OLAP implementations.

Implementation And Maintenance [2L]:

Physical design process, Aggregates and Indexing. Data Warehouse Deployment.

**Data Mining (19L)**

Introduction [2L]:

Basics of data mining, related concepts, Data mining techniques. The KDD process.

Concept Description [3L]:

Class Characterization and comparison, Attribute relevance analysis, Attribute oriented Induction, Mining descriptive statistical measures in large databases.

Classification Algorithms [4L]:

What is Classification? Supervised Learning, Classifier Accuracy, Decision Tree and Naïve Bayes Classifier.

Clustering [4L]:

What is clustering? Types of data, Partitioning Methods (K-Means, KMedoids)

Hierarchical Methods (Agglomerative, Divisive).

Association rules [4L]:

Motivation For Association Rule mining, Market Basket Analysis, Apriori Algorithm, FP tree Algorithm, Iceberg Queries. Advanced Association Rules (just concepts).

Web Mining [2L]:

Web Content Mining, Web Structure Mining, Web Usage Mining.

**References:**

1) Ralph Kimball, "The Data Warehouse Lifecycle toolkit', 2nd edition, Wiley India.

2) Han, Kamber, "Data Mining Concepts and Techniques", 2nd edition ,Elsevier

3) “Data Warehousing, Data Mining & OLAP” Alex berson& Stephen J Smith, TMG

4) “Introduction to Data Mining”, 1/e Pang-Ning Tan, Vipin Kumar, Michael Steinbach

Pearson Education

5) M.H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education

6)PaulrajPonniah, "Data Warehousing Fundamentals", Wiley Student edition.

7) ReemaTheraja “Data warehousing”, Oxford University Press.

8)“Data mining For Business intelligence” GalitShmueli, Nitin Patel, Peter Bruce; Wiley Student Edition.

9) "Mastering Data Mining”, M Berry and G. Linoff, Wiley Student Edition.

**System Software and Administration**

Code: PE(IT)701B

Credits: 3

Allotted Hrs: 40L

***System Software***

Assemblers: [14]

General design procedures, Design of two pass assemblers, Cross Assemblers, Macro Processors – Features of a macro facility,(macro instruction arguments, conditional macro expansion, macro calls

within macros), Implementation of a restricted facility : A two pass algorithm; Macro Assemblers. Loader schemes: Compile and go loaders, absolute loaders, relocating loader, Linking, Reallocation-static & dynamic linking, Direct linking loaders, Binders, Overlays, dynamic binders; Working principle of Editors, Debuggers.

***System Administration***

Introduction: [3L]

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 inittab file, Run-levels, Run level scripts.

Managing User Accounts: [2L]

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: [2L]

Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making filesystems, Superblock, I-nodes, Filesystem checker, Mounting filesystems, Logical Volumes, Network Filesystems.

***Network Administration***

Configuring the TCP/IP Networking : [4L]

Kernel Configuration; Mounting the /proc Filesystem, 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 : [4L]

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

IP Masquerade and Network Address Translation : [3L]

Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade.

The Network Information System : [3L]

Getting Acquainted with NIS, NIS Versus NIS+ , The Client Side of NIS, Running an NIS Server, NIS Server Security.

Network file system: [3L]

Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File.

System Backup & Recovery: [2L]

Log files for system and applications; Backup schedules and methods (manual and automated).

**References:**


1. John J. Donovan– “Systems Programming “-Tata McGraw-Hill Education
2. E. Nemeth, G. Snyder, S. Seebass, T. R. Hein – “ Unix system administration handbook” – Pearson Education.
3. Kirch – “ Linux network Administrator’s guide (2nd Ed.)” – O’Rielly


**Sensor Network**

Code: PE(IT)701C

Credits: 3

Allotted Hrs: 36 L

Module I(4L):

Introduction and Overview: To provide an overview about sensor networks and emerging technologies. Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hoc Networks), characteristics, reactive and proactive routing protocols with examples, introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.

Module II(8L):

Architectures : network architecture of sensor nodes and its execution environment.

Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes , operating systems and execution environments, examples of sensor nodes, sensor network scenarios, types of sources and sinks – single hop vs. multi hop networks, multiple sources and sinks – mobility, optimization goals and figures of merit, gateway concepts, design principles for WSNs, service interfaces for WSNs.

Module III(8L):

Communication Protocols: To understand the concepts of communication, MAC, routing protocols and also study about the naming and addressing in WSN. Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, low duty cycle protocols and wakeup concepts - S-MAC , the mediation device protocol, wakeup radio concepts, address and name management, assignment of MAC addresses, routing protocols- classification, gossiping, flooding, energy-efficient routing, unicast protocols, multi-path routing, data-centric routing, data aggregation, SPIN, Directed-Diffusion, geographic routing.

Module IV(8L):

Infrastructure Establishment: To learn about topology control and clustering in networks with timing synchronization for localization services with sensor tasking and control. Topology control, flat network topologies, hierarchical networks by clustering, time synchronization, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and approaches, single-hop localization, positioning in multi-hop environment, range based localization algorithms – location services, sensor tasking and control.

Module V(8L):

Sensor Network Platforms and Tools: To study about sensor node hardware and software platforms and understand the simulation and programming techniques. Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.

**References:**

1. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.

2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

**Artificial Intelligence**

Code: PE (IT)702A

Credits: 3

Allotted Hrs: 40L

**Introduction [2L]** Overview of Artificial intelligence- Problems of AI, AI techniques, Tic - Tac - Toe problem, Water-jug problem.

**Problem Solving [2L]** Defining the problem as State space search, Production system, Problem characteristics, Issues in the design of search programs.

**Search techniques [10L]** Solving problems by searching, Uniform search strategies, Breadth first search, Depth first search, Depth limited search, Bidirectional search, Comparison among uniform search strategies. Greedy best-first search, A* search, Memory bounded heuristic search, Local search algorithms & optimization problems, Hill climbing search, Simulated annealing search, Fundamentals of Genetic algorithms; Constraint satisfaction problems, Local search for constraint satisfaction problems.

**Adversarial search [3L]** Fundamentals of Game Theory, Optimal decisions & strategies in games, The minimax search procedure, alpha-beta pruning, Iterative deepening.

**Intelligent Agents [2L]** Agents & environment, Nature of environment, Structure of agents, Goal based agents, Utility based agents, Learning agents.

**Using logic [5L]** Representation of simple fact in logic, Functions & Predicates, Resolution, Natural deduction. Computational Logic -Review of PL & FOPL.

**Knowledge & reasoning [8L]** Knowledge representation issues, Procedural verses declarative knowledge, Forward verses Backward reasoning. Automatic Reasoning using Resolution in PL, Skolem Standard Form in FOPL, Clauses and Clausal Forms, Substitution, Unification, General Resolution, The semantics of Bayesian networks, Dempster-Shafer theory.

**Probabilistic reasoning [3L]** Fundamentals of Fuzzy sets & fuzzy logics.

**Basic knowledge of programming language like Prolog & LISP. [3L]** Basic Syntax & Semantics of Prolog & LISP.

**Expert Systems [2L]** Representation of domain knowledge, Expert System Shells, Knowledge acquisition.

**References:**

1. Artificial Intelligence, Ritch & Knight, TMH .
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson.
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI .
4. Poole, Computational Intelligence, OUP .
5. Logic & Prolog Programming, Saroj Kaushik, New Age International.

**Image Processing**

Code: PE(IT)702B

Credits: 3

Allotted Hrs: 39L

**Introduction [8L]**

Definition, Steps in Digital Image Processing, Components of an Image Processing System, Applications of Digital Image Processing, Neighbour of pixels, Adjacency, Connectivity, Region and Boundary, Distance Measures, Arithmetic/Logic Operations

**Digital Image Formation [4L]**

Light and the Electromagnetic Spectrum, Image Sensing and Acquisition. Image Sampling and Quantization, Image Model, Classification of Digital Images, Image File Formats

**Image Transforms [4L]**

Need for Transform, Discrete Fourier Transform, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Karheunen-Loeve transform, Hough transform

**Image Enhancement: Spatial Domain [4L]**

Basic Gray Level Transformations, Histogram Processing, Convolution and Correlation, Image Smoothing through Spatial Filters, Image Sharpening through Spatial Filters

**Image Enhancement: Frequency Domain [4L]**

Image Smoothing through Frequency-Domain Filters, Image Sharpening through Frequency Domain Filters, Homomorphic Filtering

**Image Restoration [4L]**

Types of Degradation, Types of Image Blur, Classification of Image Restoration Techniques, Image Restoration Model, Linear and Non-linear Image Restoration Techniques, Blind Deconvolution, Classification of Noise in Image, Image Denoising

**Image Segmentation [4L]**

Classification of Image Segmentation Techniques, Edge based Segmentation, Classification of edges, Edge detection, Edge Linking, Hough Transform, Region based approach to Segmentation, Clustering Techniques, Segmentation based on Thresholding, Watershed Transformation, Active Contour

**Image Compression [4L]**

Spatial and Temporal Redundancy, Image Compression Models- Lossless and Lossy Compression.

**Colour Image Processing [3L]**

Colour Models, Colour Transformation, Image Segmentation based on Colour

**References:**

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

**Soft Computing**

Code: PE(IT)702C

Credits: 3

Lectures: 36L

Module-I(10L)

Fuzzy logic: Conventional and fuzzy sets, operations on fuzzy sets, fuzzy numbers, crisp relations and fuzzy relations, realization of fuzzy systems using fuzzy relations, application of fuzzy logic in optimization, vision, pattern recognition.

Module-II(10L)

Neural Network: Introduction to neural networks, threshold logic Models of neural network: Perceptron,. Adaline, Madaline, Multi-layer perceptron, backpropagation learning, RBF network, Hopfield networks, ART –I and II, SOFM.

Module-III(10L)

Evolutionary computing: Introduction to Evolutionary Computation: Genetic algorithms, Genetic programming, Evolutionary strategies, Evolutionary programming. Genetic algorithms – Chromosome representation, encoding, decoding, Genetic operators: Selection, Crossover, Mutation, Elitism, Schema Theorem, EGA, Convergence theorem, real-coded GA, Ordered GA, Steady-state GA, Multi-objective evolutionary algorithms, applications in search and optimization. Recent advances in Evolutionary Computing (Particle Swarm Optimization, Ant Colony Optimization).

Module-IV(6L)

Hybridizations: Different types of integrations, merits. Neuron-fuzzy, Neuro-GA, FuzzyGA, Neuro-fuzzy-GA

**References:**

1. G. J. Klir and B. Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.

2. K. H. Lee, First Course on Fuzzy Theory and Applications, Springer, 2005.

3. S. Haykin, Neural Networks: A Comprehensive Foundation, 2nd ed., Prentice Hall, New Jersey, 1999.

4. J. M. Zurada, Introduction to Artificial Neural Systems, West Publishing Co., St. Paul, Minnesota, 1992. 5. J. Hertz, A. Krogh, and R. G. Palmer, Introduction to the Theory of Neural Computation, Addison Wesley, California, 1991

6. B. Yegananarayanan, Artificial Neural Networks, Prentice Hall of India, New Delhi, 1999.

7. C. M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

8. D.E. Goldberg, Genetic algorithms in search, optimization and machine learning, Addison Wesley, 1989.

9. 11. S. Rajasekharan, G. A. V. Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI, 2003.

**VLSI Design and Algorithms**

Code: PE(IT)702D

Credits: 3

Allotted Hrs: 38L

**Introduction to CMOS : (4L)**

MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations, MOS Transistor models : NMOS, PMOS,CMOS.

**Basic Electrical Properties and Circuit Concepts : (8L)**

MOS transistor switches. NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance. CMOS Logic, The inverter, Combinational Logic, NAND gate, NOT Gate, Compound Gates, Multiplexers, Memory-Latches and Registers.

**Power Dissipation: (2L)**

Static dissipation, Dynamic dissipation, short-circuit dissipation, total power dissipation.

**Placement & Routing: (4L)**

Mincut based placement – Iterative improvement placement simulated annealing. Segmented channel routing – maze routing – routability and routing resources – net delays.

**Verification and Testing**: **(5L)**

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

**Introduction to Computer aided design tools for digital systems : (15L)**

Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration, Introduction to behavioral, dataflow and structural models.

VHDL Statements : Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

Applications of VHDL : Combinational Circuit Design such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc.,

Sequential Circuit Design such as Shift registers, Counters etc.

**References:**

1. CMOS Digital Integrated Circuit, S.M.Kang & Y .Leblebici ; TMH
2. Modern VLSI Design, Wayne Wolf ; Pearson
3. Algorithm for VLSI Design & Automation ; N.Sherwani, Kluwer
4. A VHDL Primmer, Bhaskar ; PHI
5. Principle of CMOS VLSI Design, Weste and Eshrighian ; Pearson Education.
6. Modern VLSI Design: system on silicon, Wayne Wolf, Addison; Wesley Longman Publisher
7. Basic VLSI Design, Douglas A. Pucknell & Kamran Eshranghian; PHI

**Distributed Computing System**

Code: PE(IT)703A

Credits: 3

Alloted Hrs.: 36L

**Introduction to Distributed System [4]**

Introduction, Examples of distributed system, Resource sharing, Challenges, Architectural models; Theoretical Foundations: Inherent Limitations of distributed Systems, absence of global clock, shared memory, Lamport's Logical clock.

**Concepts in Message Passing Systems[3]**

Features, Issues in message passing: Failure handling, consistent and causal order, total order, total causal order, Techniques for Message Ordering.

**Communication in Distributed System[4]**

System models, Inter-process communication , Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from Sun and DCE RPC.

**Distributed Mutual Exclusion[4]**

Classification of distributed mutual exclusion algorithm. NonToken based Algorithm:Lamport's algorithm, Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.

**Distributed Deadlock Detection[4]**

Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

**Distributed Shared Memory [4]**

Architecture, Design and Implementation Issues, Algorithms for implementing DSM. Memory Coherence.

**Distributed file systems [6]**

Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience. Use of the Virtual File System layer. Examples of distributed systems including Sun NFS, OSF DCE and CODA file system.

**Protection and Security [4]**

Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

**CORBA [3]**

The Common Object Request Broker Architecture model and software and its relationship to Operating Systems.

**References:**

1 Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems Principles and Paradigms, PHI

2. Singhal Mukesh & Shivaratri N. G., Advanced Concepts in Operating Systems, TMH

3. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 199

4. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.

5. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.

6. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.

7. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.

**Cloud Computing**

Code: PE(IT)703B

Credits- 3

Allotted Hrs: 36L

Module I(9L):

Definition of Cloud Computing , Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference ,Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing .

Cloud Architecture: Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients

Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)

Module II(12L):

Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance

Concepts of Platform as a Service Definition of services, Distinction between SaaS and PaaS, Application development Use of PaaS Application frameworks

Use of Google Web Services Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit , major features of Google App Engine service.

Use of Amazon Web Services Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service

Use of Microsoft Cloud Services Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Module III (7L):

Cloud Infrastructure :Types of services required in implementation – Consulting, Configuration, Customization and Support 1. Cloud Management An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)

Concepts of Cloud Security Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)

Module IV(8L) :

Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs

Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs

Cloud-based Storage: Cloud storage definition – Manned and Unmanned

Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services

**References:**

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013

2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013

3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill

4. Cloud Computing, Miller, Pearson

5. Building applications in cloud: Concept, Patterns and Projects, Moyer, Pearson

**Pattern Recognition**

Code: PE(IT)703D

Credits- 3

Allotted Hrs: 36L

**Introduction and Mathematical Preliminaries [6L]**

Basics of Pattern Recognition, Pattern Recognition Systems, Design Cycle, Learning and Adaptation, Clustering vs. Classification; Applications; Basics of Linear Algebra, Vector Spaces, Probability Theory Basics, Decision Boundaries.

**Bayesian Decision Theory [4L]**

Bayes decision rule, Error probability, Normal Distribution, Error rate

**Linear Discriminants [5L]**

Linear Discriminant Functions and Decision Surfaces; Linear Separability; Perceptrons; Support Vector Machines

**Parametric Techniques [5L]**

Maximum Likelihood Estimation; Bayesian Parameter Estimation; Sufficient Statistics;

**Non-Parametric Techniques [5L]**

Kernel Density Estimators; Parzen Window; Nearest Neighbor Methods

**Unsupervised Learning and Clustering [7]**

Unsupervised Bayesian Learning, Component Analysis and Dimension Reduction: Principal Component Analysis, Fisher Linear Discriminant Analysis, Independent Component Analysis; Clustering: K-Means, Hierarchical Clustering, Fuzzy C-Means Clustering

**Tree Classifiers [4]**

Decision Trees, Random Forests.

**References:**

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.

2. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.

3. S. Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

**Government College of Engg. & Ceramic Technology**
**Autonomy Syllabus 8th Semester**

| SL. NO | PAPER CODE | PAPER NAME | L | T | P | CONTACT HRS./WEEK | CREDIT |
|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | |
| 01. | HS804 | INDUSTRIAL MANAGEMENT | 3 | 0 | 0 | 3 | 3 |
| 02. | IT817 | E- COMMERCE | 3 | 0 | 0 | 3 | 3 |
| 02. | PE(IT)804 | A. MOBILE COMPUTING<br>B. ADVANCED WEB TECHNOLOGY<br>C. CRYPTOGRAPHY & NETWORK SECURITY<br>D. NATURAL LANGUAGE PROCESSING<br>E. COMPUTER VISION | 3 | 0 | 0 | 3 | 3 |
| 03. | OE(IT)803 | A. PROJECT MANAGEMENT<br>B. ROBOTICS<br>C. REAL TIME OPERATING SYSTEMS<br>D. GIS & REMOTE SENSING<br>E. CYBER LAW & SECURITY POLICY<br>F. OPTICAL NETWORKING | 3 | 0 | 0 | 3 | 3 |
| **PRACTICAL** | | | | | | | |
| 05. | IT897 | E- COMMERCE LAB | 0 | 0 | 3 | 3 | 2 |
| 04. | IT723 | PROJECT PART -II | 0 | 0 | 12 | 12 | 8 |
| 05. | IT724 | COMPREHENSIVE VIVA VOCE | 0 | 0 | 0 | 0 | 2 |
| | | TOTAL | 12 | 0 | 15 | 27 | 24 |

**Industrial Management**
**HS804**
**Contact: 3L**
**Credit: 3**
**Allotted: 36L**

**Basics of Management [4L]:** Introduction, Definition of management, characteristics of management, functions of management - Planning, Organizing, Staffing, Directing, Co-ordination, Controlling, Motivating, Communication, Decision Making, Principles of management, Administration and management, Forms of Organization- Line, Line –staff etc. Forms of ownerships – Partnership, Proprietorship, Joint stock, Co-operative society, Govt. Sector etc.

**Strategic Management [4L]:** Military origins of strategy – Evolution - Concept and Characteristics of strategic management, Preparing an Environmental Threat and Opportunity Profile (ETOP) – Industry Analysis - Porter's Five Forces Model of competition. BCG Matrix – GE 9 Cell Model - Balanced Scorecard, Generic Competitive Strategies: Low cost, Differentiation, Focus

**Quality Management [8L]:** Definition of quality, goalpost view of quality, continuous improvement definition of quality, types of quality – quality of design, conformance and performance, phases of quality management, Juran's and Demings view of quality, Quality Management Assistance Tools: Ishikawa diagram – Pareto Analysis – Pokka Yoke (Mistake Proofing).quality circles, TQM, Kaizen, Five S (5S), Six sigma Quality Management Standards (Introductory aspects only)- The ISO 9001:2000 Quality Management System Standard- The ISO 14001:2004 Environmental Management System Standard- ISO 27001:2005 Information Security Management System

**Financial Management [6L]:** Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph

**Human Resource Development [6L]:** Strategic importance HRM; objectives of HRM; challenges to HR professionals; role, Responsibilities and competencies of HR professionals; HR department operations; Human Resource Planning - objectives and process; human resource information system.. Talent acquisition; recruitment and selection strategies, career planning and management, training and development, executive development.

**Management Information Systems [4L]** Concept of data and information, characteristics of information, types of information, Definition of MIS, Need, Purpose and Objectives, Decision-making models, Types of decisions, Decision Support Systems, Introduction to e-commerce, types – B2B, B2C, C2B, C2C etc.

**Industrial Laws [4L]:** Indian IT Act, Minimum Wages Act, 1948, The Factories Act, 1948, Industrial Disputes Act, 1947, Environment Protection Act, 1986, Indian Boiler Act, 1923, Payment of Wages Act, 1936, Indian Electricity Act, 1910, Workmen's Compensation Act, 1923, Employees' State Insurance Act, 1948.

**References:**


1. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd, New Delhi
2. L.C.Jhamb , Savitri Jhamb , Industrial Management – I , Everest Publishing House .
3. Dinesh Seth and Subhash C. Rastogi, "Global Management Solutions", Cengage Learning, Second Edition, USA.
4. B. Davis and Margrethe H. Olson, "Management Information Systems", Mc-Graw-Hill International Editions.
5. Azar Kazmi , "Strategic Management & Business Policy ", Tata McGraw Hill, New Delhi
6. Kenneth C. Laudon and Jane P. Laudon, ""Management Information Systems", Eighth Edition, Pearson Education
7. K.Shridhara Bhat, "Materials and Logistics Management", Himalaya Publishing House, Mumbai
8. M.Y. Khan and P. K. Jain, "Financial Management", Tata McGraw Hill, New Delhi Ravi M. Kishore, "Project Management", Tata McGraw Hill, New Delhi

**E-Commerce**
**IT817**
**Contact: 3L**
**Credit: 3**
**Allotted: 36L**

**Introduction to E-Commerce [4L]**
Definition, Scope of E-Commerce, Hardware requirements, Ecommerce and Trade Cycle, Electronic Markets, Internet Commerce.

**Business to Business E-Commerce [6L]**

Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

**Legal issues [5L]:**
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.

**Security Issues [6L]:**
Security Solutions: Symmetric and Asymmetric Cryptosystems, Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Financial transactions over internet, Internet Security.

**Business to Consumer E-Commerce [8L]:**
Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with case studies.

**E-business [7L]:**
Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking , E Auctions, Online Share Dealing, E-Diversity with Case studies.

**Books:**
1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
3. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and TheodoreH. K Clark, University Press

**MOBILE COMPUTING**
**PE(IT)804A**
**Contacts: 3L**
**Credits- 3**
**Total: - 36L**

**Module1 [5L]**
Introduction to Mobile Communications and Computing ; GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security; GPRS: GPRS Architecture; 3G Mobile Services, LTE, Quality of services; Satellite systems: Basics and Applications; Mobile Computing (MC) , limitations, and architecture.

**Module2 [10L]**
Infrastructure and Adhoc Networks, (Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.; WLANs: Services, DFWMAC, IEEE 802.11 standards; Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management).

**Module3 [5L]**
Mobile Network Layer : Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

**Module4 [5L]**
Mobile Transport Layer : Traditional TCP, Classical TCP Improvements, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission.

**Module5 [5L]**
Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

**Module6 [6L]**
Protocols and Tools : Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), WML.
Server-side programming in Java, Pervasive web application architecture, Device independent example application.

**REFERENCES :**
1. Jochen Schiller,"Mobile Communications",Addison-Wesley.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press.
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional.
5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer.
6. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech.

**Cryptography & Network Security**
**PE(IT)804C**
**Contacts: 3L**
**Credits- 3**
**Total: - 36L**

**Module1 [3L]:**
Introduction**:** Principles of Security, Need for Security, Security approaches, Types of attack and their impact.

**Module2 [4L]:**
Cryptography: Concepts & Techniques, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption.

**Module3[8L]:**
Symmetric Key Cryptography, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.

**Module4[8L]:**
Asymmetric Key Cryptography, overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function.

**Module5[7L]:**
Internet Security Protocols, User Authentication, Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.

**Module6[3L]:**
Electronic Mail Security , Pretty Good Privacy, S/MIME.

**Module7[3L]:**
Firewall, Types of firewall, Firewall Configurations, DMZ Network

**REFERENCES :**
1. “Cryptography and Network Security”, William Stallings, 2nd Edition, Pearson Education Asia
2. “Network Security private communication in a public world”, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.
4. “Network Security Essentials: Applications and Standards” by William Stallings, Pearson
5. “Designing Network Security”, MerikeKaeo, 2nd Edition, Pearson Books
6. “Building Internet Firewalls”, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
7. “Practical Unix & Internet Security”, Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

**REAL TIME OPERATING SYSTEM**
**OE(IT)803C**
**Contacts: 3L**
**Credits- 3**
**Total: - 36L**

**Introduction to RTOS [6L]**
Architecture of OS (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures), Virtual Computers, Interaction of O.S. & hardware architecture, Evolution of operating systems, Batch, multi programming. Multitasking, Multiuser, parallel, distributed & real time O.S.

**Architectures of RTOS[10L]**
Defining Real time systems, designing and Developing Real-time Systems, Special Characteristics of real time systems, Hard Real Time System and Soft Real Time System, Interrupts and Exceptions, Concepts of interrupt driven activation, need for real time monitor, pseudo parallelism, meeting of deadlines & real time constraints, Real-Time Devices, Event driven activities, Timers and Real-time Facilities, I/O Devices and Buses, Serial devices and parallel devices, Peripheral serial buses.

**Resource management [6L]**
Resource management in real-time systems, potential problems and their resolution as well as practical issues in building real-time systems.
Resource sharing in real-time systems.
Distributed real-time systems, multiprocessor real-time systems

**Process Management [8L]**
Multitasking in Real-Time Systems, Real Time Scheduling concepts. Uniprocessor scheduling, Multiprocessor Scheduling, schedulablity analysis, clock-driven and priority-driven scheduling Process Synchronization, Inter-task communication Networking,

**Implementation model [6L]**
Overview of WARD & MELLOR Methodology: Ward & Mellor Life Cycle, the essential model step, the, real time extensions of DFD Real time languages: overview of ADA/Java Extension

**REFERENCES :**

1. C.M.Krishna and G.Shin, *"Real Time Systems,"* McGraw-Hill International Edition
2. Real Time Systems and software -Alan C. Shaw ; John Wiley & Sons Inc
3. "Real time Systems", J. W. S. Liu, Pearson

**GIS AND REMOTE SENSING**
**OE(IT)803D**
**Contacts: 3L**
**Credits- 3**
**Total: - 34L**

**Module1[6L]**

Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere scattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance

**Module2[10L]**

Data acquisition Process, Reflectance and Digital numbers, Reference data, Ground truth, Analog to Digital conversion, Aerial Photography – Photogrammetry and Visual Image Interpretation, Satellites in orbit and their sensors, Resolutions; Multispectral Remote Sensing system,Visible-Near Infra-Red Thermal Infra-Red Radiation properties and applications, Microwave and LIDAR Remote Sensing – Principles and Applications, Hyperspectral Remote Sensing-Principles and Applications .

**Module3[5L]**

Digital images; Subsetting of Data; Geo-referencing of Digital data; Image enhancement techniques: Histogram equalization; Band ratio; Image filtering; Principal Component Analysis (PCA).

**Module4[6L]**

GIS: Features and Functions; GIS as an Information System; GIS and Cartography, GIS and Maps, Map Projections and Coordinate Systems

**Module5[7L]**

Geographic data: Spatial and Non Spatial; Data Models: Raster and Vector; GIS Database; Data Structures: Relational, Hierarchical and Network; Data input: Digitization of Maps and Imageries; Coordinate transformation; Attribute Data Generation.

**REFERENCES**


1. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, “Remote sensing and image interpretation “, John Wiley & Sons.
2. Jensen J. , “Remote Sensing and Image Processing”, Pearson
3. Burroughs P. A, “Principles of Geographical Information System”, Oxford University Press.

**Cyber law and Security Policy**
**OE(IT)803E**
**Contacts: 3L**
**Credits- 3**
**Total: - 36L**

**Module1[3L]:**
Introduction of Cybercrime, Category of Cybercrime, Forgery, Hacking, Software Piracy, Network intrusion.

**Module2[3L]:**
Attacks: passive attack, Active attacks, cyberstalking.

**Module3[8L]:**
Cybercrime on Mobile & Wireless devices: Security challenges in mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

**Module4[8L]:**
Tools and Methods used in Cyber-crime: Proxy servers, password breaking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: buffer overflow,

**Module5[6L]:**
Phishing methods, Identity theft, Online identity method, social engineering, ransomware, keystroke dynamics.

**Module6[8L]:**
Security policy: Intrusion detection system(IDS), password protection, Legal aspects, Indian laws, IT act, Digital certificate, Aadhar(UID).

**REFERENCES :**
1. Cyber security , Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Information Security and Cyber Laws, Pankaj Agarwal