

**Proposed Curricula for 3<sup>rd</sup> to 8<sup>th</sup> Semesters in Computer Science and Engineering (CSE)**

**Semester- III**

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	M 301	Engineering Mathematics III	3	0	0	2	100
2	M 302	Numerical Methods and Optimization Techniques	3	0	0	3	100
3	CSE 301	Advanced Data Structure	3	1	0	3	100
4	CSE 302	Algorithm Analysis and Design	3	1	0	3	100
5	ECE 322	Principles of Electronic Devices	3	0	0	2	100
6	ECE 323	Principles of Digital Electronics & Logic Design	3	1	0	3	100
<b>Practical/Sessional Papers</b>							
7	M 352	Numerical Methods and Optimization Techniques Laboratory	0	0	3	2	100
8	CSE 351	Advanced Data Structure Laboratory	0	0	3	2	100
9	ECE 372	Electronic Devices Laboratory	0	0	3	2	100
10	ECE 373	Digital Logic Laboratory	0	0	3	2	100
<b>Sub-total</b>			<b>18</b>	<b>3</b>	<b>12</b>	<b>24</b>	<b>1000</b>
<b>Total</b>			<b>33</b>			<b>24</b>	<b>1000</b>

**Semester- IV**

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	M 402	Discrete Mathematics	3	0	0	2	100
2	CSE 401	Fundamentals of Computer Organization and Architecture	3	1	0	3	100
3	CSE 402	Object Oriented Technology I	3	1	0	3	100
4	ECE 422	Microprocessor and Its Applications	3	1	0	3	100
5	CSE 403	Computer Graphics	3	1	0	3	100
6	HS 401	Values and Ethics (Non-credit paper)*	3	0	0	0	100
<b>Practical/Sessional Papers</b>							
7	CSE 451	Fundamental Computer Organization and Architecture Laboratory	0	0	3	2	100
8	CSE 452	Object Oriented Technology I Laboratory	0	0	0	2	100
9	CSE 453	Computer Graphics Laboratory	0	0	3	2	100
10	ECE 472	Microprocessor and Its Applications Laboratory	0	0	3	2	100
11	HS 481	Business Communication and Presentation Skills I	0	0	2	2	100
<b>Subtotal</b>			<b>18</b>	<b>4</b>	<b>11</b>	<b>24</b>	<b>1000</b>
<b>Total</b>			<b>33</b>			<b>24</b>	<b>1000</b>

Semester- V

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	CSE 501	Computer Network	3	1	0	3	100
2	CSE 502	Operating System	3	1	0	3	100
3	CSE 503	Internet and Web Technology	3	1	0	3	100
4	CSE 504	Formal Language And Automata Theory	3	1	0	3	100
5	CSE 505	System Programming	3	1	0	3	100
6	ECE 521	Communication Engineering	3	0	0	2	100
<b>Practical/Sessional Papers</b>							
7	CSE 551	Computer Network Laboratory	0	0	3	2	100
8	CSE 552	Operating System Laboratory	0	0	3	2	100
9	CSE 553	Internet and Web Technology Laboratory	0	0	3	2	100
10	ECE 571	Communication Engineering Laboratory	0	0	3	2	100
<b>Sub-total</b>			<b>18</b>	<b>5</b>	<b>12</b>	<b>25</b>	<b>1000</b>
<b>Total</b>			<b>35</b>			<b>25</b>	<b>1000</b>

Semester- VI

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	CSE 601	Database Management System	3	1	0	3	100
2	CSE 602	Software Engineering	3	1	0	3	100
3	CSE 603	Compiler Design	3	1	0	3	100
4	CSE 604	Object Oriented Technology II	3	1	0	3	100
5	ECE 622	Digital Signal Processing	3	1	0	3	100
<b>Practical/Sessional Papers</b>							
6	CSE 651	Database Management System Laboratory	0	0	3	2	100
7	CSE 653	Compiler Design Laboratory	0	0	3	2	100
8	CSE 654	Object Oriented Technology II Laboratory					
9	ECE 672	Digital Signal Processing Laboratory	0	0	3	2	100
10	HS 681	Business Communications and Skills II	0	0	3	2	100
<b>Sub-total</b>			<b>15</b>	<b>5</b>	<b>14</b>	<b>25</b>	<b>1000</b>
<b>Total</b>			<b>34</b>			<b>25</b>	<b>1000</b>

**Semester- VII**

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	HS 701	Law for Engineers	3	0	0	2	100
2	CSE 701	Computational Intelligence	3	1	0	3	100
3	CSE 702	Digital Image Processing	3	1	0	3	100
4	CSE 703	Design and Analysis of Information System	3	1	0	3	100
5	Refer to Appendix-I	Professional Elective I	3	1	0	3	100
<b>Practical/Sessional Papers</b>							
6	CSE 751	Computational Intelligence Laboratory	0	0	3	2	100
7	CSE 752	Digital Image Processing Laboratory	0	0	3	2	100
8	CSE 753	Information System Design Laboratory	0	0	3	2	100
9	CSE 791	Project I	0	0	3	4	100
10	CSE 792	Seminar I	0	0	3	2	100
<b>Sub- total</b>			<b>15</b>	<b>5</b>	<b>15</b>	<b>26</b>	<b>1000</b>
<b>Total</b>			<b>34</b>			<b>26</b>	<b>1000</b>

**Semester- VIII**

Sl. No	Paper Code	Name of the Paper	Periods/Week			Credits	Full Marks
			L	T	P		
<b>Theoretical Papers</b>							
1	CSE 801	VLSI System Design	3	1	0	3	100
2	CSE 802	Cryptography and Network Security	3	1	0	3	100
3	CSE 803	Advance Computer Organization and Architecture	3	1	0	3	100
4	Refer Appendix-II	Professional Elective II	3	1	0	3	100
<b>Practical/Sessional Papers</b>							
5	CSE 851	VLSI System Design Laboratory	0	0	3	2	100
6	CSE 891	Project II	0	0	6	6	100
7	CSE 892	Seminar II	0	0	3	2	100
8	CSE 893	Grand Viva	0	0	0	3	100
<b>Sub-total</b>			<b>12</b>	<b>4</b>	<b>12</b>	<b>25</b>	<b>800</b>
<b>Total</b>			<b>28</b>			<b>25</b>	<b>800</b>

**Appendix-I**  
**Professional Elective I (CSE 7<sup>th</sup> Semester)**  
**List of Electives**

<b>Sl. No</b>	<b>Paper code</b>	<b>Name of the paper</b>
1.	CSE 711(a)	Data Mining
2.	CSE 711(b)	Embedded Systems and Applications
3.	CSE 711(c)	E-Commerce
4.	CSE 711(d)	Robotics
5.	CSE 711(e)	Natural Language Processing
6.	CSE 711(f)	Big Data Analysis

**Appendix-II**  
**Professional Elective II (CSE 8<sup>th</sup> Semester)**  
**List of Electives**

<b>Sl No.</b>	<b>Paper code</b>	<b>Name of the paper</b>
1	CSE 811(a)	Computer Vision
2	CSE 811(b)	Fault Tolerant Systems
3	CSE 811(c)	Distributed Computing
4	CSE 811(d)	Pattern Recognition
5	CSE 811(e)	Distributed Operating System
6	CSE 811(f)	Data Analytics

Semester- III

**Paper Name : Engineering Mathematics III**

**Paper Code : M 301**

**Weekly Load : L: 3 T: 0 P: 0**

**Credit Unit : 2**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
<b>1</b>	<p><b>Complex Analysis:</b> Complex Variable functions; Limit, Continuity, Differentiability and analyticity of functions of a complex variable, Cauchy-Riemann Equations, Laplace Equation, Harmonic function, Mobius transformation, Cauchy's integral Theorem, Cauchy's integral formula, Power series, Taylor's series, Liouville's Theory, Laurent's series, Zeros and singularities, Calculus of residues, Contour integration.</p>	<b>15L</b>
<b>2</b>	<p><b>Probability:</b> Conditional probability, multiplication rule, independence, total probability, Bayes' theorem, applications. Random variables: Definition, Discrete and continuous random variable, probability mass function and probability density function, expectation and variance Some special distributions: Uniform, Exponential, Hypergeometric, Binomial, Poisson and Normal distribution. Joint distribution: Joint, Marginal and conditional distributions, Covariance, Correlation, Independence of random variables.</p>	<b>12L</b>
<b>3</b>	<p><b>Statistics:</b> Regression: Least square method, linear fitting, parabolic curve fitting, goodness of fit. Sampling distribution: Central limit theorem, distribution of sample mean and sample variance for a normal population, Chi-square, t and F distribution.</p>	<b>6L</b>
<b>4</b>	<p><b>Estimation:</b> Consistent and unbiased estimate, Maximum likelihood estimation, Applications. Confidence intervals: Confidence intervals for the means and variances of different distributions. Testing of Hypotheses: Null and alternative hypotheses, Critical and acceptance region, Type-I and Type-II error, power of the test, Neymann-Pearson lemma, Applications in population.</p>	<b>9L</b>
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Probability, Statistics and Random Processes-T.Veerarajan, Tata McGrawHill, 2002
2. Stochastic Processes-J. Medhi, Wiley, 1994
3. Theory of Functions of a complex variable- Shanti Narayan, P.K. Mittal, S.Chand Publishing & Company
4. Complex Variables-Spiegel, McGrawHill

**Paper Name : Numerical Methods and Optimization Techniques****Paper Code : M 302****Weekly Load : L: 3 T: 0 P: 0****Credit Unit : 3****Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Numerical Methods:</b> Error Formulation</p> <p><b>Numerical Interpolation:</b> Finite differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation, error analysis.</p> <p><b>Numerical Differentiation and Integration:</b> Numerical differentiation using interpolating polynomial, Trapezoidal rule, Simpson's 1/3 rd rule of integration, error analysis.</p>	<b>15L</b>
<b>2</b>	<p><b>Numerical solution of polynomial and transcendental equations:</b> Bisection method, Regula-Falsi method, Fixed point iteration, Newton-Raphson method, Gauss-Jacobi iteration and Gauss-Seidel iteration for solving a system of linear equations.</p> <p><b>Numerical solution of ODE:</b> Numerical solution of first order ODE with initial condition by Picard's, Euler's and Taylor's series method, Runge-Kutta method, Predictor-Corrector methods (Milne and Adams-Bashforth); Boundary value problems, Shifting and finite difference method.</p>	<b>12L</b>
<b>3</b>	<p><b>Introduction:</b> Historical Development, Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems.</p> <p><b>Linear Programming:</b> Graphical method, Simplex method, Big-M Method, Revised simplex method, Duality in linear programming (LP), Sensitivity analysis, Transportation, assignment and other applications.</p> <p><b>Game theory and its applications:</b> Maximin, Minimax Principle, Two-person-zero-sum game, Dominance principle, Graphical Method.</p>	<b>6L</b>
<b>4</b>	<p><b>Non Linear Programming:</b> Unconstrained optimization techniques, Direct search methods, Constrained optimization, Direct and indirect methods, Optimization with calculus, Kuhn-Tucker conditions.</p> <p><b>PERT and CPM</b></p>	<b>9L</b>
	<b>TOTAL:</b>	<b>42L</b>

	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International (P) Ltd., New Delhi, 2000.
2. J.K.Sharma "Operations Research", National Publishing House
3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
4. K. Deb, "Optimization for Engineering Design – Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. An Introduction to Numerical Analysis (2nd edn.)-Atkinson, John Wiley and sons
6. Numerical Analysis-James Blaine Scarborough, Oxford University Press
7. Numerical Analysis and computational Procedure-S.A. Mollah, Books and Allied Publishers

**Paper Name : Advanced Data Structure**

**Paper Code : CSE 301**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Unit : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Sorting:</b> Merge Sort, Quick Sort, Bucket Sort, Radix Sort, Counting Sort.	<b>8L+4T</b>
<b>2</b>	<b>Heap:</b> Heap Sort, Balanced search tree as heaps, Array based heaps, Heap-ordered trees and half-ordered trees, Leftist heaps, Skew heaps, Binomial heaps, Changing keys in heaps, Fibonacci heaps. <b>Priority Queue:</b> Models and simple implementation, Double ended priority queues, Binary Heap and application.	<b>14L+4T</b>
<b>3</b>	<b>Tree:</b> M-way search tree, B-tree, B <sup>+</sup> tree, AVL tree, Splay tree, KD tree-point location problem.	<b>12L+4T</b>
<b>4</b>	<b>Hashing:</b> Hash function, Different types of hash table - Universal hashing and perfect hashing. <b>Graph:</b> Definition, basic terminologies, representation of graph, graph traversal methods, applications of graph.	<b>8L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, Data Structures Using C and C++ , Prentice Hall India Learning Private Limited

2. R. L. Kruse, B. P. Leung and C. L. Tondo, Data Structures and Program Design in C: Kruse & Leung, Prentice Hall India Learning Private Limited
3. Heileman, Data Structures, Algorithms & Object Oriented Programming, Tata Mcgraw-Hill Publishing Company Limited
4. M. Radhakrishnan and V. Srinivasan, Data Structures Using C, BPB Publications
5. H. Ellis and S. Sahni, Fundamentals of Data Structures, Computer Science Press.
6. A. Agarwal, Data Structure through C, Cyber Tech Publications.
7. S. Lipschutz, Data Structures, Tata Mcgraw-Hill Publishing Company Limited.

**Paper Name : Algorithm Analysis and Design**

**Paper Code : CSE 302**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Unit : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Algorithm, Flowchart, Mathematics for Algorithmic Sets, Functions and Relations, Review of proof techniques.</p> <p><b>Analysis of Algorithm:</b> Ideas of time and space complexity, Big O, <math>\Omega</math>, <math>\Theta</math> notations, Solutions of Recurrence relations, Analyzing control statement, Loop invariant and the correctness of the algorithm Complexity analysis of well-known algorithms.</p>	6L+1T
2	<p><b>Divide and Conquer Algorithm:</b> Introduction, Problem Solving using Divide and Conquer Algorithm.</p> <p><b>Dynamic Programming:</b> Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming.</p>	12L+4T
3	<p><b>Greedy Algorithm:</b> General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm.</p> <p><b>Backtracking and Branch and Bound:</b> Introduction, Problem solving using Backtracking and Branch and Bound.</p>	11L+4T
4	<p><b>Exploring Graphs:</b> Topological sort, Minimum spanning tree, Connected component finding algorithms (Strongly connected components &amp; Bi-connected component). Single source shortest path problem, All pair shortest path problem.</p> <p><b>Introduction to NP-Completeness:</b> The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem.</p>	13L+5T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>



**Books: Text and/or Reference:**

1. T.H. Coreman, C.E. Leiserson, R. L. Rivest and C. Stein, Introduction to Algorithms, The MIT Press.
2. E.Horowitz, S.Sahani and S. Rajasekaran, Fundamentals of Computer Algorithms, Universities Press.
3. S. Baase and A. V. Gelder, Computer Algorithms: Introduction to Design and Analysis, Pearson
4. G. Bassard and P. Bartly, Fundamentals of Algorithmics, Prentice Hall India Learning Private Limited
5. A. V. Aho, J. E. Hopcroft and J. D. Ullman, The Design and Analysis of Algorithms, Prentice Hall India Learning Private Limited
6. J. Kleinberg and E. Tardos, Algorithm Design, Pearson.

**Paper Name : Principles of Electronic Devices**

**Paper Code : ECE 322**

**Weekly Load : L: 3 T: 0 P: 0**

**Credit Unit : 2**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>BJT and Circuits:</b> Overview of analog Devices and Circuits. Characteristics of BJT; Ebers-Moll equations and large signal models; inverse mode of operation, early effect; BJT as an amplifier and switch. Biasing and dc circuits of BJT Small signal models, Small signal analysis of CE, CB, CC amplifiers using $r_e$ models, frequency response of amplifiers. Large signal analysis of BJT.	<b>11L</b>
<b>2</b>	<b>FET:</b> JFET types, Device structure and operation , Volt-amp characteristics. <b>MOSFET:</b> enhancement NMOS, PMOS and CMOS, Device structure and operation of Volt-amp characteristics. Biasing and dc circuits of JFET, MOS. Current source biasing. Small signal analysis of JFET (CS, CG, Source follower).	<b>8L</b>
<b>3</b>	<b>Operational amplifiers :</b> Ideal operational amplifier(OP-AMP), parameters, Characteristics. Inverting and noninverting configurations; Common OPAMP ICs: Gain-frequency and Slew rate etc. <b>Applications of Op-AMP:</b> Inverting, Non-Inverting amplifiers; Instrumentation Amplifier, Integrators, Differentiators; Comparators; Schmitt triggers, Active filters, Linear regulators etc.	<b>10L</b>

<b>4</b>	<b>Feedback , oscillators and Application Specific ICs:</b> Feedback concept and definition; Four basic feedback topologies with real circuits; Analysis of Series-shunt, series-series, shunt-shunt and shunt-series feedback amplifiers; Principle of sinusoidal oscillators and Barkhausen criterion; Wien Bridge; Phase-Shift; LC Oscillators. Multivibrators, 555 timer as Astable and Monostable multivibrators , VCO(LM 566) and PLL (LM 565). Monolithic regulators. SMPS Concepts.	<b>13L</b>
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Microelectronic Circuits – Sedra and Smith (Fifth Edition) (Oxford)
2. Sergio Franco – Operational Amplifier (TMH)
3. Electronic Devices and Circuit theory – Boylestead and Nashlesky – PHI/Pearson Education
4. Design of Analog CMOS Integrated Ckts- Behzad Razavi-Mc Graw Hill Pub.
5. CMOS Analog Circuit Design-P.E. Allen & D.R.Hollberg –Oxford Pub.
6. Millman and Halkias – Integrated Electronics – TMH Op Amp and Linear Ics.
7. P. Horowitz and W. Hill, The Art of Electronics, 2nd Edition, Cambridge University Press, 1989.
8. Foundations of Analog and Digital Electronic Circuits. Agarwal, Anant, and Jeffrey H. Lang. San Mateo, CA: Morgan Kaufmann Publishers, Elsevier
9. R. A. Gayakwad, Op-Amps and Linear Integrated Circuit, Prentice Hall of India,
10. Fundamentals of Microelectronics –Behzad Razavi- John Wiely

**Paper Name : Principles of Digital Electronics & Logic Design**

**Paper Code : ECE 322**

**Weekly Load : L: 3 T: 1 P:0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Number system and binary codes:</b> Digital Circuits, Definition of Analog & Digital Signals. Characteristics of Digital Circuits, Advantages and Disadvantages of Digital systems over Analog system. Brief overview of decimal, binary, octal and hexadecimal number systems and their arithmetic operations. Conversion of one number system to another. Complement methods of different number systems and their arithmetic operation. Signed and floating point representations of binary numbers. Arithmetic operation using signed binary numbers. Definition and signification of binary codes, classification of binary codes- weighted, non-weighted, error detecting and correcting codes, sequential, reflective, self-complementing and cyclic codes, alphanumeric codes. Arithmetic operation of BCD and Excess-3 code.	<b>11L+4T</b>

	Conversion of binary to gray code and vice versa. Error detecting and correcting code using Hamming and parity code. ASCII code.	
<b>2</b>	<p><b>Logic gates and logic expressions:</b>  Basic logic gates (NOT, AND, OR, NAND, NOR, XOR and XNOR) – operations, truth tables and Venn diagram representations. Universal gates and representation of basic logic gates using universal gates i.e. 7400 &amp; 4000 series IC's.  Different postulates and laws of Boolean algebra, De Morgan's theorem; Canonical forms representation of Boolean expressions-SOP and POS forms.  Simplification and minimization of logic expressions using Boolean algebra, K-maps, and Quinn McClusky methods, simplification using don't care terms.</p>	<b>6L+6T</b>
<b>3</b>	<p><b>Digital circuits:</b>  <b>Combinational Logic Circuits:</b>  Introduction, Design procedure of combinational logic circuits, Analysis and synthesis of different combinational logic circuits - Adder, Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, decoder driver, Parity generator/checker, Priority encoder, Code-converter etc.  <b>Sequential Logic Circuits:</b>  Introduction, Latch and Flip-flops, Analysis and synthesis of different types of Flip-flops- S-R, J-K, D and T type flip-flops. Triggering of a flip-flops, Master-slave F/F, Race Around condition of an F/F. Conversions of flip-flops. Application of flip-flops.  Shift registers-Introduction, serial, parallel and universal shift register, applications.  Counters-Introduction, Classification of counters, synchronous and asynchronous counters; binary, design and analysis of modulo-N and arbitrary sequence counters. Shift register counters (Ring and Johnson).</p>	<b>10L +2L</b>
<b>4</b>	<p><b>Analysis and synthesis of synchronous sequential circuits and Interface Circuits:</b>  Introduction, Basic models of sequential machine (Moore, Mealy), Use of Algorithmic State Machine, Analysis of Synchronous and Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits Design procedure of different synchronous sequential circuits, Synthesis of completely and incompletely specified synchronous sequential machines, Problems in Asynchronous Circuits, Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VHDL.  Different parameters definitions such as resolution, accuracy etc.  Analog to Digital converter (ADC) - flash type, counter type, tracking type, single and dual-slope type, successive approximation method.  Digital to Analog converter (DAC) - weighted resistor method, R-2R ladder method.</p>	<b>15L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Digital design by Morris Mano (PHI).
2. Fundamental of digital circuits by A.Anand Kumar (PHI).
3. Digital Circuit & Design by S.Salivhanan, S.Aribazhagan-Vikas Publishing House.
4. Digital Fundamentals by T.L.Floyd, R.P.Jain (Pearson)
5. Digital design principles and applications (6/e) by D.P.Leach, A.P.Malvino, G.Saha (TMH)
6. Comer- Digital Logic & State Machine Design, OUP.

**Paper Name : Numerical Methods and Optimization Techniques Laboratory****Paper Code : M 352****Weekly Load : L: 0 T: 0 P: 3****Credit Unit : 2****Total Marks : 100**

Unit	Detailed Description	Practical Period
1	<b>Forward and Backward difference Table</b>	
2	<b>Numerical Differentiation:</b> Use of Newton's forward and backward interpolation formula only.	
3	<b>Numerical Integration:</b> Trapezoidal formula (composite), Simpson's 1/3 <sup>rd</sup> formula (composite), Problems. Numerical Solution of System of linear Equations: Gauss-Jordan method, Gauss-Siedel method, Sufficient condition of convergence.	
4	<b>Numerical Solution of Algebraic and Transcendental Equations:</b> Iteration method, Bisection method, Secant method, Regula-Falsi method, Newton- Raphson method.	
5	<b>Numerical solution of Initial value problems of First order ODE:</b> Taylor's series method, Euler's method, Runge-Kutta method (4 <sup>th</sup> order), Modified Euler's method.	
6	<b>Optimization Techniques:</b> Linear Programming ( Transportation , Assignment , Duality , Simplex)	
7	<b>PERT/CPM :</b> Critical Path Calculation	
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Numerical Methods with programming in C -T. Veerarajan, Tata McGrawHill, 2004
2. Numerical Methods in Science and Engineering- S.Rajasekaran, S Chand Publishing
3. Numerical Methods for Engineering and Science –Guha & Srivastava, Oxford University Press

**Paper Name : Advanced Data Structure Laboratory**

**Paper Code : CSE 351**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Unit : 2**

**Total Marks : 100**

Unit	Detailed Description	Practical Period
1	Implementation of Merge Sort, Quick Sort, Bucket Sort, Radix Sort, Counting Sort.	9P
2	Implementation of heap, heap sort, Skew heap, Binomial heap, Fibonacci heap.	9P
3	Implementation of Priority queue and applications.	6P
4	Implementation of M-way search tree, B-tree, B <sup>+</sup> tree, AVL tree, Splay tree, KD tree.	9P
5	Implementation of different hash functions.	6P
6	Implementation of BFS and DFS algorithms on graph.	3P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, Data Structures Using C and C++ , Prentice Hall India Learning Private Limited
2. R. L. Kruse, B. P. Leung and C. L. Tondo, Data Structures and Program Design in C: Kruse & Leung, Prentice Hall India Learning Private Limited
3. Heileman, Data Structures, Algorithms & Object Oriented Programming, Tata Mcgraw-Hill Publishing Company Limited
4. M. Radhakrishnan and V. Srinivasan, Data Structures Using C, BPB Publications
5. H. Ellis and S. Sahni, Fundamentals of Data Structures, Computer Science Press.
6. A. Agarwal, Data Structure through C, Cyber Tech Publications.

**Paper Name : Electronic Devices Laboratory**

**Paper Code : ECE 372**

**Weekly Load : L : 0 T : 0 P : 3**

**Credit Point : 2**

**Total Marks : 100**

Unit	Detailed Description	Practical Period
1	Study of Clipping circuits.	3P
2	Study of CE Amplifier.	3P
3	Study of Power Amplifier.	3P
4	Study of frequency response single stage R – C coupled voltage amplifier.	3P
5	Study of OP-AMP characteristics.	3P
6	Study of Integrator and Differentiator circuits.	3P
7	Study of Transistor Phase – Shift Oscillator.	6P
8	Study of series voltage regulator using Transistor and Zener diode.	6P
9	Study of 555 timer as Astable, Monostable multivibrators	6P

<b>10</b>	Study of Active filters using OP-AMP.	<b>6P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Microelectronic Circuits – Sedra and Smith (Fifth Edition) (Oxford)
2. Sergio Franco – Operational Amplifier (TMH)
3. Electronic Devices and Circuit theory – Boylestead and Nashlesky – PHI/Pearson Education
4. Design of Analog CMOS Integrated Ckts- Behzad Razavi-Mc Graw Hill Pub.
5. CMOS Analog Circuit Design-P.E. Allen & D.R.Hollberg –Oxford Pub.
6. Millman and Halkias – Integrated Electronics – TMH Op Amp and Linear Ics.
7. P. Horowitz and W. Hill, The Art of Electronics, 2nd Edition, Cambridge University Press, 1989.
8. Foundations of Analog and Digital Electronic Circuits. Agarwal, Anant, and Jeffrey H. Lang. San Mateo, CA: Morgan Kaufmann Publishers, Elsevier
9. R. A. Gayakwad, Op-Amps and Linear Integrated Circuit, Prentice Hall of India,
10. Fundamentals of Microelectronics –Behzad Razavi- John Wiely

**Paper Name : Digital Logic Laboratory**

**Paper Code : ECE 373**

**Weekly load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	To Study and Verify the Truth Table of Different Basic Logic Gates (NOT, AND, OR, NAND, NOR, EX-OR)	<b>3P</b>
<b>2</b>	To Study and Implementation of Different Basic Logic Gates using Universal Gates (NAND, NOR) and verification of De-Morgan's theorem.	<b>3P</b>
<b>3</b>	Design and Verify the logic circuit of Half Adder and Full Adder Using Basic Logic Gates.	<b>3P</b>
<b>4</b>	Design and Verify the logic circuit of Half Subtractor and Full Subtractor Using Basic Logic Gates.	<b>3P</b>
<b>5</b>	Design and Verify of 2x4 line Decoder Using Basic Logic Gates and Study of Decoder IC 74138.	<b>3P</b>
<b>6</b>	Design of 4:1 Multiplexer Using Basic Logic Gates and Study of Multiplexer IC 74153.	<b>3P</b>
<b>7</b>	Study of BCD to Decimal Decoder Driver by Using Decoder Driver IC 7447 and Seven Segment LED Display Device LTS-542.	<b>3P</b>
<b>8</b>	Design and Verify of S-R, J-K, D and T type Flip Flop Using Basic Logic Gates.	<b>3P</b>
<b>9</b>	Design and Study of four bit Shift Register using IC 7474 in different Modes: a) Serial in-Serial out; b) Serial in-Parallel out; c) Parallel in-Serial out; d) Parallel in-Parallel out.	<b>3P</b>
<b>10</b>	Design and Study of Asynchronous (Ripple) Counter of given modulus by using IC 7476.	<b>3P</b>
<b>11</b>	Design and Study of 8 bit A/D Converters	<b>6P</b>

<b>12</b>	Design and Study of 8 bit D/A Converters	<b>6P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Digital design by Morris Mano (PHI).
2. Fundamental of digital circuits by A.Anand Kumar (PHI).
3. Digital Circuit & Design by S.Salivhanan, S.Aribazhagan-Vikas Publishing House.
4. Digital Fundamentals by T.L.Floyd, R.P.Jain (Pearson)
5. Digital design principles and applications (6/e) by D.P.Leach, A.P.Malvino, G.Saha (TMH)
6. Comer- Digital Logic & State Machine Design, OUP.

Semester- IV

**Paper Name : Discrete Mathematics**  
**Paper Code : M 402**  
**Weekly load : L: 3 T: 0 P: 0**  
**Credit Point : 2**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<b>Cartesian product in set theory:</b> Application of discrete structures in programming language, Relation and ordering, Properties of binary relations in a set, Relation matrix and the graph of a relation, Partition and covering of a set, Equivalence relations, Partial ordering, Application in data structures, Discrete functions and its application in organizing files in a computer, Cardinal number and its concepts in finite and infinite sets, Recursive functions and its techniques in programming.	10L
2	<b>Algebraic structures I:</b> Definition and examples with general properties, Semigroups and Monoids and their Homomorphism, Application to grammars and languages, Groups, cosets, subgroup, normal subgroup, cyclic group, permutation group, order of an element, order of group, its fundamental properties and its applications in error correcting codes, Rings, Fields and their applications in computer science.	8L
3	<b>Algebraic structures II:</b> Residue arithmetic, Fermat's theorem, Euler's theorem, Application to computer, Lattices and Boolean algebra; its few properties and definitions. Applications to computers, Boolean functions and its application to design switching circuits, Hamming code, Hamming distance, Tautology.	8L
4	<b>Graph Theory:</b> Graph, Digraph, Isomorphism, Walk; Path, Circuit; Shortest Path Problem, Dijkstra's Algorithm, Tree, Properties of tree, Binary tree and fundamental Circuit, Minimal spanning tree, Kruskal's Algorithm, Prim's Algorithm, DFS, BFS; Cut set, Fundamental cut set and cut vertices, Planar and Dual graphs, Matrix representation of Graphs (Adjacency and Incidence Matrices, Network, Flow Augmenting Path, Max flow and Min-cut theorem. Introduction to Eulerian and Hamiltonian Graphs.	16L
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Discrete Mathematics and its applications- A. Tamilarasi & A.M. Natarajan, Khanna Publishers
2. Discrete Mathematics- Chakraborty & Sarkar, Oxford University Press



**Paper Name : Fundamentals of Computer Organization and Architecture**  
**Paper Code : CSE 401**  
**Weekly load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<b>Introduction:</b> Computer Architecture and Organization, Von-Neumann Architecture <b>Computer Arithmetic:</b> Booth's Multiplication Algorithm, Restoring & Non-Restoring Division Algorithms <b>Memory Hierarchy:</b> Main memory Organization, RAM/ROM, Memory Address Mapping, Cache Memory	10L+4T
2	<b>General Processor Organization &amp; Instructions sets:</b> Instruction Types and Formats, Fixed and Variable Length Instructions; Addressing Modes: Various Types of Addressing Modes, Displacement Addressing- Indexing; Instruction interpretation: Micro Operations and their RTL level specifications, Instruction Phases, Instruction Cycle	10L+4T
3	<b>Control Unit Design:</b> Hardwired Control Unit, Micro Programmed Control Unit <b>I/O Transfer:</b> Program controlled, Interrupt controlled and Direct Memory Access <b>Architectural support:</b> Uni-programming and Multi-programming <b>RISC and CISC Architectures:</b> RISC, CISC, Concepts of Register Windows used in RISC <b>Measure of computer performance:</b> Benchmarking, MIPS, FLOPS	10L+4T
4	<b>Pipelined processors:</b> Pipeline Stalls, Hazards, Techniques for eliminating /reducing hazards, Instruction Flow Charts <b>Flynn's Classification:</b> SIMD: Array Processors, Loosely Coupled, Tightly Coupled machines, ICNs; MIMD: Multiprocessors, Shared Memory, Cache Coherence	12L+2T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. J. P. Hayes, Computer Architecture and Organization, McGraw Hill.
2. W. Stallings, Computer Organization and Architecture, Pearson.
3. K. Hwang and F. A. Briggs, Computers Architecture and Parallel processing, Tata McGraw Hill
4. J. L. Hennessey and D. A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.

5. K. Hwang and N. Jotwani, Advanced Computer Architecture, McGraw Hill.
6. C. Hamacher, Z. Vranesic, S. Zaky, N. Manjikian, Computer Organization and Embedded Systems, Mc Graw Hill.
7. L. Null and J. Lobur, The Essentials of Computer Organization and Architecture, Jones & Bartlett Learning.

**Paper Name : Object Oriented Technology I**

**Paper Code : CSE 402**

**Weekly load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b>  Concepts of structural program development, Fundamental Principles of Object Oriented Programming, Paradigms and Metaphors, (classes, objects, messages, encapsulation, information hiding, inheritance, polymorphism, exception handling, and object-oriented containers). Benefits of OOP, Object-oriented languages, Java Virtual Machine (JVM), Bytecode, Platform independency, ahead-of-time (AOT) compiler, dynamic recompilation, HotSpot.</p> <p><b>Development of programming Language (C++ and Java):</b>  Data types- Variables. The Primitive Types, String, Variables, Type Conversion and Casting, Arrays, Arithmetic, Bitwise, Relational, Boolean Logical, Assignment. “?” operators, Operator Precedence. Loops, Decisions, Structures -Relational Operators-Loops – for, while &amp; do, Decisions – if, if .... Else, switch Statements, Logical Operators, Control Statements – break, continue, Structured &amp; Enumerated variables, array, Storage Classes, Functions-call by value, call by reference parameters, Inline functions, Default arguments, const arguments, Function overloading, Friend Function</p> <p><b>Classes and objects:</b>  Class fundamentals, Access Specifier, Declaring objects, new operator, Constructor, Assigning Object Reference Variables, Methods, Constructors, this keyword, Garbage Collection/Destructor, Overloading, Using Objects as Parameters, Returning Objects, Static members, final, nested &amp; inner classes, String class, Using Command –line Arguments, Varargs: Variable-Length Arguments</p> <p><b>Inheritance:</b>  Superclass Variable Referencing Subclass Object, Use of super, Dynamic Method Dispatch, Overriding, Abstract Classes, Virtual base classes, The Object Class</p>	12L+5T
2	<p><b>Operator Overloading and Virtual Function for C++:</b>  Unary operator overloading (prefix and postfix cases), Binary operator overloading-using member function and friend function, Difference between Assignment operator overloading and copy constructor, Manipulation of strings using operators, Type conversation. Pointer to object, this pointer, Compile time, run time polymorphism, virtual function, Virtual table, VPTR, pure virtual function.</p> <p><b>Packages &amp; Interfaces:</b></p>	10L+3T

	<p>Defining a Package, Accessing a package, Adding a class to a package, Defining an interface, Implementing Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces can be extended.</p> <p><b>Exception handling:</b> Types of errors, Exception Types, Uncaught Exception, Using try-catch-throw, throws, finally, creating own exception subclasses</p>	
<b>3</b>	<p><b>Threading:</b> Java thread model, Creating single &amp; multiple thread, Thread priorities, Thread synchronization, Inter thread Communication, Suspending Resuming and stopping threads.</p> <p><b>Enumerations, Autoboxing and Annotations:</b> Enumeration Fundamentals, Type Wrappers, Autoboxing and Methods, Annotation, Closures</p> <p><b>Generics and Java Structures:</b> General Form, Bounded Types, Wildcard Arguments, Generic Method, Generic Interfaces, Erasure, Generic Restrictions, Iterator, Bit Set, Array List, Looping through Data Structures, Map, Hash Map</p>	<b>10L+3T</b>
<b>4</b>	<p><b>Input/ Output:</b> I/O Basics-Streams, Byte Streams, Character Streams, Reading and writing console Input/Output, Reading and writing files, Object serialization.</p> <p><b>Event handling:</b> Mechanisms, Delegation Event Model, Event classes, Event listener Interfaces.</p> <p><b>Abstract Window Toolkit (AWT):</b> AWT Classes. Window Fundamentals: Component, container, Panel, Window, Frame, Canvas, Working with Graphics: Lines, Rectangles, Iliques and Circles, Arcs, Polygons, Sizing Graphics, Working with Color: Methods, Setting Color, Working with Fonts: Determining the Available Fonts, Creating and Selecting a Font, Obtaining Font Information. Control Fundamentals, Labels, Buttons, Check Boxes, Lists, Scroll Bars, TextField, TextArea, Layout Managers, Menu Bars and Menus, Dialog Boxes. .</p>	<b>10L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. H. Schildt, Java: The Complete Reference, McGraw Hill Education
2. H. Schildt, C++: The Complete Reference, McGraw Hill Education
3. B. Stroustrup, The Design and Evolution of C++, Addison-Wesley.
4. H. M. Deitel and P. J. Deitel, Java How To Program, Prentice Hall
5. H. M. Deitel and P. J. Deitel, C++ How To Program, Prentice Hall
6. E. Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education
7. E. Balagurusamy, Programming with Java: A Primer, McGraw Hill Education
8. R. Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt Ltd
9. D. T. Editorial Service, Java 8 Programming Black Book, Dreamtech Press
10. Y. Daniel Liang, Introduction to Java programming, Pearson education.
11. C. S. Horstmann and G. Cornell, Core Java, Volume I : Fundamentals, Pearson Education.

12. C. S. Horstmann and G. Cornell, Core Java(TM) 2, Volume II--Advanced Features, Pearson Education.

**Paper Name** : Microprocessor and Its Applications  
**Paper Code** : ECE 422  
**Weekly load** : L: 3 T: 1 P: 0  
**Credit Point** : 3  
**Total Marks** :100

Module	Detailed Description	Lecture / Tutorial Period
1	<b>Introduction and Architecture of 8085 microprocessor:</b> Definition of Microprocessor & Microcomputer System, The evolution of microprocessors (from 4 bits onwards). Basic functions of a microprocessor. Various sections of 8085 Microprocessor such as Register section, Arithmetic & Logic Unit, Timing control unit, Interface Section etc, Pin configuration of 8085, timing diagram & execution, Demultiplexing & buffering of system buses of 8085 CPU. Instruction set, classification of instructions, addressing modes, software model of 8085 CPU.	9L+2T
2	<b>Assembly Language Programming using 8085 CPU:</b> Program writing for different arithmetic operation with 8-bit & 16-bit binary numbers and BCD numbers, writing program using time delays & calculation of T-states, Concepts of Stack & Sub-routine, Program for searching & sorting using Stack & Subroutine. Code conversion, concept of look-up table.	10L+4T
3	<b>Memory and Memory interfacing, Interrupt structure of 8085 and I/O interfacing technique:</b> Memory elements; RAM, ROM, PROM, EPROM, EEPROM, Memory constituents. Memory expansion; Interfacing of RAM, ROM, EPROM & DRAM etc, EPROM programming. <b>&amp; their uses.</b> Different interrupts used for 8085, RIM, SIM. Peripheral mapped I/O & Memory mapped I/O, data transfer schemes- synchronous, asynchronous & interrupt driven data transfer, DMA data transfer, Use of SID and SOD pins of 8085.	11L+3T
4	<b>Interfacing Chips:</b> 8255, 8253, 8251, 8279, 8259 & 8237. Interfacing of DAC, ADC, keyboards, printer, and displays using 8255. Basic concept of RISC and CISC based machines. .	12L+5T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Microprocessor Architecture, Programming & Application-R. Gaonkar, Wiley.
2. Fundamental of microprocessor, Uday Kumar, Pearson.

3. 8085 Microprocessor Programming & Interfacing- N.K Srinath-PHI.
4. Microprocessor-Theory & Application-M. Rafiquezzaman;PHI.
5. Advanced Microprocessor & Peripherals-Ray & Bhurchnadi, Tata- McGrowHill.
6. Fundamentals of Microprocessors and Microcontrollers – B. Ram, Dhanpat Rai.

**Paper Name : Computer Graphics**

**Paper Code : CSE 403**

**Weekly load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks :100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction to Computer Graphics &amp; Graphics Systems :</b>            Overview of computer graphics &amp; its uses; Classification, characteristics, components &amp; applications of computer graphics; Representing pictures; Basic Terminologies: Pixel, Resolution &amp; its different types, Dots, Dot Pitch, Aspect ratio; Raster scan display: Refresh rate &amp; Interlacing, Retrace, CRT, Shadow mask, Aperture grill, Bit planes, Color depth, Color palette, Frame buffer, Video controller, General architecture of Raster Scan display; Active &amp; Passive graphics devices; Computer graphics software.</p> <p><b>Scan Conversion:</b>            Points &amp; lines, Line drawing algorithms: DDA algorithm, Advantages &amp; Disadvantages; Bresenham's line algorithm; Circle generation algorithm: Basic concepts, Midpoint circle drawing algorithm, Brsenham's circle drawing algorithm; Ellipse generation algorithm: Basic concepts, Midpoint ellipse generation algorithm; Aliasing, Antialiasing, Methods of antialiasing.</p>	12L+4T
2	<p><b>Polygon and Filling algorithms:</b>            Inside &amp; Outside test of polygon: Even-Odd method, Winding number method; Polygon filling algorithms: Scan line polygon, Scan line seed fill algorithm, Boundary fill algorithm, Flood fill algorithm.</p> <p><b>2D Transformation:</b>            Basic transformations: translation, rotation, scaling, reflection, shear; Transformation between coordinate systems; Homogeneous coordinates &amp; Combined transformations; Inverse transformation: Rotation about an arbitrary point, General fixed point scaling, Reflection through an arbitrary line.</p>	10L+4T
3	<p><b>Viewing and Clipping:</b>            Viewing transformation: Viewing pipeline, Window to viewport coordinate transformation; Clipping: Point clipping, Line clipping -- Cohen-Sutherland algorithm, Liang-Barsky algorithm, Polygon clipping – Sutherland-Hodgeman algorithm, Weiler-Atherton algorithm; Text clipping.</p> <p><b>3D transformation and Projection:</b>            3D transformations: translation, rotation, scaling, reflection &amp; shearing. 3D Projection: Parallel projection – Orthographic, Axonometric, Oblique; Perspective projection – transformation matrix, vanishing points, Single-point, Two-point, Three-point perspective transformation.</p>	10L+4T

<b>4</b>	<p><b>Curves:</b> Curve generation algorithm: DDA method, approximation method, Spline representation, Continuity, Piecewise Cubic Spline, Bezier curves – Cubic Bezier, Mid-point Bezier, B-spline curves.</p> <p><b>Hidden Surfaces:</b> Depth comparison, Z-buffer algorithm, Back faces detection, BSP tree method, Painter’s algorithm, Scan-line algorithm; Hidden line elimination method, wire frame methods.</p> <p><b>Color &amp; Shading Models:</b> Introduction, Modeling Light Intensities and Sources, Diffuse Reflection, Lambert’s Cosine Law, Specular Reflection, Half-toning, Color Models - RGB Color, CMY Color.</p>	<b>10L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. D. Hearn and M. P. Baker, Computer Graphics (C version), Prentice Hall.
2. Z. Xiang and R. A. Plastock, Schaum’s outlines Computer Graphics, McGraw Hill.
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, McGraw Hill.
4. D. P. Mukherjee, Fundamentals of Computer Graphics & Multimedia, Prentice Hall.
5. J. F. K Buford., Multimedia Systems, Pearson Education.
6. P. K. Andleigh and K. Thakrar, Multimedia Systems Design, Pearson Education India
7. S. Harrington, Computer Graphics: A programming Approach, McGraw Hill.
8. A. V. Dam; F. H. John; J. D. Foley; S. K. Feiner, Computer Graphics principles and practice, Pearson Education.
9. W. M. Newman and R. F. Sproull, Principles of Interactive computer Graphics, McGraw Hill.
10. M. E. Cook, Principles of Interactive Multimedia, McGraw Hill.
11. A. Mukhopadhyay and A. Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas Publishing House

**Paper Name : Values and Ethics**

**Paper Code : HS 401**

**Weekly load : L: 3 T: 0 P: 0**

**Credit Point : 0**

**Total Marks :100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Nature of professional ethics:</b> Introduction, definition, morals &amp;ethics sources of ethics, sources of ethics, relationship between ethics and management. Nature of professional ethics, importance of ethics in profession, nature and objectives of ethics, need for ethics.</p> <p><b>Ethical decision making:</b> Values, morals, standards, corporate social responsibility, attitude and beliefs, ethical values and dimensions dilemmas- decision making, organization and power politics.</p>	<b>11L</b>
<b>2</b>	<p><b>Effects of technological growth:</b> Energy Crisis, Rapid technological growth, environmental degradation</p>	<b>8L</b>

	and pollution, human operator in Engineering projects and industries, problems of man, machine, interaction. Impact of assembly line and automation.	
<b>3</b>	<b>Ethics in profession:</b> Engineering profession, ethical issues in engineering practice, conflicts between business demands and professional ideals, social and ethical responsibilities of technologists, code of professional Ethics, Whistleblowing and beyond, effects of globalization in modern organization, case study. <b>Managing ethics:</b> Building a value system, role of law enforcement, training in ethics, ethics in commercial and operational profession, ethics in finance, ethics in HRM, ethics in Global Business, ethics and IT.	<b>15L</b>
<b>4</b>	<b>Engineering Ethics:</b> Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment – Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.	<b>8L</b>
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Blending the best of the East & West, Dr. SubirChowdhury, EXCEL
2. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3. Business Ethics, Pherwani, EPH
4. Ethics, Indian Ethos & Mgmt., Balachandran, Raja, Nair, Shroff Publishers
5. Business Ethics: concept and cases, Velasquez, Pearson
6. Engineering Ethics: Charles D, Fleddermann, Pearson / PHI, New Jersey 2004 (Indian Reprint)
7. Engineering Ethics – Concepts and Cases: Charles E Harris, Michael S. Protchard and Michael J Rabins, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
8. Ethics and the Conduct of Business: John R Boatright, Pearson Education, New Delhi, 2003.
9. Fundamentals of Ethics for Scientists and Engineers: Edmund G Seebauer and Robert L Barry, Oxford University Press, Oxford, 2001.

**Paper Name : Fundamental Computer Organization and Architecture Laboratory**  
**Paper Code : CSE 451**  
**Weekly load : L: 0 T: 0 P: 3**  
**Credit Point : 2**  
**Total Marks : 100**

<b>UNIT</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Design & Implementation of different computational subunits of an Arithmetic Unit	<b>9P</b>

2	Study of the functionality of an ALU Chip	3P
3	Design & Implementation of simple logic units	6P
4	Study of Interfacing and Accessing of different RAM Chips	9P
5	Design of higher capacity RAM chip using basis chips	9P
6	Design of a simple Arithmetic & Logic Unit	6P
	<b>Total :</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. J. P. Hayes, Computer Architecture and Organization, McGraw Hill.
2. W. Stallings, Computer Organization and Architecture, Pearson.
3. K. Hwang and F. A. Briggs, Computers Architecture and Parallel processing, Tata McGraw Hill
4. J. L. Hennessey and D. A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
5. K. Hwang and N. Jotwani, Advanced Computer Architecture, McGraw Hill.

**Paper Name : Object Oriented Technology I Laboratory**

**Paper Code : CSE 452**

**Weekly load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks :100**

UNIT	Detailed Description	Practical Period
1	Programs to build class, constructor, doing overloading, inheritance, overriding	6P
2	Programs on Function overloading, Friend Function, wrapper class, vectors, arrays	6P
3	Programs on developing interfaces, inheritance, extending interfaces	3P
4	Programs on creating and accessing packages	3P
5	Polymorphism, Virtual Functions and related problems.	3P
6	Thread programming	6P
7	Programs on handling errors and exceptions	3P
8	Programs on Enumerations, Autoboxing and Annotations	3P
9	Generic class programming	3P
10	Programming on Input/ Output	3P
11	AWT programming	3P
	<b>TOTAL:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. H. Schildt, Java: The Complete Reference, McGraw Hill Education
2. H. Schildt, C++: The Complete Reference, McGraw Hill Education
3. B. Stroustrup, The Design and Evolution of C++, Addison-Wesley.
4. H. M. Deitel and P. J. Deitel, Java How To Program, Prentice Hall
5. H. M. Deitel and P. J. Deitel, C++ How To Program, Prentice Hall
6. E. Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education



7. E. Balagurusamy, Programming with Java: A Primer, McGraw Hill Education
8. R. Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt Ltd
9. D. T. Editorial Service, Java 8 Programming Black Book, Dreamtech Press
10. Y. Daniel Liang, Introduction to Java programming, Pearson education.
11. C. S. Horstmann and G. Cornell, Core Java, Volume I : Fundamentals, Pearson Education.
12. C. S. Horstmann and G. Cornell, Core Java(TM) 2, Volume II--Advanced Features, Pearson Education.

**Paper Name : Computer Graphics Laboratory**

**Paper Code : CSE 453**

**Weekly load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks :100**

Unit	Detailed Description	Practical Period
1	Implementation of Point plotting, Line & regular figures drawing using different line drawing algorithms, Circle and Ellipse drawing algorithms.	12P
2	Implementation of 2-D / 3-D transformations of line and regular figures.	9P
3	Implementation of Windowing and Clipping algorithms for points, lines & polygons.	9P
4	Implementation of Polygon Filling algorithms.	6P
5	Implementation of Curve generation algorithms.	6P
	<b>Total :</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. D. Hearn and M. P. Baker, Computer Graphics (C version), Prentice Hall.
2. Z. Xiang and R. A. Plastock, Schaum's outlines Computer Graphics, McGraw Hill.
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, McGraw Hill.
4. D. P. Mukherjee, Fundamentals of Computer Graphics & Multimedia, Prentice Hall.
5. J. F. K Buford., Multimedia Systems, Pearson Education.
6. P. K. Andleigh and K. Thakrar, Multimedia Systems Design, Pearson Education India
7. S. Harrington, Computer Graphics: A programming Approach, McGraw Hill.
8. A. V. Dam; F. H. John; J. D. Foley; S. K. Feiner, Computer Graphics principles and practice, Pearson Education.
9. W. M. Newman and R. F. Sproull, Principles of Interactive computer Graphics, McGraw Hill.
10. M. E. Cook, Principles of Interactive Multimedia, McGraw Hill.
11. A. Mukhopadhyay and A. Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas Publishing House

**Paper Name : Microprocessor and Its Applications Laboratory**

**Paper Code : ECE 472**

**Weekly Load : L : 0 T : 0 P : 3**

**Credit Point : 2**

**Total Marks : 100**

Unit	Detailed Description	Practical Period
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1	<b>Basic assembly language programs writing and execution using 8085 Microprocessor Trainer kit like:</b> a) Addition of two numbers or block of numbers. b) Subtraction of two numbers / difference calculation of two numbers. c) Sorting of data blocks (Ascending / Descending). d) Searching maximum and minimum number from a block of data.	6P
2	<b>Higher level assembly language programs writing and execution using 8085 Microprocessor Trainer kit like:</b> a) Multiplication and division of 8 bit data. b) Series calculation. c) Code Conversion (BCD to Binary or reverse) d) Square, Square Root & Factorial calculation of a given no etc	6P
3	<b>Experiments using 8255 PPI chip on the trainer kit:</b> e.g. subroutine for delay, reading switch state and glowing LEDs accordingly, square wave generation etc.	6P
4	<b>Experiment with Intel 8259 (Programmable Interrupt Controller) chip:</b> Writing interrupt program to interrupt any process on execution, using any of the interrupt pins (IR0-IR7) available in 8259 chip of trainer kit.	6P
5	<b>Experiments with Intel 8253(Programmable Interval Timer) chip:</b> Programming 8253 chip in various modes to generate different waveforms and to study the waveforms in CRO.	6P
6	<b>Interfacing of Microprocessor Trainer Kits with PC:</b> Interfacing through RS -232 cables and downloading the Hex code for the Assembly language programs from PC to kit and execution and verifying the programs from PC. Uploading the programs in RAM from microprocessor kit to PC and storing as a Hex file in the hard disk of a PC. Familiarization with different 8085 simulator on PC.	6P
7	<b>Study the operation of microprocessor based Stepper Motor Controller:</b> Study of the programs for speed controlling, direction or angle of rotation controlling etc.	6P
	<b>Total :</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Microprocessor Architecture, Programming & Application-R. Gaonkar, Wiley.
2. Fundamental of microprocessor, Uday Kumar, Pearson.
3. 8085 Microprocessor Programming & Interfacing- N.K Srinath-PHI.
4. Microprocessor-Theory & Application-M. Rafiquezzaman;PHI.
5. Advanced Microprocessor & Peripherals-Ray & Bhurchnadi, Tata- McGrowHill.
6. Fundamentals of Microprocessors and Microcontrollers – B. Ram, Dhanpat Rai.

**Paper Name : Business Communication and Presentation Skills I**

**Paper Code : HS 481**

**Weekly Load : L : 0 T : 0 P : 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Business communication covering Role of communication in information age; concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication and sola;	
<b>2</b>	Style and organization in technical communication covering Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report	
<b>3</b>	Communication and personality development covering Psychological aspects of communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution;	
<b>4</b>	Language Laboratory emphasizing Listening and comprehension skills; Reading\ Skills; Sound Structure of English and intonation patterns	
	<b>Total :</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. Lesikar and petit, Report writing for Business
3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
4. Wallace and masters, Personal Development for Life and Work, Thomson Learning
5. Hartman Lemay, Presentation Success, Thomson Learning
6. Malcolm Goodale, Professional Presentations
7. Farhathullah, T. M. Communication skills for Technical Students
8. Michael Muckian, John Woods, The Business letters Handbook
9. Herta A. Murphy, Effective Business Communication
10. MLA Handbook for Writers of Research Papers

Semester- V

**Paper Name : Computer Network**  
**Paper Code : CSE 501**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Overview Of Data Communication And Networking:</b> Introduction; Data communications: components, data representation (ASCII,ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.</p> <p><b>Physical Layer:</b> Overview of data(analog &amp; digital), signal(analog &amp; digital), transmission (analog &amp; digital) &amp; transmission media (guided &amp; non-guided); TDM, FDM, WDM; Circuit switching: time division &amp; space division switch, TDM bus; Telephone network;</p>	<b>8L+4T</b>
<b>2</b>	<p><b>Data link Layer:</b> Types of errors, framing(character and bit stuffing), error detection &amp; correction methods; Flow control; Protocols: Stop &amp; wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;</p> <p><b>Medium Access Sub Layer:</b> Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, Fast Ethernet:</p>	<b>12L+4T</b>
<b>3</b>	<p><b>Network Layer:</b> Internetworking &amp; devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, Classfull address, subnetting; Routing : techniques, static vs. dynamic routing , routing table for Classfull address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.</p> <p><b>Transport Layer:</b> Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos.</p>	<b>13L+3T</b>

<b>4</b>	<b>Application Layer:</b> DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls. <b>Modern Topics:</b> ISDN services & ATM; DSL technology, Cable modem, Sonet. Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.	<b>9L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. B. A. Forouzan , Data Communications and Networking, McGraw Hill Education
2. A. S. Tanenbaum ,Computer Networks ,Pearson Education
3. W. Stallings, Data and Computer Communications , Pearson Education
4. Y. Zheng, S. Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. M.A. Michael, Data Communication & Network, Vikas Publishing
7. J. F Kurose,K.W. Rose , Computer Networking -A Top Down Approach Featuring The Internet, Pearson Education
8. A. L. Garica, I. Widjaja ,Communication Network, McGraw Hill Education
9. J. Walrand ,Communication Networks ,McGraw Hill Education
10. D. E. Comer ,Internetworking with TCP/IP, vol. 1, 2, 3,Pearson Education

**Paper Name : Operating System**

**Paper Code : CSE 502**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction:</b> Introduction to OS. Operating system functions, Different types of O.S.: batch, multi-programmed, time-sharing, and real-time. <b>System Structure:</b> Operating system structure, system calls. <b>Processes:</b> Concept of processes, state diagram, Process Control Block, scheduling of processes – criteria, types of scheduling, non-preemptive and preemptive scheduling algorithms : FCFS, Shortest Job First (SJF), Round Robin (RR), Highest Response ratio Next (HRN), Priority based scheduling, different Multilevel queue scheduling. Inter-process Communication (IPC) – Shared memory Model, Message Passing Model. <b>Threads:</b> Concepts, Process vs. Thread, User level vs. Kernel level threads, Different multithreaded models.	<b>12L+4T</b>

<b>2</b>	<p><b>Process Synchronization:</b>  Concepts, Critical Section Problem, Solutions to critical section, critical region, synchronization hardware, monitors, classical problems of synchronization, semaphores.</p> <p><b>Deadlocks:</b>  System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.</p>	<b>8L+4T</b>
<b>3</b>	<p><b>Memory Management:</b>  Address binding, logical vs. physical address space, swapping, contiguous memory allocation, paging, Structure of Page Table, segmentation</p> <p><b>Virtual Memory:</b>  Demand paging, page replacement algorithms, allocation of frames, thrashing.</p> <p><b>File Systems:</b>  File concept, access methods, directory structure, file system structure, allocation, File sharing and protection, free-space management , directory implementation.</p>	<b>12L</b>
<b>4</b>	<p><b>Disk Management:</b>  Disk structure, disk scheduling algorithms, disk management.</p> <p><b>I/O Management:</b>  I/O Structure, Different modes of data transfer.</p> <p><b>Protection &amp; Security:</b>  Goals of protection, domain of protection, security problem, authentication.</p> <p><b>A Case Study of UNIX.</b></p>	<b>10L+6T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. A. S. Tanenbaum and A. S. Woodhull, Operating System Design and Implementation, Pearson
2. A. Silberschatz, P. B. Galvin, G. Gagne, Operating System Concepts, Wiley.
3. D. M. Dhamdhare, Operating System : A Concept-based Approach, Tata McGraw-Hill Education.
4. W. Stallings, Operating Systems: Internals and Design Principles, Pearson
5. H. M. Dietel, Paul J. Deitel and David R. Choffnes, Operating Systems, Pearson.
6. M. Milenkovic, Operating Systems Concept and Design, McGraw Hill Education
7. S. Das, Your Unix/Linux: The Ultimate Guide”, McGraw Hill Education
8. G. J. Nutt, Operating Systems: A Modern Perspective, Addison-Wesley Pub (Sd)
9. M. J. Bach, Design of the Unix Operating Systems, Pearson Education India

**Paper Name : Internet and Web Technology**  
**Paper Code : CSE 503**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>An Overview on Internet:</b> Need for an Internet, Evolution of Internet, Concept of Internet, Intranet and Extranet, URI, URL,URN, Concept of Search Engine, Search Engine Optimization, Types of Search Engine, Search Engine Optimization Algorithms.</p> <p><b>TCP/IP Protocol Suite:</b> HTTP,FTP,SMTP,Ping,DNS,TCP,UDP,ICMP,IP, Concept of Unicast Routing, Unicast Routing Protocols: RIP, OSPF and BGP, Concept of Multicast Routing, Multicast Routing Protocols: MOSPF, DVMRP, PIM,CBT.</p> <p><b>Mobile IP:</b> Definition of Mobile IP, Stationary Hosts, Mobile Host, Three Phases of Remote host to Mobile Host Communication, Inefficiency of Mobile IP, Double Crossing, Triangle Routing.</p>	12L+5T
2	<p><b>Introduction to Web:</b> Web Architecture, Web Applications, Web servers, Web Browsers, Internet standards.</p> <p><b>Hyper Text Markup Language:</b> Elements, Attributes, Tags, Tables, Forms, Frames.</p> <p><b>Cascading Style Sheets:</b> Advantages, Rules, CSS and page Layout</p> <p><b>JavaScript and DHTML:</b> Regular Expression, Event Handling, W3C Event Handling Model, HTML DOM, JavaScript and HTML DOM, JavaScript and HTML Forms, AJAX.</p>	10L+4T
3	<p><b>XML Technologies:</b> XML, Namespace, DTD, W3C XML Schema, XPath, XQuery, Parsing XML, XML DOM, XSLT, XSL-FO.</p> <p><b>Applets:</b> Client-side Java, Life Cycle, Writing an Applet, Compiling an Applet, The Applet Tag, Security, Utility Methods, Using Status Bar, Applet Context Interface, Document Base and Code Base, Passing Parameter, Event Handling, Communication between Two Applets, Loading Web Pages.</p>	10L+2T

<b>4</b>	<p><b>Server-side Programming:</b> Common Gateway Interface (CGI)—Internet Programming paradigm, languages for CGI, Applications, Server Environment, Environment Variables, CGI Building Blocks, CGI Scripting Using C, Shell Script, Writing CGI Programs, CGI Security, Alternatives and Enhancements to CGI</p> <p><b>Servlets:</b> Server-side Java, Advantages Over Applets, Alternatives, Strengths, Architecture, Life Cycle, GenericServlet and HttpServlet, Passing and Retrieving Parameters, Server-Side Include, Cookies, Filters, Problems with Servlet, Security Issues</p> <p><b>Java Server Pages:</b> JSP and HTTP, JSP Engines, How JSP Works, JSP and Servlet, Anatomy of a JSP Page, JSP Syntax, JSP Components, Beans, Session Tracking, Users Passing Control and Data between Pages, Sharing Session and Application Data, Database Connectivity, JDBC Drivers, Basic Steps, Loading a Driver, Making a Connection, Execute an SQL Statement, SQL Statements, Retrieving Result, Getting Database Information, Scrollable and Updatable ResultSet, ResultSetMetadata</p>	<b>10L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. B. A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Higher Education
2. D. Minoli, Internet & Intranet Engineering, McGraw-Hill Education (India) Pvt Limited
3. E. Enge ,S. Spencer, J.Stricchiola, R. Fishkin, The Art of SEO: Mastering Search Engine Optimization, O'REILLY
4. Web Technologies HTML, Javascript, PHP, Java, JSP,ASP.NET, XML and AJAX BLACK BOOK, Dreamtech Press
5. D. Goodman, Dynamic HTML: The Definitive Reference, O'REILLY
6. D. Flanagan, JavaScript: The Definitive Guide, O'REILLY
7. E. R. Harold, W. S. Means, XML in a Nutshell: A Desktop Quick Reference, O'REILLY
8. A. Moller, M. Schwartzbach, An Introduction to XML and Web Technologies, Pearson Education India
9. H. Bergsten, Java Server Pages: Help for Server-Side Java Developers, O'REILLY
10. M. Wutka, Special Edition Using Java Server Pages and Servlets, Que Publishing
11. R. Barton, J. Henry, P. Grossetete, R. Trollope, G. Salgueiro, D. Hanes, IoT Fundamentals : Networking Technologies, Protocols and Use Cases for the Internet of Things, Pearson Education

**Paper Name : Formal Language and Automata Theory**

**Paper Code : CSE 504**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
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<b>1</b>	<p><b>Theory of Automata:</b> Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages Automaton, Transition System, Mealy and Moore machines.</p> <p><b>Regular languages and Finite Automata:</b> Regular Languages and Regular Expressions, Recognition by Finite Automata, Deterministic and Non-deterministic Finite Automata, Equivalence of DFA and NFA, Minimization of FA. The pumping lemma for regularity, Closure properties of regular sets.</p>	<b>13L+3T</b>
<b>2</b>	<p><b>Context-Free languages:</b> Context-Free grammars and context-free languages. Closure properties of CFLS, derivation trees and ambiguity, Empty production and useless symbol elimination from context free grammar, Simplified forms and Normal forms (CNF,GNF),Pumping lemma for CFLs.</p>	<b>12L+3T</b>
<b>3</b>	<p><b>Push-DownAutomata:</b> Deterministic and Non-deterministic Push down Automata, Acceptance by PDA, Correspondence between PDA and CFG.</p>	<b>8L+2T</b>
<b>4</b>	<p><b>Turing Machines:</b> Models of computation and Church-Turing Thesis, Turing Machine and its variations, Universal Turing Machines, Recursively enumerable and recursive languages, Unrestricted grammars and TMs.</p> <p><b>Context-sensitive languages:</b> Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.</p>	<b>9L+6T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. J. E. Hopcroft, R. Motwani and J. D. Ullman, Introduction to Automata Theory, Languages & Computation, Pearson
2. K. L. P. Mishra and N. Chandrasekaran, Theory of Computer Science: Automata, Languages and Computation, Prentice Hall India Learning Private
3. H. R. Lewis and C. H. Papadimitriou, Elements of the Theory of Computation, Prentice-Hall
4. R. Y. Kain, Automata theory : machines and languages, McGraw Hill
5. P. Linz, An Introduction to Formal Languages and Automata, Narosa Publishing House

**Paper Name : System Programming**  
**Paper Code : CSE 505**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Types of programs– System program and Application program, Difference between system programming and application programming, Elements of Programming environment- Editor, Preprocessor, Assembler, Compiler, Interpreter, Linker &amp; Loader, Debugger, Device drivers, Program Development Flow.</p> <p><b>Assembly Language:</b> Simplified Instructional Computer (SIC), Architecture of SIC Machine, SIC Programming Examples.</p> <p><b>Assembler:</b> Definition, Features of assembly language, advantages &amp; disadvantages, Statement format, Types of statements– Imperative, Declarative, Assembler Directive, Constants and Literals, Advanced assembler directives (LTOrg, ORIGIN, EQU), Design of assembler– Analysis Phase and Synthesis Phase, Overview of assembling process, Pass Structure of Assembler– One pass &amp; two pass assemblers. Problems of 1-pass assembler- forward reference, efficiency, Table of Incomplete Instructions, Design of 2-pass Assembler– Pass-I and Pass-II Data structure of 2-pass assembler, Intermediate Code– Need, Forms- Variant I and Variant II, Cross assemblers.</p>	12L+5T
2	<p><b>Macros and Macro Processors:</b> Definition, Macro definition and call Macro expansion– positional and keyword parameters, Design of Data structures to be used for Macro definition and usage, Nested macro calls, Advanced macro facilities– alteration of flow of control during expansion, expansion time variable, conditional expansion, expansion time loops (with examples). Design of macro preprocessor– Design overview, data structure, processing of macro definition and macro expansion (except algorithms), Macro assembler– Comparison of macro preprocessor and macro assembler, Pass structure of macro assembler.</p>	8L+3T
3	<p><b>Linker and Loader:</b> Definition, Concept of bindings, static and dynamic binding, translated, linked and load time addresses, Concept of Relocation and Linking– program relocation, performing relocation, public and external references, linking, binary program, object module, Relocatability and its various forms- nonrelocatable, relocatable, and self relocating programs, Linking for Overlays, binders, dynamic binders, Object file formats- a.out, ELF,COFF,EXE,PE &amp; COM, Loader schemes- Compile and go loaders, absolute loaders, relocating loader, direct linking loaders.</p>	10L+3T

<b>4</b>	<b>Editors and Debugger:</b> Definition, purpose of editor. Types of editor, Different editor examples- ed, sed, VIM & emacs, Structure of editor, Working Principle of debugger. <b>Unix:</b> Introduction, Features and Applications of UNIX, Structure of UNIX, Security in Unix, File Management in Unix, inode structure, Unix Process, Various commands in Unix, Shell programming, Unix System Calls and uses of Unix System Call.	<b>12L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. L. L. Beck, System Software: An Introduction to Systems Programming, Pearson Education.
2. S. Chattopadhyay, System Software, Prentice-Hall India
3. S. Pal, System Programming, Oxford University Press.
4. M. Ticher, PC Intern: The Encyclopedia of System Programming, Abacus Software Inc
5. D. M. Dhamdhare, Operating System : A Concept-based Approach, Tata McGraw-Hill Education.
6. S. Das, Your Unix/Linux: The Ultimate Guide, McGraw Hill Education
7. W. R. Stevens and S. A. Rago, Advanced Programming in the UNIX Environment, Addison Wesley.
8. R. Love, Linux System Programming, O' Reilly.
9. D. S. W. Tansley, Linux and UNIX Shell Programming, Addison-Wesley.

**Paper Name : Communication Engineering**

**Paper Code : ECE 521**

**Weekly Load : L: 3 T: 0 P: 0**

**Credit Point : 2**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Signals, Fourier series and Fourier Transform:</b> Introduction to fundamental elements of communication systems. Concepts of signals and spectrum, spectrum allocation for different communication systems. Baseband and Bandpass transmission of signals. Discussions about communication channels and propagation characteristics. Fourier series and Fourier transformations, properties of Fourier transformation with application.	<b>12L</b>
<b>2</b>	<b>CW Modulation:</b> Basic concepts and necessity of Modulation. Classifications of CW modulation. <b>Amplitude Modulation:</b> Definition, time and frequency analysis for AM, basic concepts of DSB-SC, SSB-SC and VSB-SC modulation. Different types of modulator and demodulator circuits of Amplitude Modulation (e.g. Square law modulator, balanced modulator, ring	<b>10L</b>

	modulator, envelope detector etc.) <b>Angle Modulation:</b> Principles and definitions, relationship between frequency and phase modulations, narrow and wide band FM. Different types of modulator and demodulator circuits of Frequency Modulation (e.g. Direct and Indirect modulator, Slope detector, PLL etc.)	
<b>3</b>	<b>Pulse and Digital Modulation:</b> Sampling theorem, Nyquist criterion, Interpolation. Definitions and overview of PAM, PPM, PWM. Concepts of PCM, DM. Concept of digital carrier modulation, generation and detection of ASK, FSK, PSK, basic concepts of BPSK & QPSK.	<b>12L</b>
<b>4</b>	<b>Communication Systems:</b> Concepts of Telephone switching network, Computer communication, Cellular phone, Satellite communication, Optical Communication etc.	<b>8L</b>
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

- 1 Electronic Communications – Dennis Roddy and John Coolean , 4th Edition, PEA, 2004
- 2 Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004
- 3 Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
- 4 Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
- 5 B.Carlson, Introduction to Communication Systems (4/e), McGraw-Hill
- 6 Principles of Communication Systems – H. Taub & D. Schilling , TMH, 2nd Edition, 2003

**Paper Name : Computer Network Laboratory**

**Paper Code : CSE 551**

**Weekly Load : L :0 T:0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	NIC Installation & Configuration (Windows/Linux), Familiarization with Networking Cables, Connectors Hubs, Switches, Gateway	<b>8P</b>
<b>2</b>	Inter Process Communication using Message and Pipes.	<b>6P</b>
<b>3</b>	Introduction Socket Programming, Implementation of simplex, duplex chatting, daytime server, echo server etc.	<b>10P</b>
<b>4</b>	Study of Different Routing Protocols using Network Simulator.	<b>12P</b>
<b>5</b>	Study of Network Congestion Control Algorithms Using Network Simulator.	<b>6P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. B. A. Forouzan , Data Communications and Networking, McGraw Hill Education
2. J. Walrand ,Communication Networks ,McGraw Hill Education
3. D. E. Comer ,Internetworking with TCP/IP, vol. 1, 2, 3,Pearson Education
4. W. R. Stevens, UNIX Network Programming(Vol I and II),Pearson Education
5. B. W. Kernighan and R. Pike, The UNIX programming environment , PHI

**Paper Name : Operating System Laboratory**

**Paper Code : CSE 552**

**Weekly Load : L :0 T:0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

Unit	Detailed Description	Practical Period
1	<b>Shell programming:</b> Basic unix commands, creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions).	12P
2	<b>Process:</b> Creating new process, replacing and duplicating a process image, waiting for a process.	9P
3	<b>Inter-process communication:</b> Pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO). Programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).IPC using shared memory model and message passing model.	12P
4	<b>Signal :</b> Signal handling, sending signals, signal interface, signal sets.	3P
5	<b>POSIX Threads :</b> Programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel).	6P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. S. Das, Your Unix/Linux: The Ultimate Guide, McGraw Hill Education
2. Y. Kanetkar, Unix Shell Programming, BPB Publications
3. W. R.Stevens, B. Fenner and A. M. Rudoff, Unix Network Programming, Volume 1: The Sockets Networking API, Addison-Wesley Professional
4. M. J. Bach, The Design of the Unix Operating System, Prentice Hall India
5. B. W. Kerninghan and R. Pike, The Unix Programming Environment, Prentice Hall

**Paper Name : Internet and Web Technology Laboratory**  
**Paper Code : CSE 553**  
**Weekly Load : L:0 T:0 P:3**  
**Credit Point : 2**  
**Total Marks :100**

Unit	Detailed Description	Practical Period
1	Assignment to implement the HTML Elements, Attributes, Tags, Tables, Forms, Frames etc.	4P
2	Assignment to implement the different types CSS properties.	6P
3	Assignment to implement the Java Script Regular Expression, Event Handling , Java Script & HTML DOM, JavaScript & HTML Forms and AJAX.	6P
4	Assignment to implement XML, Namespace, DTD, W3C XML Schema, XPath, XQuery, Parsing XML, XML DOM, XSLT, XSL-FO.	6P
5	Assignment to implement the Applets for some client specific real life applications.	4P
6	Assignment to implement CGI programming for server side application development.	6P
7	Assignment to implement Servlets and JSP for server side application for real life problems.	8P
8	Concept of MEAN Stack, Initial Setup, Server Side implementation using Node.js and Express, Front-End implementation using AngularJS, Database implementation of MongoDB.	2P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Web Technologies HTML, Javascript, PHP, Java, JSP,ASP.NET, XML and AJAX BLACK BOOK, Dreamtech Press
2. D. Goodman, Dynamic HTML: The Definitive Reference, O'REILLY
3. D. Flanagan, JavaScript: The Definitive Guide, O'REILLY
4. E. R. Harold, W. S. Means, XML in a Nutshell: A Desktop Quick Reference, O'REILLY
5. A. Moller, M. Schwartzbach, An Introduction to XML and Web Technologies, Pearson Education India
6. H. Bergsten, Java Server Pages: Help for Server-Side Java Developers, O'REILLY
7. M. Wutka, Special Edition Using Java Server Pages and Servlets, Que Publishing
8. A. Q. Haviv, MEAN Web Development, Packt Publishing

**Paper Name : Communication Engineering Laboratory**

**Paper Code : CSE 571**

**Weekly Load : L :0 T:0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	To design and study of active, Butterworth low pass filter and verification of cut-off frequency from its frequency response characteristics.	<b>3P</b>
<b>2</b>	To design and study of active, Butterworth high pass filter and verification of cut-off frequency from its frequency response characteristics.	<b>3P</b>
<b>3</b>	To design and study of active Butterworth band pass filter and verification of band-width & cutoff frequency from its frequency response characteristics.	<b>3P</b>
<b>4</b>	To design and study of amplitude modulation circuit, and estimation of modulation index, hence observation of AM waves with different modulation indices.	<b>3P</b>
<b>5</b>	To design and study of amplitude demodulation circuit using envelope detection.	<b>3P</b>
<b>6</b>	To design and study of Sampling, sample & Hold and reconstruction circuit, hence verification of Nyquist criteria.	<b>3P</b>
<b>7</b>	To study of PAM, PWM, PPM using trainer kit.	<b>3P</b>
<b>8</b>	To study generation and detection of ASK, FSK, PSK, BPSK, QPSK and their relevant demodulation on trainer kit.	<b>3P</b>
<b>9</b>	To study four channel time division multiplexing on trainer kit.	<b>3P</b>
<b>10</b>	To study delta, adaptive delta modulation on trainer kit.	<b>3P</b>
<b>11</b>	To study of two channels multiplexed PCM and its demodulation on trainer kit.	<b>6P</b>
<b>12</b>	Study of encoding and decoding circuit on trainer kit.	<b>6P</b>
	Total:	<b>42P</b>
	Total Week Required:	<b>14</b>
	No. Of Week Reserved:	<b>02</b>

**Books: Text and/or Reference:**

1. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition, PEA, 2004
2. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004
3. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
4. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
5. B.Carlson, Introduction to Communication Systems (4/e), McGraw-Hill
6. Principles of Communication Systems – H. Taub & D. Schilling , TMH, 2nd Edition, 2003

Semester- VI

**Paper Name : Database Management System**  
**Paper Code : CSE 601**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
<b>1</b>	<p><b>Introduction:</b>            Database system vs. file system, DBMS applications, When not to use a DBMS, Three-schema architecture and data independence, components of a DBMS, structure of a DBMS, Database languages (DCL, DDL, DML).</p> <p><b>Database Design and the Entity Relationship (E-R) Model:</b>            Overview of the database design process: Requirements collection and analysis, conceptual design, Logical design, Physical Design.            E-R Model: Entity Sets, Relationship Sets, Attributes, Constrains: Mapping Cardinalities, Participation Constraints, Keys. Roles, Weak Entity Sets, Relationship Attributes, Binary versus <i>n</i>-ary Relationship Sets, Specialization, Generalization, Aggregation.</p> <p><b>Relational Model:</b>            Relation, Tuples, Domains, Relational integrity constraints, E-R-to-Relational mapping algorithm (9 steps), The relational algebraic operations-selection, projection, Cartesian product, union, intersection, join, division.</p>	<b>14L+3T</b>
<b>2</b>	<p><b>Structured Query Language (SQL):</b>            Domain types, Basic structures, set operations, null values, aggregate functions, nested sub-queries, Modifications of database, join expressions, relations, views, transaction, integrity constraints, Authorization, Functions and procedures, Triggers.</p> <p><b>Relational Database Design:</b>            Decomposition and Synthesis approach of database design, Functional dependencies (FDs), closure, cover, Atomic domains and first normal form (NF) , Decomposition using FDs, NFs based on primary keys, second and third NFs, Boyce-Codd NF, Multivalued dependency and fourth NF, Join dependencies and fifth NF, domain-key normal form (DKNF).</p>	<b>8L+3T</b>
<b>3</b>	<p><b>Storage, File Structure, Indexing and Hashing:</b>            Redundant arrays of independent disks (RAID), tertiary storage.            File structures: Organization of records in files, database buffer, ordered indices , index definition in SQL</p> <p><b>Query Processing and Optimization:</b>            Steps in query processing, Building Query Graph, Determining cost of evaluating Selection, Join, Projection, Set Theoric Operation, Aggregate and Join, Combining operations using pipelining, Using heuristics in query optimization</p> <p><b>Transaction:</b>            Properties of the transactions, States of transactions, Transaction Definition in SQL.</p>	<b>11L+3T</b>



<b>4</b>	<p><b>Concurrency Management and Deadlock Handling:</b>  Concurrency Control Mechanisms, Conflict and View Serializability, Recoverable schedules, Cascading Rollbacks, Cascadeless Schedules, Lock-Based Protocols, Granularity of locking, Timestamp-Based Protocols. Deadlock detection strategies, wait-for graph</p> <p><b>Recovery system:</b>  Types of failure in DBMS, log-based recovery, write-ahead log strategy, recovery-using checkpoint, shadow page scheme, Database backup and recovery from catastrophic failures.</p>	<b>9L+5T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. A. Silberschatz, H. F. Korth and S. Sundarshan, Database Systems Concepts, McGraw Hill publications.
2. R. Elmasri and B. Navathe, Fundamentals of Database Systems, Pearson publications.
3. B. C. Desai, An Introduction to Database Systems, Galgotia publications
4. C. J. Date, An Introduction to Database Design, Pearson publications.
5. A. K. Majumdar and P. Bhattacharyya, Introduction to Database Management Systems, McGraw Hill publications.

**Paper Name : Software Engineering**

**Paper Code : CSE 602**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Introduction:</b>  What is Software engineering, Introduction to the notion of software engineering as a product, Characteristics of good software products, Introduction to the Engineering aspects of Software Products, Necessity of automation, Job responsibilities of programmers and Software Engineers as Software Developers, Software development process models.</p> <p><b>Software Development Life Cycle and Process Models:</b>  Requirement analysis, Software Design, Coding, Testing, Maintenance. Code and Fix Model, Waterfall Model, Prototyping model, Iterative Enhancement Model, RAD Model, Evolutionary process Model, Unified process Model, Spiral Model, Selection of Life Cycle Models, Role of Management in Software Development.</p> <p><b>Software certification:</b>  Requirement of certification, Types, Certification of: Product, Process, Person, Third party certification.</p>	<b>14L+4T</b>

<b>2</b>	<p><b>Software Requirement Specification:</b>  Problem analysis, Requirement Specification, Requirement Types, Requirement Gathering Techniques, feasibility Study Validation, metrics, Use Case diagram, ER Diagram.</p> <p><b>Techniques for Software Size and Cost Estimation: Software Project Planning:</b>  Line of Codes method, Function Point Analysis for size estimation, Static Single variable and Static Multi Variable models for Cost Estimation. COCOMO and COCOMO-II.</p>	<b>8L+3T</b>
<b>3</b>	<p><b>System Design:</b>  Problem Partitioning, Abstraction, Top-down and bottom-up design, Structured approach, Modularity, Coupling and cohesion, DFD and Structure chart.</p> <p><b>Coding:</b>  Top-down and Bottom up approach, Structured Programming, program style and internal documentation ,Verification, Validation, Metrics, Types of metrics, Token Count methodology, Data Sharing among modules, Information flow metrics, Basic and revised information flow model.</p>	<b>9L+4T</b>
<b>4</b>	<p><b>Testing:</b>  Levels of testing, Alpha Testing, Beta Testing, Functional Testing, Boundary Value Analysis, Introduction to the technique for testing real time systems, Test case specification.</p> <p><b>Software Reliability:</b>  Software reliability, Reliability Curve, failure, Fault, Risk Management, Software quality ,Software quality assurance models :McCall Software Quality model, Boehm Software Quality model, ISO 9000,ISO 9126</p> <p><b>Software Maintenance:</b>  Categories of maintenance, problems during maintenance, Maintenance Process, Maintenance models: Quick and Fix model, Iterative Enhancement model, Reuse oriented model, Boehm's model, Taute Maintenance model.</p>	<b>11L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. R. Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Y. Singh, Software Engineering, New Age International Publishers.
4. C. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
5. I. Sommerville, Software Engineering, Addison Wesley.
6. P. Jalote, Software Engineering, Narosa Publication
7. S. L. Pfleeger, Software Engineering : The Production of Quality Software, Macmillan Pub Co

**Paper Name : Compiler Design**  
**Paper Code : CSE 603**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction :</b>            Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Overview and use of linker and loader, types of Compiler, Analysis of the Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers, Front-end and Back-end of compiler, pass structure</p> <p><b>Lexical Analysis :</b>            Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA</p>	10L+3T
2	<p><b>Syntax Analysis :</b>            The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Error Recovery strategies for different parsing techniques.</p> <p><b>Syntax Directed Translation:</b>            Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, syntax directed definitions and translation schemes. , Specification of a simple type checker, Equivalence of type expressions,</p>	15L+6T
3	<p><b>Run Time Environments :</b>            Source Language Issues, Storage Organization, Storage-Allocation Strategies, and Access to Non local Names, Parameter Passing, Symbol Tables, and Language Facilities for Dynamic Storage Allocation, Dynamic Storage Allocation Techniques.</p> <p><b>Intermediate Code Generation:</b>            Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).</p>	9L+3T
4	<p><b>Code optimization:</b>            Introduction, Basic blocks &amp; flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization.</p> <p><b>Code generations:</b>            Issues in the design of code generator, a simple code generator, Register allocation &amp; assignment.</p>	8L+2T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. V. Aho, R. Sethi and J. D. Ullman, Compiler Principles, Techniques, and Tools, Addison-Wesley
2. A. I. Holub, Compiler Design in C, Prentice-Hall.
3. S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann

**Paper Name : Object Oriented Technology II**

**Paper Code : CSE 604**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Object oriented modeling, The Rumbaugh OMT, The Booch methodology, Jacobson's OOSE methodologies</p> <p><b>Introduction to UML:</b> Introduction to UML, Components of the UML: Class diagram, object diagram, Use case diagram, state diagram, sequence diagram, Activity diagram, Communication diagram, Component diagram, Deployment diagram.</p> <p><b>Static structural view (Models):</b></p> <ul style="list-style-type: none"><li>• <b>Class diagram:</b> Classes, values and attributes, operations and methods, abstract classes, access specification Relationships among classes: Associations, Dependencies. Inheritance - Generalizations, Aggregation. Association, Notes in class diagram, Extension mechanisms, Metadata, Refinements, Derived , data, constraint, stereotypes, Package &amp; interface Cohesion, Coupling,</li><li>• <b>Object diagram:</b> Notations and modeling, relations among objects (links).</li></ul> <p><b>Factional view(models):</b></p> <ul style="list-style-type: none"><li>• <b>Use case diagram:</b> Requirement Capture with Use case, Building blocks of Use Case diagram, Relationships between use cases - extend, include, generalize.</li><li>• <b>Activity diagram:</b> Elements of Activity Diagram - Action state, Activity state, Object, node, Control and Object flow, Transition (Fork, Merge, Join), Partition - Swim Lane.</li></ul>	11L+4T
2	<p><b>Behavioral (Dynamic structural view):</b></p> <ul style="list-style-type: none"><li>• <b>State diagram:</b> Notations, events,. State Diagram states, transition and condition, state diagram behavior, completion transition, sending signals.</li><li>• <b>Interaction diagrams: Sequence and Collaboration diagram</b> -Iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in diagram.</li></ul> <p><b>Architectural view:</b></p> <ul style="list-style-type: none"><li>• <b>Component Diagram:</b> Logical architecture, Hardware</li></ul>	8L+4T

	architecture, Process architecture, Implementation architecture. <b>Environmental View:</b> • <b>Deployment diagram:</b> Nodes and their relationships.	
<b>3</b>	<b>Software Re-usability:</b> Introduction to Design Patterns. <b>Distributed object model:</b> Distributed object computing, interoperability and middleware standards CORBA and COM/DCOM. <b>Object Oriented Database:</b> OO paradigm, OO data models: Object identifiers, object definition and query language, Relationship and Integrity, ER Diagramming model for OO relationships, Object relational data models.	<b>14L+5T</b>
<b>4</b>	<b>J2EE:</b> Goals of an Enterprise Architecture, components of J2EE Architecture, Architectural Tiers in J2EE Applications, The Model View Controller (MVC) Architectural Pattern. Java Transaction API, Remote Method Invocation to Internet Inter-ORB Protocol (RMI-IIOP), Java Database Connectivity (JDBC), Java Message Service (JMS), Java Naming and Directory Interface (JNDI), JavaBeans Activation Framework (JAF), Java API for XML Parsing (JAXP), Security Services (JAAS), Web Services etc. Application component APIs: Enterprise JavaBeans (EJB), Java Servlet, Java Server Pages (JSP).	<b>9L+1T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books:Text and/or Reference:**

1. G. Booch, J. Rumbaugh, I. Jacobson, The Unified Modeling Language User Guide, Pearson Education.
2. M. P. Jones, Fundamentals of Object Oriented Design in UML, Addison-Wesley Longman.
3. P. Roques, Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
4. A. Kahate, Object Oriented Analysis & Design, The McGraw-Hill Companies.
5. M. Priestley, Practical Object-Oriented Design with UML, TATA McGraw Hill.
6. C. Larman, Applying UML and Patterns: An introduction to Object: Oriented Analysis and Design and Unified Process, Prentice Hall India.
7. A. Bahrami, Object Oriented Systems Development: Using the Unified Modeling Language, McGraw-Hill.
8. R. Johnson, Expert One-on-One J2EE Design and Development, Wrox publication.
9. J. Keogh, J2EE: The complete Reference, McGraw Hill Education.
10. H. F. Korth and A. Silverschatz, Database Systems Concepts, McGraw Hill
11. A. S. Tanenbaum, Distributed Systems: Principles and Paradigms, CreateSpace Independent Publishing Platform.

**Paper Name : Digital Signal Processing**  
**Paper Code : ECE 622**  
**Weekly Load : L: 3 T :1 P :0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction to Digital Signal Processing and Discrete time Systems:</b></p> <p>Signals, Signal Processing and Its benefits, Examples of Signals, Classification of Signals, Application areas, Typical Signal Processing Operations, Overview of real-time Signal Processing, Advantages Digital Signal Processing.</p> <p>Sampling of Continuous Signal, Signal Reconstruction, Practical Considerations for Signal Sampling: Anti-Aliasing Filtering, Practical Considerations for Signal Reconstruction: Anti-Image Filter and Equalizer, Analog-to-Digital Conversion, Digital-to-Analog Conversion, Quantization.</p> <p>Introduction, Discrete time Signals and Systems, Operations on Sequences, Classification of Discrete-time Systems, Convolution and Correlation, Linear Time Invariant (LTI) System, System described by Difference Equation, Recursive and Non-recursive Systems.</p>	9L +2T
2	<p><b>Correlation , convolution and discrete-time fourier transform (DTFT):</b></p> <p>Convolution: Introduction, Discrete-time LTI Systems: Impulse Response, Convolution Sum, Graphical Method for Convolution Sum, Analytical Method, Properties of Convolution, Circular Convolution, Fast Linear Convolution, Computational Advantages of Fast Linear Convolution.</p> <p>Correlation Description: Cross-correlation and Auto-correlation, Applications of Correlation, Fast Correlation, Relationship between Convolution and Correlation.</p> <p>Discrete-time Fourier Series: Evaluation of DTFS Coefficient, Magnitude and Phase Spectrum of Discrete-time Periodic Signals, Properties of Discrete Time Fourier Series</p> <p>Discrete-time Fourier Transform and its Inverse, Properties of Discrete-time Fourier Transform, Fourier Transform of periodic Signals</p>	8L+4T
3	<p><b>Discrete Fourier transform (DFT) and the z-transform:</b></p> <p>Introduction: Fourier Series, Fourier Transform, DFT and its Inverse, DFT as a Linear Transformation, Properties of DFT, Filtering of Long Data Sequences using DFT: Overlap-save Method, Overlap-add Method, Computational Complexity of DFT.</p> <p>Fast Fourier Transform (FFT): The Decimation-in-Time Fast Fourier Transform (DIT-FFT) Algorithm, Butterfly Diagram, Algorithmic Development, Computational advantage of the FFT, Inverse Fast</p>	11L+4T

	Fourier Transform, The Decimation-in-Frequency Fast Fourier Transform (DIF-FFT) Algorithm, Comparison of DIT and DIF algorithm. Introduction, Region-of-Convergence and its Properties, Relationship between: z-Transform and DTFT, z-Transform and Laplace Transform, z-Transform and Discrete Time Fourier Series, Properties of z-Transform, The Inverse z-Transform: Power Series Method, Partial Fraction Expansion Method, Residue Method, Applications of z-Transform	
<b>4</b>	<b>Digital filter:</b> Introduction of digital filters, FIR, IIR filters, their representation advantages and disadvantages. Design of FIR filter: Linear phase filter, rectangular window technique, Gibbs phenomenon, different windows- Bartlett, Hamming, Hanning, Kaiser etc. Design of IIR filter from analog filter, Bilinear Transformation method, Impulse invariant method, Butterworth, Chebyshev. Elliptic IIR filters. Realization of IIR and FIR filters-structures, Direct form-I and II structures, cascade and parallel structures, Filter design using Pole-zero placements.	<b>14L+4T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books:Text and/or Reference:**

1. J.G. Proakis & D.G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Pearson/PHI
2. R. Babu, Digital Signal Processing, Scitech
3. S.K.Mitra, Digital Signal Processing - A Computer based approach, TMH.
4. S. Salivahanan et al, Digital Signal Processing, TMH
5. E.C. Ifeachor et.al., Digital Signal Processing : A Practical approach, Pearson Education.
6. Hamming R.W, Digital Filters, Pearson/ PHI
7. A.Oppenheim, R.Schafer , Digital Signal Processing, Pearson/PHI.
8. Roman Kuc, Introduction to DSP, BS Publication.
9. L.R. Rabiner & B.Gold, Theory and Application of Digital Signal Processing, Pearson/PHI
10. K.Padmanabhan, S.Ananthi & R.Vijayarajeswaran, A Practical Approach to Digital Signal Processing- New Age
11. Ingle, Digital Signal Processing using MATLAB, Vikas Pub.
12. Lyons, R.G. Understanding digital signal processing. Pearson Education

**Paper Name : Database Management System Laboratory**

**Paper Code : CSE 651**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Creating table, inserting data, updating table data, data record deletion, viewing data, modifying table structure, renaming and destroying table.	<b>6P</b>
<b>2</b>	Arithmetic, logical operator, range searching, pattern matching, numeric function- scalar & group functions, string functions, Date function, table conversion functions.	<b>6P</b>
<b>3</b>	Null value concept, primary key, and foreign key, unique, creating constraints, creating Indexes.	<b>3P</b>
<b>4</b>	Grouping data, join, sub-queries, union , intersection, minus clause, indexing, view, granting and revoking permissions.	<b>3P</b>
<b>5</b>	Introduction to PL/SQL – data type, branching, looping, simple problem solving using PL/SQL, Transaction concepts –commit, rollback, savepoint, introduction to cursor, parameterized cursor, locking.	<b>9P</b>
<b>6</b>	Stored procedure and functions, package, trigger.	<b>6P</b>
<b>7</b>	Use of host language inter-pace with embedded SQL.	<b>6P</b>
<b>8</b>	Use of user interfaces and report generation utilities typically available with RDBMS products.	<b>3P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books:Text and/or Reference:**

1. I. Bayross, SQL, PL/SQL The Programming Language of ORACLE, BPB Publications
2. K. Loney and B. Bryla, Oracle Database 12c The Complete Reference (Oracle Press), McGraw-Hill Education

**Paper Name : Compiler Design Laboratory**

**Paper Code : CSE 653**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Write a C program to identify whether a given line is a comment or not Write a C program to test whether a given identifier is valid or not.	<b>3P</b>



2	Implement following programs using Lex. a. Create a Lexer to take input from text file and count no of characters, no. of lines & no. of words. b. Write a Lex program to count number of vowels and consonants in a given input string.	3P
3	Implement following programs using Lex. a. Write a Lex program to print out all numbers from the given file. b. Write a Lex program to printout all HTML tags in file. c. Write a Lex program which adds line numbers to the given file and display the same onto the standard output. d. Write a Lex program to count the number of comment lines in a given C program. Also eliminate them and copy that program into separate file.	6P
4	Design a lexical analyzer for given language using LEX and C	6P
5	To Study about Yet Another Compiler-Compiler(YACC). Create Yacc and Lex specification files to recognizes arithmetic expressions involving +, -, * and /. Create Yacc and Lex specification files are used to generate a calculator which accepts, integer and float type arguments.	6P
6	Write a C program for constructing of LL (1) parsing.	6P
7	Write a C program for constructing recursive descent parsing	6P
8	Write a C program to implement LALR parsing.	6P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. V. Aho, R. Sethi and J. D. Ullman, Compiler Principles, Techniques, and Tools, Addison-Wesley
2. A. I. Holub, Compiler Design in C, Prentice-Hall.
3. S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann
4. D. Brown, J. Levine and T. Manson, lex & yacc , O'Reilly

**Paper Name : Object Oriented Technology II Laboratory**

**Paper Code : CSE 654**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

Unit	Detailed Description	Practical Period
1	<b>Object Oriented Software design using UML Modeling Tool:</b> Forward engineering (Code and Test case generation) and Reverse Engineering using UML diagram.	21P
2	<b>Implementing Types, Object Views, methods using DBMS Software:</b> Working with Abstract Data Types, Implementing Object Views, and methods.	10P

<b>3</b>	<b>Advanced Object Oriented Concepts using DBMS Software:</b> Row Objects vs. Column Objects, Object Tables and OIDs, Object Views with REFs, Object PL/SQL, Objects in the Database.	<b>11P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. G. Booch, J. Rumbaugh, I. Jacobson, The Unified Modeling Language User Guide, Pearson Education.
2. M. P. Jones, Fundamentals of Object Oriented Design in UML, Addison-Wesley Longman.
3. P. Roques, Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
4. A. Kahate, Object Oriented Analysis & Design, The McGraw-Hill Companies.
5. M. Priestley, Practical Object-Oriented Design with UML, TATA McGraw Hill.
6. C. Larman, Applying UML and Patterns: An introduction to Object: Oriented Analysis and Design and Unified Process, Prentice Hall India.
7. A. Bahrami, Object Oriented Systems Development: Using the Unified Modeling Language, McGraw-Hill.
8. K. Loney and B. Bryla, Oracle Database 12c The Complete Reference (Oracle Press), McGraw-Hill Education

**Paper Name : Digital Signal Processing Laboratory**

**Paper Code : ECE 672**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Familiarization with MATLAB software and general functions.	<b>3P</b>
<b>2</b>	Write a MATLAB program to develop some elementary continues time (CT) signals: Sinusoidal, Complex waveform, Unit Impulse, Unit Step, Unit Ramp, Exponential, Noise.	<b>3P</b>
<b>3</b>	Write a MATLAB program to find the sum of sinusoidal signals and understanding of the concept of harmonics.	<b>3P</b>
<b>4</b>	Write a MATLAB program to develop some elementary sequences or discrete time (DT) signals: Sinusoidal, Complex waveform, Unit Impulse, Unit Step, Unit Ramp, Exponential, and Noise.	<b>3P</b>
<b>5</b>	Write a MATLAB program to find the impulse response of a LTI system defined by a difference equation and to plot the Frequency response of a given LTI sequence	<b>3P</b>
<b>6</b>	Write a MATLAB program to compute linear convolution and circular convolution of two given sequences.	<b>3P</b>
<b>7</b>	Write a MATLAB program to find the Discrete Time Fourier Transform DTFT of the given sequence.	<b>3P</b>
<b>8</b>	Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.	<b>3P</b>
<b>9</b>	Write a MATLAB programs for auto correlation and cross correlation.	<b>3P</b>

<b>10</b>	<b>Using TMS320C5X</b> 1. Study of various addressing modes of DSP hardware using simple programming examples 2. Sampling of input signal and display 3. Implementation of FIR filters 4. Calculation of FFT	<b>15P</b>
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Digital Signal and Image Processing Using MATLAB by Blanchet and Charbit
2. Ingle, Digital Signal Processing using MATLAB, Vikas Pub.
3. S.K.Mitra, Digital Signal Processing - A Computer based approach, TMH.
4. J.G. Proakis & D.G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Pearson/PHI
5. Alex Palamides & Anastasia Veloni, Signals and Systems Laboratory with MATLAB

**Paper Name : Business Communication and Presentation Skills II**

**Paper Code : HS 681**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>Unit</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	Oral Presentation and professional speaking covering Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech	
<b>2</b>	Career Oriented Communication covering Resume and biodata: Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion;	
<b>3</b>	Advanced Techniques in Technical Communication covering Interview through telephone/video-conferencing; Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports; Writing for the media	
<b>4</b>	Language laboratory training in speaking skills covering oral presentations, mock interviews and model group discussions through the choice of appropriate programmes	
	<b>Total :</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. Lesikar and petit, Report writing for Business
3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
4. Wallace and masters, Personal Development for Life and Work, Thomson Learning
5. Hartman Lemay, Presentation Success, Thomson Learning
6. Malcolm Goodale, Professional Presentations
7. Farhathullah, T. M. Communication skills for Technical Students
8. Michael Muckian, John Woods, The Business letters Handbook
9. Herta A. Murphy, Effective Business Communication
10. MLA Handbook for Writers of Research Papers

**Semester- VII**

**Paper Name : Law for Engineers**  
**Paper Code : HS 701**  
**Weekly Load : L: 3 T: 0 P: 0**  
**Credit Point : 2**  
**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b><i>Constitutional Law</i></b> covering the Preamble; Fundamental Rights, Judicial Activism including Equality and Social Justice, Life and Personal Liberty and Secularism and Religious freedoms; Directive principles of State policy; Fundamental Duties; Emergency provisions-kinds, legal requirements and legal effects.</p> <p><b><i>Arbitration, Conciliation and ADR system</i></b> covering Arbitration – meaning, scope and types – distinction between law of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, ground of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York Convention Awards and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs</p>	<b>10L</b>
<b>2</b>	<p><b><i>Human Rights and Public International Law</i></b> covering Human Rights in International Law-Theoretical foundation, human rights and international law; Historical development of human rights; Human Rights in Indian tradition and Western tradition; Covenant on Civil &amp; Political Rights 1966 including Optional Protocol – I (Individual Complaint Mechanism) &amp; Optional Protocol – II (Abolition of Death Penalty); Covenant on Economic, Social and Cultural Rights 1966 including Optional Protocol – I (2002); UN Mechanism and specialized agencies, (UNICEF, UNESCO, WHO, ILO, FAO, etc.); International NGOs – Amnesty International, Human Rights Watch, Greenpeace Foundation; Enforcement of Human Rights in India including Supreme Court, High Courts, Statutory Commissions – NHRC, NCW, NCM, NC-SCST etc. Public International Law, covering Introduction, Customs, Treaties, State territories including Recognition of States and governments, Law &amp; Practice of Treaties and Law of Sea.</p> <p><b><i>Right to Information Act, 2005</i></b> covering, Evolution and concept; Practice and procedures; Official Secret Act, 1923; Indian Evidence Act, 1872; Information Technology – legislation and procedures, Cybercrimes – issues and investigations.</p> <p><b><i>Gender Studies</i></b> covering Meaning of gender, international perspective and national perspective; Laws relating women in India; Judicial approach and responses- Vishaka V/s State of</p>	<b>11L</b>

	Rajasthan 1997 SC; Rights enforcement mechanism in India; Landmark judicial decisions of Supreme Court relating to women.	
<b>3</b>	<b>Law relating to Intellectual property</b> covering Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Other new forms such as plant varieties and geographical indications; International instruments on IP – Berne convention, Rome convention, TRIPS, Paris convention and international organizations relating IPRs, WIPO, WTO etc; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – literary, dramatics and musical works, sound records and cinematographic films, computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Trademarks under Trademark Act, 1999 including Rationale of protection of trademarks as Commercial aspect and Consumer rights, Trademarks, registration, procedures, Distinction between trademark and property mark, Doctrine of deceptive similarity, Passing off an infringement and remedies; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies.	<b>10L</b>
<b>4</b>	<b>General Principles of Contract under Indian Contract Act, 1872</b> covering General principles of contract – Sec. 1 to 75 of Indian Contract Act and including Government. as contracting party, Kinds of government contracts and dispute settlement, Standard form contracts; nature, advantages, unilateral character, principles of protection against possibility of exploitation, judicial approach to such contracts, exemption clauses, clash between two standard form contracts. <b>Labour Laws</b> covering Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923. <b>Corporate Law</b> covering Meaning of corporation; Law relating to companies, public and private (Companies Act, 1956) general provisions; Law and multinational companies – International norms for control, FEMA 1999, collaboration agreements for technology transfer; Corporate liability, civil and criminal.	<b>11L</b>
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Agarwal H.O.(2008), International Law and Human Rights, Central Law Publications

2. S.K. Awasthi & R.P. Kataria(2006), Law relating to Protection of Human Rights, Orient Publishing
3. S.K. Kapur(2001), Human Rights under International Law and Indian Law, Central Law Agency
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. J N Pandey, Indian Constitution, Central Law Agency
6. Avtarsingh(2002), Law of Contract, Eastern Book Co.
7. Dutt(1994), Indian Contract Act, Eastern Law House
8. Anson W.R.(1979), Law of Contract, Oxford University Press
- 9 R K Bangia, Indian Contract Act, Allahabad law Agency.
- 10 S N Mishra, Labour Law , Central law publication & Bare Act
11. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
12. Wadhwa (2004), Intellectual Property Rights, Universal Law Publishing Co.
13. Bare text (2005), Right to Information Act
14. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
15. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
16. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
17. Avtarsingh (2007), Company Law, Eastern Book Co.
18. K.D. Gaur(2002), A Text book on IPC, Deep & Deep Publications
19. Asha Bajpai Gender Studies, OUP India Pub & Bare Act
- 20 Vakul Sharma, Right to Information Act , Universal publishers & Bare Act.

**Paper Name : Computational Intelligence**

**Paper Code : CSE 701**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Introduction:</b> Definition of Artificial Intelligence (AI), Approaches to AI, soft computing and hard computing; elements of soft computing and hard computing.</p> <p><b>Problem Solving and Search techniques:</b> Problems, Problem Space &amp; Search: Defining the problem as state space search, Uninform and Heuristic search strategies, Constraint satisfaction problems, local search for constraint satisfaction problems.</p> <p><b>Decision Under Uncertainty:</b> Bayes Theorem, Bayes Network, Demstar Shaffer Theorem.</p> <p><b>Propositional &amp; Predicate Logic:</b> Using constraints on feature values, Interpretations of formulas, Propositional truth table; Propositional Calculus-- Resolution principle for the propositional logic, unification algorithm. Predicate calculus-- Representing simple facts in logic representing instances, IS-A relationship, Computable functions, predicate resolutions, Clause form, Substitutions.</p>	<b>18L+8T</b>

<b>2</b>	<b>Artificial Neural network:</b> Mathematical model, properties of neural network; Typical architectures: single layer, multilayer, competitive layer; Learning methods: supervised, unsupervised, reinforced, hebbian, competitive, Boltzman, error correction & memory based learning; Common activation functions; Approximation of activation functions; NN viewed as directed graph; Taxonomy of NN architecture. Different Models of ANN: McCulloh-Pitts, Hebb Net, Perceptron, Back propagation NN, ADALINE, MADALINE, Discrete & Continuous Hopfield net, Bidirectional Associative Memory.	<b>8L+2T</b>
<b>3</b>	<b>Fuzzy Sets and Logic :</b> Fuzzy versus Crisp; Fuzzy sets-- membership function, linguistic variable, basic operators, properties, extension principle; Fuzzy relations-- Cartesian product, operation on relations; Geometry of fuzzy sets, fuzzy entropy theorem, Fuzzy rule based system— possibility theory, graphical techniques of inference (Mamdani, Sugeno- Takagi model); Defuzzification.	<b>8L+2T</b>
<b>4</b>	<b>Genetic Algorithm (GA) :</b> Basic concept, Role of GA in optimization, Fitness function, Selection of initial population, Cross over, Mutation, Selection, Constraints handling, Binary coded and real coded GA, Multi objective optimization in GA, Pareto front, Non Dominated Solution, Elitist Selection.	<b>8L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. E. Rich, K. Knight, S. B. Nair, Artificial Intelligence, TMH
2. S. J. Russel and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson
3. D. W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI
4. D. L. Poole, Computational Intelligence: A Logical Approach, Oxford University Press
5. S. Kaushik, Logic & Prolog Programming, New Age International
6. G. L. Steele Jr., Common Lisp: The Language, Digital Press.
7. H. A. Simon, The Sciences of the Artificial, MIT Press.
8. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural networks, fuzzy logic and genetic algorithms synthesis & applications, PHI
9. D. K. Pratihari, Soft Computing: Fundamentals and Applications, Alpha Science International Ltd
10. S.N. Sivanandam and S.N. Deepa, Principles of Soft Computing, Wiley India (P) Ltd
11. S. Haykin, Neural networks, A comprehensive foundation- Pearson.
12. D. Fausett, Neural networks, Pearson.
13. B. Kosko, Neural Networks and Fuzzy Systems: A Dynamical **Systems** Approach to Machine Intelligence, PHI.
14. T. J. Ross, Fuzzy logic with engineering applications, McGraw-Hill.
15. G. J. Klir and B. Yuan, Fuzzy sets & Fuzzy logic: Theory & Applications, PHI.
16. D.E. Goldberg, Genetic algorithm in search, optimization & machine learning, Pearson Edu.
17. K. Deb, Multi-Objective Optimization using Evolutionary Algorithms, Wiley



**Paper Name : Digital Image Processing**

**Paper Code : CSE 702**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction:</b> Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display. <b>Digital Image Formation:</b> A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	<b>8L+3T</b>
<b>2</b>	<b>Mathematical Preliminaries:</b> Neighbor of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine, Wavelet Transform. <b>Image Enhancement :</b> Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	<b>11L+4T</b>
<b>3</b>	<b>Image Restoration:</b> Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation. <b>Image Segmentation:</b> Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection- Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	<b>11L+3T</b>
<b>4</b>	<b>Image Representation and Description:</b> Representation schemes, Chain codes, Polygonal approximations, Signatures, Boundary segments, The skeleton of a region, Line segmented encoding, Boundary descriptors, Basic descriptors, Fourier descriptors, Regional descriptors: Basic descriptors, Topological descriptors, Texture. <b>Image Compression:</b> Image Compression Models, Elements of Information Theory ,Lossy and Error-Free Compression , Huffman Coding, Image Compression	<b>13L+4T</b>

Standards	<b>Morphological Image Processing:</b> Introduction, Basic Definitions: Dilation, Erosion, Concept of structuring elements, Opening and closing operations, Boundary extraction, concept of hit or miss transformation, Thinning and thickening transformation, Skeletonization, Pruning	
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books:Text and/or Reference:**

1. Digital Image Processing, Gonzalez and Woods, Pearson Education
2. Digital Image Processing, Jahne, Springer India
3. Digital Image Processing and Analysis, Chanda & Majumder, PHI
4. Fundamentals of Digital Image Processing, Jain, PHI
5. Fundamentals of Digital Image Processing, S. Annadurai, Pearson Education

**Paper Name : Design and Analysis of Information System**

**Paper Code : CSE 703**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Data and Information:</b> Types of information: operational, tactical, strategic and statutory – why do we need information systems – introduction to MIS - management structure – requirements of information at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information</p> <p><b>Systems Analysis and Design Life Cycle:</b> Requirements determination – requirements specifications – feasibility analysis – final specifications – hardware and software study – system design – system implementation – system evaluation – system modification. Role of systems analyst – attributes of a systems analyst – tools used in system analysis</p>	<b>6L+2T</b>
<b>2</b>	<p><b>Information gathering:</b> Strategies – methods – case study – documenting study – system requirements specification – from narratives of requirements to classification of requirements as strategic, tactical, operational and statutory. Example: Case study</p> <p><b>Feasibility analysis:</b> Deciding project goals – examining alternative solutions – cost – benefit analysis – quantifications of costs and benefits – payback period – system proposal preparation for managements – parts and documentation of a proposal – tools for prototype creation.</p> <p><b>Tools for systems analysts:</b> Data flow diagrams – case study for use of DFD, good conventions – leveling of DFDs – leveling rules – logical and physical DFDs –</p>	<b>10L+3T</b>

	software tools to create DFDs.	
<b>3</b>	<p><b>Structured systems analysis and design:</b>  Procedure specifications in structured English – examples and cases – decision tables for complex logical specifications – specification oriented design vs procedure oriented design</p> <p><b>Data oriented systems design:</b>  Entity relationship model – E-R diagrams – relationships cardinality and participation – normalizing relations – various normal forms and their need – some examples of relational data base design.</p> <p><b>Data input and output methods:</b>  Coding techniques – requirements of coding schemes – error detection of codes – validating input data – input data controls interactive data input .Designing outputs – output devices – designing output reports – screen design – graphical user interfaces – interactive I/O on terminals.</p>	<b>12L+4T</b>
<b>4</b>	<p><b>Control – audit and security of information systems:</b>  Why controls are needed – objectives of control – techniques used in control – auditing information systems – auditing around, through and with the computer – testing information systems – types of tests – how to generate tests – security of information systems – disaster recovery – business process continuity .</p> <p><b>Complete system analysis and design case studies</b></p>	<b>14L+5T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. V. Rajaraman, Analysis and Design of Information Systems, PHI
2. I. Hawryszkiewicz, Introduction to Systems Analysis and Design, Prentice Hall
3. J. A. Senn, Analysis and Design of Information Systems, McGraw Hill
4. P. Jalote, An Integrated Approach to Software Engineering, Springer Science & Business Media
5. R. S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill

**Paper Name : Computational Intelligence Laboratory**

**Paper Code : CSE 751**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

<b>UNIT</b>	<b>Detailed Description</b>	<b>Practical Period</b>
<b>1</b>	<p><b>Logic programming using Prolog:</b>  Introduction to prolog environment, list operators and arithmetic, Defining Programs, input-output, Basic Flow of Control, prolog programming style, Atoms and Lists, More on Predicates, Properties, Search techniques using prolog.</p>	<b>21P</b>
<b>2</b>	Assignment on Baysian Network.	<b>3P</b>
<b>3</b>	Assignment on classification by Artificial Neural Network.	<b>3P</b>
<b>4</b>	Assignment on clustering by Artificial Neural Network.	<b>3P</b>
<b>5</b>	Assignment on Fuzzy logic controller.	<b>3P</b>
<b>6</b>	Implementation of Binary Genetic Algorithm.	<b>3P</b>

7	Implementation of Real Coded Genetic Algorithm.	3P
8	Implementation of Multi Objective Genetic Algorithm.	3P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. I. Bratko, PROLOG: Programming for Artificial intelligence, Pearson Education India.
2. W. A. Clocksin and C. S. Mellish, Programming in Prolog: Using the ISO Standard, Springer.
3. E. Rich, K. Knight, S. B. Nair, Artificial Intelligence, TMH
4. S. J. Russel and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson
5. D. W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI
6. D. L. Poole, Computational Intelligence: A Logical Approach, Oxford University Press
7. S. Kaushik, Logic & Prolog Programming, New Age International
8. G. L. Steele Jr., Common Lisp: The Language, Digital Press.
9. H. A. Simon, The Sciences of the Artificial, MIT Press.
10. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural networks, fuzzy logic and genetic algorithms synthesis & applications, PHI
11. D. K. Pratihari, Soft Computing: Fundamentals and Applications, Alpha Science International Ltd
12. S.N. Sivanandam and S.N. Deepa, Principles of Soft Computing, Wiley India (P) Ltd
13. S. Haykin, Neural networks, A comprehensive foundation, Pearson.
14. D. Fausett, Neural networks, Pearson.
15. B. Kosko, Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence, PHI.
16. T. J. Ross, Fuzzy logic with engineering applications, McGraw-Hill.
17. G. J. Klir and B. Yuan, Fuzzy sets & Fuzzy logic: Theory & Applications, PHI.
18. D.E. Goldberg, Genetic algorithm in search, optimization & machine learning, Pearson Edu.
19. K. Deb, Multi-Objective Optimization using Evolutionary Algorithms, Wiley

**Paper Name : Digital Image Processing Laboratory**

**Paper Code : CSE 752**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

UNIT	Detailed Description	Practical Period
	Assignments can be done using C/MATLAB/JAVA/Pythons etc.	
1	Assignments on Image Enhancement in spatial and frequency domain	9P
2	Assignments on Image Restoration	9P
3	Assignments on Image Segmentation	9P
4	Assignment on Image Representation and Description	9P
5	Assignments on Image Compression And Morphological operation	6P
	<b>TOTAL:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Digital Image Processing, Gonzalez and Woods, Pearson Education

2. Digital Image Processing, Jahne, Springer India
3. Digital Image Processing and Analysis, Chanda & Majumder, PHI
4. Fundamentals of Digital Image Processing, Jain, PHI
5. Fundamentals of Digital Image Processing, S. Annadurai, Pearson Education

**Paper Name : Information System Design Laboratory**

**Paper Code : CSE 753**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

UNIT	Detailed Description	Practical Period
<b>1.</b>	Implementation of any Information System by following all the steps of SDLC (System Development Life Cycle Model). List of some Information Systems: a) Payroll accounting system. b) Library circulation management system. c) Inventory control system. d) University examination & grading system. e) Patient information system. f) Tourist information system. g) Judiciary information system. h) Flight reservation system. i) Bookshop automation software j) Time management software.	<b>42P</b>
	<b>TOTAL:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Whitten—System Analysis & Design Methods, 5/e, TMH
2. V. Rajaraman, “Systems Analysis and Design”, PHI
3. R.G. Murdic., J. Rose and JR Claggt., “Information Systems for Modern Management”, PHI,
4. K Wigardes, A Svensson., L Sehong, G. Dahlgren, “Structured Analysis and Design of Information Systems”,
5. R. Thomas and Prince, “Information Systems for Planning and Control”.
6. J Senn., “Analysis and Design of Information Systems”, McGraw Hill
7. P. Jalote—Software Engineering
8. Naik Kishore—System Analysis & Design
9. Rogers G Pressman—Software Engineering

Semester- VIII

**Paper Name : VLSI System Design**  
**Paper Code : CSE 801**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction to VLSI circuit design:</b> Integrated Circuits, Gordon Moore's Prediction. <b>MOSFETs:</b> Operation of MOS transistors, NMOS, PMOS, Comparisons, Realization of NOT, NAND, NOR using PMOS, NMOS. <b>Static Logic design:</b> Static NMOS and CMOS combinational networks, OAI, AOI logic gates, Pseudo NMOS.	<b>10L+4T</b>
<b>2</b>	<b>Fabrication:</b> Basic IC, NMOS, N-well CMOS <b>Design Rules:</b> Layout Design Rules, Lambda & Micron Design Rules. <b>Pass Transistors:</b> Degraded Signal Passing Phenomenon, Transmission Gates. Delays through Pass Gates, Transmission Gates.	<b>10L+4T</b>
<b>3</b>	<b>Dynamic Logic Design:</b> Dynamic CMOS, Cascading Problem, Domino CMOS structures, Charge Sharing, NORA logic circuit. <b>Special Circuit Layouts:</b> MOS Memory devices, Multiplexers, Barrel Shifter. <b>Stick Diagram:</b> Layout Stick Diagrams, Example of a MOS.	<b>10L+4T</b>
<b>4</b>	<b>Power Consumption:</b> Static & Dynamic Power, Switching Activity, Different Power Reduction Techniques of VLSI circuits. <b>VLSI Design Cycle:</b> System Specification, Design Entry – HDL/ Schematic, Logic Design & Verification, Physical design, Fabrication & Packing.. <b>Basic idea of Physical design:</b> Partitioning, Placement, Floor planning, Routing.	<b>12L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. S.M. Kang, Y. Leblebici, CMOS Digital Integrated Circuits, Mc Graw Hill.
2. N.H.E Weste, D.M. Harris, A. Banerjee, CMOS VLSI Design, Pearson Education.
3. K. Eshraghian, N.H.E Weste, Principles of CMOS VLSI Design, Pearson Education.
4. K. Parhi, VLSI Digital Signal Processing, IEEE - Wiley Press.
5. J. Millman, C. Halkias, Integrated Electronics, Tata Mc Graw Hill.

6. R. J. Baker, CMOS Circuit Design Layout and Simulation, IEEE - Wiley Press.
7. Michael D. Ciletti, Advanced Digital Design with Verilog HDL, PHI Ltd.
8. Brown, Varansic, Digital Logic with Verilog Design, Mc. Graw Hill Professional
9. Peter J. Ashenden, Designer's Guide to VHDL, Morgan Kaufmann 2<sup>nd</sup> Edition

**Paper Name : Cryptography and Network Security**

**Paper Code : CSE 802**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Overview and Security Attacks:</b> Security Approaches, Principals of security, Types of attacks: Active attack - interruption, modification, fabrication; Passive attack – release of message contents, traffic analysis; Viruses, Worms, Trojan horse</p> <p><b>Symmetric Ciphers:</b> Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard, Introduction to Finite Fields, Advanced Encryption Standard, RC4, Confidentiality Using Symmetric Encryption</p>	10L+4T
2	<p><b>Public-Key Encryption and Hash Functions:</b> Introduction to Number Theory, Public-Key Cryptography and RSA, Key Management; Diffie-Hellman, ECC</p> <p><b>Message Authentication and Hash Functions:</b> Hash and MAC Algorithms, Digital Signatures and Authentication Protocols</p>	10L+4T
3	<p><b>Database Security:</b> Database Access Control, Inference, Statistical Database, Database Encryption</p> <p><b>Internet Security Protocols and Standards:</b> IPSec, SSL and TLS, PGP and S/MIME</p>	10L+4T
4	<p><b>Internet Authentication Applications:</b> Kerberos, X.509, Public Key Infrastructure</p> <p><b>Security Appliances:</b> Intrusion Detection Systems, Firewalls and Intrusion Prevention Systems</p>	12L+2T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

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", Merike Kaeo, 2nd Edition, Pearson Books

6. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2<sup>nd</sup> Edition, Oreilly
7. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

**Paper Name : Advanced Computer Organization and Architecture**

**Paper Code : CSE 803**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Evolution of computer architecture, Flynn's classification, System performance.</p> <p><b>Parallelism, Partitioning and Flow Mechanism:</b> Condition of parallelism – data, resource and control dependencies, Bernstein's Condition, Hardware &amp; Software parallelism; Program partitioning &amp; Scheduling – Grain Sizes &amp; Latency, Grain Packing &amp; Scheduling, Static Multiprocessor Scheduling; Program Flow Mechanisms - Control Flow, Data Flow, Demand Driven Mechanisms, comparisons.</p>	10L+4T
2	<p><b>Advanced Processor Technology:</b> RISC, CISC, Symbolic Processor and characteristics, Difference between RISC and CISC.</p> <p><b>Pipelines:</b> Linear pipelines – Synchronous &amp; Asynchronous model, Speedup, Efficiency, Throughput; Non-linear pipelines – Reservation &amp; Latency Analysis, Collision free scheduling, MAL – Minimal Average Latency; Instruction pipelines – phases, mechanisms, dynamic instruction scheduling, branch handling techniques; Arithmetic pipeline design – Multiply pipe design using CSA, Convergence division, Multifunctional arithmetic pipeline.</p>	12L+4T
3	<p><b>Interconnection Network Architectures:</b> Properties &amp; Routing of different types of networks, Multistage Dynamic networks - Crossbar Switches.</p> <p><b>Vector &amp; Array Processor:</b> Vector processor, vector instruction types, compound vector operations, vector loops and chaining; Array processor – SIMD processors, comparison with vector processor, masking, Example of an arithmetic operation on SIMD.</p>	10L+2T
4	<p><b>Memory Interleaving:</b> Low order, high order techniques, Memory Bandwidth.</p> <p><b>Multiprocessors:</b> Loosely &amp; tightly coupled, processor characteristics of multiprocessing, Interconnections – time shared or common bus, multiport memory; Cache coherence and synchronization – cache coherence problem, snoopy bus protocols, directory based protocols.</p>	10L+4T
<b>TOTAL:</b>		<b>42L+14T</b>



	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Carl Hamacher, Zvonko Vranesic, Safwat, Computer Organization, McGraw Hill.
2. J.P. Hayes, Computer Architecture and Organization, McGraw Hill.
3. William Stallings, Computer Organization and Architecture, Pearson Education
4. K. Hwang, F. Briggs, Parallel processing and Computers Architecture, Tata McGraw Hill
5. Hennessey, Patterson, Computer Architecture, Elsevier.
6. Kai Hwang, Advanced Computer Architecture, McGraw Hill International.

**Paper Name : VLSI System Design Laboratory**

**Paper Code : CSE 851**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Point : 2**

**Total Marks : 100**

UNIT	Detailed Description	Practical Period
1	Familiarization with the Xilinx - ISE package	3P
2	Familiarity with the Xilinx ISE Simulator and Test Benches	3P
3	Conversancy with programming techniques using Verilog or VHDL	6P
4	Structural design and simulation of Combinatorial Logic Devices	12P
5	Functional design and simulation of Sequential Logic Devices	12P
6	Implementing Designs in Spartan II FPGA boards	6P
	<b>Total:</b>	<b>42P</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Brown, Z G Varansic, Digital Logic with Verilog Design, Mc. Graw Hill Professional.
2. Michael D. Ciletti, Advanced Digital Design with Verilog HDL, PHI Ltd.
3. T. R. Padmanabhan, B. Bala Tripura Sundari, Design through Verilog HDL, IEEE-Wiley Press.
4. J. Bhaskar, VHDL Premier, PHI Ltd.
5. Douglas L. Perry, VHDL Programming by Example, Mc. Graw Hill Professional.
6. Peter J. Ashenden, Designer's Guide to VHDL, Morgan Kaufmann .
7. Xilinx ISE DataSheets.

**Appendix-I**  
**Professional Elective I (CSE 7<sup>th</sup> Semester)**

**Paper Name : Data Mining**  
**Paper Code : CSE 711(a)**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
<b>1</b>	<p><b>Introduction to Data Mining:</b> Process of Knowledge Discovery, Types of Data, Data Mining Functionalities.</p> <p><b>Describing Data:</b> Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity, Data Visualization Techniques.</p> <p><b>Data Preprocessing:</b> Data Summarization, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization, Concept Hierarchy Generation.</p>	<b>10L+4T</b>
<b>2</b>	<p><b>Frequent Pattern Mining, Association Rule Generation, Correlation Analysis:</b> Frequent Itemset Mining methods – Apriori Algorithm, FP-Tree Growth. Association Rules &amp; their types, Association to Correlation.</p>	<b>8L+2T</b>
<b>3</b>	<p><b>Classification and Prediction:</b> Decision trees, Bayesian Classifier, Rule-Based Classification, k-Nearest-Neighbor Classifiers, Associative Classifier, Model Evaluation-Cross-Validation, Comparing Classifiers Based on Cost-Benefit and ROC Curves.</p>	<b>8L+3T</b>
<b>4</b>	<p><b>Cluster Analysis:</b> Categories of Clustering Methods: Partitioning, Hierarchical, Density-based, Grid-based methods, Clustering of High-Dimensional Data, Evaluation of Clustering-Measuring Clustering Quality.</p> <p><b>Outlier Detection:</b> Basic concepts and types of Outliers, Statistical Methods, Proximity-Based Methods- Distance-Based Outlier Detection and a Nested Loop Method, Grid-Based and Density-Based Outlier Detection methods, Clustering-Based Outlier Detection Methods, Modeling High-Dimensional Outliers.</p>	<b>16L+5T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. J. Han and M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers.
2. M. H. Dunham, Data Mining Introductory and Advanced Topics, Printice Hall.

3. I. H. Written and E. Frank, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier.

**Paper Name** : Embedded Systems & Applications  
**Paper Code** : CSE 711(b)  
**Weekly Load** : L: 3 T: 1 P: 0  
**Credit Point** : 3  
**Total Marks** : 100

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Embedded System Hardware:</b> <ul style="list-style-type: none"> <li>• <b>Input</b> – Sensors, Sample &amp; Hold Circuits, A/D Converters</li> <li>• <b>Communication</b> – Requirements, Electrical Robustness, Guaranteeing Real-Time Behavior</li> <li>• <b>Processing units</b> – Application Specific Integrated Circuits (ASIC), Processors, Reconfigurable Logic</li> <li>• <b>Memory</b> – Scratch Pad Memories (SPM)</li> <li>• <b>Output</b> – D/A Converters, Actuators</li> </ul>	<b>10L+4T</b>
<b>2</b>	<b>Embedded operating system, Middleware &amp; Scheduling:</b> <ul style="list-style-type: none"> <li>• <b>Prediction of Execution Time</b> – The Worst Case Execution Time (WCET)</li> <li>• <b>Scheduling in Real Time Systems</b> – Classification of Scheduling Algorithms, Aperiodic and Periodic Scheduling, Resource Access Protocols</li> <li>• <b>Embedded Operating Systems</b> – General Requirements, Real Time Operating Systems (RTOS)</li> <li>• <b>Middleware</b> – Real Time Database, Access to Remote Objects</li> </ul>	<b>10L+4T</b>
<b>3</b>	<b>Implementing Embedded Systems : Hardware Software Co-Design</b> <ul style="list-style-type: none"> <li>• Task level Concurrency Management</li> <li>• High Level Optimization</li> <li>• Hardware / Software Partitioning</li> <li>• Compilers for Embedded Systems</li> <li>• Voltage Scaling and Power Management</li> </ul>	<b>10L+4T</b>
<b>4</b>	<b>Validation:</b> Simulation, emulation, test, fault simulation, injection, formal verification <b>Applications of Embedded system:</b> Application areas, Growing importance	<b>12L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Peter Marwedel, Embedded system design, Springer
2. Barret, Embedded systems, Pearson Education

3. F. Vahid, T. Ginergies Embedded system Design – A unified hardware/software introduction, John Wiley & Sons

**Paper Name : E-Commerce**  
**Paper Code : CSE 711(c)**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction to E-Commerce:</b> Definition, Scope of E-Commerce, Features of E-Commerce, Benefits of E-Commerce, Limitations of E-Commerce, Types of E-Commerce, E-Commerce practice vs. traditional practice.	<b>8L+3T</b>
<b>2</b>	<b>E-Commerce Technologies:</b> Supporting technologies and tools, Architecture (e.g. Java e-commerce solution), Protocols and standards, Security, Business models, Payment mechanisms	<b>8L+3T</b>
<b>3</b>	<b>Application of E-Commerce in Business:</b> E-Marketing – Market place vs. market space, impact of ecommerce on market, direct marketing, one to one marketing E-Finance – E-Banking, traditional vs. e-banking, impact and advantage of e-trading, trading vs. e-trading. E-Ticketing – online booking system and procedure for railway, airline, tourist, religious places, hotels, entertainment.	<b>8L+2T</b>
<b>4</b>	<b>E-Commerce Recommender Systems:</b> Basic concepts, Types of Recommender Systems, Collaborative Filtering Algorithms, Scalability, Trust and Security in Recommender Systems <b>E-Commerce in India:</b> Role of Government in development of ecommerce in India, Problems and opportunities in E-Commerce in India, Legal issues, future of E-Commerce in India.	<b>18L+6T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. David Whiteley, E-Commerce: Strategy, Technologies and Applications, Tata McGraw Hill.
2. P. T. Joseph, E-Commerce: A managerial Perspectives, Tata McGraw Hill.
3. Kamallesh k Bajaj and Debjani Nag, E-Commerce – The Cutting Edge of Business, Tata McGraw Hill. Delhi.
4. Kalakota and Whinston. Frontiers of Electronic Commerce, Addison Wesley.
5. Francesco Ricci and Lior Rokach, Recommender System Handbook, Springer Nature.

**Paper Name : Robotics**  
**Paper Code : CSE 711(d)**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<b>Introduction:</b> Definitions, Law of Robotics, Robotic systems – Its role in automated manufacturing, Robot anatomy, Robot classification and specifications. <b>Robot Kinematics:</b> Forward and reverse transformation, Homogeneous transformations.	8L+2T
2	<b>Robot Drives, Actuators and Control:</b> Function of Drive System, Types of fluid, pump classification, Pneumatic System, Electrical drives, DC Motors and Transfer Functions, Stepper Motor, Drive Mechanisms. <b>Robot End Effectors:</b> Classification of End-effectors, Mechanical, Magnetic and Vacuum Grippers, Gripper force analysis and gripper design, Active and passive grippers.	10L+2T
3	<b>Robot Sensors:</b> Need of Sensing systems, Different types of contact and non-contact sensors, Robot vision. <b>Workspace Analysis and Trajectory Planning:</b> Path description and generation, collision free path planning <b>Linear Control of manipulators:</b> Feedback and closed loop control, control of second order system, trajectory-following control, continuous vs. discrete time control, architecture of an industrial robot controller	14L+6T
4	<b>Robot Language and programming technique:</b> Classification of robot languages, Computer control and robot software, VAL II, robot intelligence and task planning, AI and robotics <b>Application of Robots in Material Handling:</b> Machine loading/ unloading, Inspection, Welding, Spray painting and finish coating, assembly etc.	10L+4T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Industrial Robotic Technology: Programming and Application - M.P. Groover – McGraw Hill publications.
2. Robotics for Engineers – Y Koren – McGraw Hill publications.
3. Robotics: Control, Sensing, Vision and Intelligence – K. S. Fu, R. C. Gonzalez, C. S. G. L03ee - McGraw Hill publications

4. Robotics Technology and Flexible Automation – S .R. Dev – Tata McGraw Hill publications.
5. Robots Modelling Control and Applications with Software P. G. Rankey and C. H. Ho – Springer Verlag Berlin..

**Paper Name : Natural Language Processing**

**Paper Code : CSE 711(e)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Introduction:</b> Brief Introduction to NLP, Need of NLP,Regular Expression, Finite State Automata,Biology of Speech Processing, Place and Manner of Articulation,Word Boundary Detection; Argmax based computations.</p> <p><b>Tokenization:</b> Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking ,Bayesian Approach, Minimum Edit Distance.</p>	<b>12L+4T</b>
<b>2</b>	<p><b>Morphology:</b> Morphology Fundamental, Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer,Morphological Diversity of Indian Languages,</p> <p><b>Parsing:</b> Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.</p>	<b>10L+4T</b>
<b>3</b>	<p><b>Language Modelling:</b> Introduction to N-grams, Chain Rule, Smoothing,Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models.</p> <p><b>Hidden Markov Models:</b> Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging ,Rule based and Machine Learning based approaches, Evaluation.</p> <p><b>Text Classification:</b> Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis, Opinion Mining and Emotion Analysis, Resources and Techniques.</p>	<b>12L+4T</b>
<b>4</b>	<p><b>Computational Lexical Semantics:</b> Introduction to Lexical Semantics, Homonymy, Polysemy, Synonymy, Thesaurus, WordNet, Computational Lexical Semantics,Thesaurus based and Distributional Word, Similarity.</p> <p><b>Application of NLP:</b> Sentiment Analysis; Text Entailment; Robust and Scalable Machine</p>	<b>8L+2T</b>

	Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval,	
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. J. Allen, Natural Language Understanding, Pearson
2. C. D. Manning, H. Schuetze, Foundations of Statistical Natural Language Processing, MIT Press
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Second Edition, Prentice Hall
4. E. Charniack, Statistical Language Learning, MIT Press

**Paper Name : Big Data Analysis**

**Paper Code : CSE 711(f)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p><b>Introduction:</b> History of big data, Big data: definition and taxonomy, Big data value for the enterprise, advantages, disadvantages.</p> <p><b>Technologies:</b> Introduction to Hadoop, functioning of Hadoop, Cloud computing (features, advantages, applications).</p>	8L+2T
2	<p><b>Understanding Hadoop Ecosystem:</b> HDFS, MapReduce, YARN, HBase, Hive, Pig, Sqoop, Zookeeper, Flume, Oozie etc.</p> <p><b>Big data stack:</b> Data source layer, ingestion layer, source layer, security layer, visualization layer, visualization approaches etc.</p>	10L+4T
3	<p><b>Hadoop to store data:</b> HDFS, HBase and their respective ways to store and manage data along with their commands.</p> <p><b>Process Data using Map Reduce:</b> Developing simple mapreduce framework, Testing and Debugging Map Reduce Applications.</p>	12L+4T
4	<p><b>YARN Architecture:</b> Background of YARN, advantages of YARN, working with YARN, backward compatibility with YARN, YARN Commands, log management etc.</p> <p><b>Exploring Hive, Pig, Oozie</b></p> <p><b>NoSQL Data Management:</b> document databases, relationships, graph databases, schema less databases, CAP Theorem etc.</p>	12L+4T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Big data. Architettura, tecnologie e metodi per l'utilizzo di grandi basi di dati, A. Rezzani, Apogeo Education
2. Hadoop For Dummies, Dirk deRoos, For Dummies.

**Appendix-II**  
**Professional Elective II (CSE 8<sup>th</sup> Semester)**

**Paper Name : Computer Vision**  
**Paper Code : CSE 811(a)**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
<b>1</b>	<p><b>Digital Image Formation and Low-level processing:</b>            Overview of Camera geometry, Fundamentals of Image Formation, Transformation in 2D: translation, rotation, scaling, shearing, affine and rigid etc, Transformations in 3D: translation, rotation about X,Y,Z axis, rotation about arbitrary axis, 3D affine, number of degrees of freedom, Concept of image coordinate system and camera coordinate system, Intrinsic camera parameters, Concept of world coordinate system and its relationship to camera and image coordinate systems, Extrinsic camera parameters.</p> <p><b>Depth estimation and Multi-camera views:</b>            Perspective projection, Binocular Stereopsis: Camera and Epipolar Geometry, Homography, Derivation for planar homography, Algorithm for homography estimation given N pairs of corresponding points from two images of a planar scene.</p>	<b>12L+4T</b>
<b>2</b>	<p><b>Feature Extraction:</b>            Edge Detection, Hough transform, Interest points and corners, Local Image Features and Feature Matching, Scale-Space Analysis- Image Pyramids and filters, Line and curve detection, SIFT operator, Image-based modeling and rendering, Mosaics, Snakes.</p> <p><b>Motion Estimation:</b>            Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.</p>	<b>10L+4T</b>
<b>3</b>	<p><b>Shape Representation and Image Segmentation:</b>            Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Multi resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation, Object detection.</p>	<b>10L+2T</b>
<b>4</b>	<p><b>Pattern Analysis:</b>            Clustering, K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models, Dimensionality Reduction: PCA, LDA, ICA; Non-parametric</p>	<b>10L+4T</b>



	methods. <b>Recognition:</b> Recognition Overview, Large-scale Instance Recognition, Large-scale Scene Recognition and Advanced Feature Encoding, Detection with Sliding Windows.	
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. R.C. Gonzalez and P.Wintz, Digital Image Processing, Addison-Wesley Longman Publishing Co.
2. B. K. P. Horn, Robot Vision, MIT Press.
3. D. H. Ballard and C. M. Brown, Computer Vision, Prentice Hall India.
4. R. C. Gonzalez and M. G. Thomason, Syntactic Pattern Recognition : An introduction, Addison-Wesley.
5. P. A. Devijver and J. Kittler, Pattern Recognition - A Statistical Approach, Prentice Hall India.
6. W. K. Pratt, Digital Image Processing, John Wiley & Sons.
7. A. K. Jain, Fundamentals of Digital Image Processing, Pearson
8. A. Rosenfeld and A. C. Kak, Digital Picture Processing, Morgan Kaufmann
9. R. O. Duda and P. E. Hart, Pattern Classification and Scene Analysis, John Wiley & Sons.
10. W. E. L. Grimson, Object Recognition by Computer: The Role of Geometric Constraints, MIT Press.
11. A. N. Netravali and B.G. Haskell, Digital Pictures: Representation and Compression, Perseus Publishing.
12. M. D. Levine, Vision in Man and Machine, McGraw-Hill.
13. R.J.Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, John Wiley & Sons.
14. R. J. Schalkoff, Digital Image Processing and Computer Vision, John Wiley & Sons.
15. T. Pavlidis, Algorithms for Graphics and Image Processing, Computer Science Press.
16. K. S. Fu and T. Y. Young, Handbook of Pattern Recognition and Image Processing, Academic Press.

**Paper Name : Fault Tolerant Systems**

**Paper Code : CSE 811(b)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction:</b> Fault classification, Types of redundancy, Basic measures of fault tolerance. <b>Hardware fault Tolerance:</b> The rate of hardware failures, Failure rate, Reliability and main time to failure, Canonical and resilient structures, Fault tolerant processor level techniques.	<b>10L+2T</b>
<b>2</b>	<b>Software Fault Tolerance:</b> Acceptance tests, single version fault tolerance, recovery block approach, fault tolerant RPC.	<b>10L+4T</b>

	<b>Reliability &amp; Fault Tolerance:</b> Impact of Scaling on Reliability, Defects, Faults, Errors and Reliability, Mechanisms of permanent device failure, Software reliability model, Reliability evaluation technique.	
<b>3</b>	<b>Diagnosis, Repair &amp; Reconfiguration:</b> Diagnosis Algorithms, Repair Algorithms, Reconfiguration Techniques <b>Single Event Effects &amp; Mitigations:</b> Particles causing Single Event Effects, Critical Charge and Soft Error Rate, Techniques used for Mitigation of Single Event Upsets	<b>10L+4T</b>
<b>4</b>	<b>Error Correcting Codes:</b> Single Bit Error Detection and Correction Codes, Double Bit Error Detection and Correction Codes, Fault Tolerant Design Techniques for RAMs <b>Yield Modeling:</b> Yield Models, Yield Loss Mechanisms, Yield enhancement through redundancy	<b>12L+4T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Israel Koren, C Mani Krishna , Fault Tolerant Systems, Elsevier.
2. Laura L. Pullum, Software Fault Tolerance Techniques and Implementation, Artec House.
3. T. Anderson, P. A. Lee, Fault tolerance, principles and practice, Prentice Hall International.
4. Tinghuai Chen , Fault Diagnosis and Fault Tolerance , Springer Verlag.

**Paper Name : Distributed Computing**

**Paper Code : CSE 811(c)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction to Distributed System:</b> GOALS: Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls, Types Of Distributed Systems-distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems, System Architectures-centralized Architectures, Decentralized Architectures, and Hybrid Architectures. <b>Middleware:</b> Architectures Versus Middleware-Interceptors, General Approaches to Adaptive Software, CLIENTS-Networked User Interfaces, Client-Side Software for Distribution Transparency, SERVERS-General Design Issues, Server Clusters, Managing Server Clusters, Virtualization.	<b>10L+3T</b>
<b>2</b>	<b>Clock Synchronization:</b> Physical Clocks, Global Positioning System, Clock Synchronization Algorithms, LOGICAL CLOCKS, Lamport's Logical Clocks Vector Clocks, Centralized and Decentralized Algorithms.	<b>12L+3T</b>

	<b>Code Migration:</b> Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Application of Code Migration using Agent.	
<b>3</b>	<b>Introduction To Fault Tolerance:</b> Basic Concepts, Failure Models, Failure Masking by Redundancy <b>PROCESS RESILIENCE</b> -Design Issues, Failure Masking and Replication Agreement in Faulty Systems Failure Detection <b>DISTRIBUTED COMMIT</b> -Two-Phase Commit, Three-Phase Commit. <b>Java RMI &amp; Mobile Agent:</b> Client side, Server Side, object registry, Remote Interface, Server side software, client side software, Client callback, stub downloading. Basic architecture of Mobile Agent, advantages, mobile agent framework systems, design, implementation using Java RMI.	<b>12L+4T</b>
<b>4</b>	<b>Distributed coordination-based systems JINI:</b> Runtime Environment, Architecture, Discovery Protocol, Join Protocol, Lookup Service, Distributed Event, Distributed Leasing, Transactions, Surrogate Architecture. <b>Case Study:</b> GARUDA Project, WLHC Grid.	<b>8L+4T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. M. L. Liu, Distributed Computing: Principles and Applications, Pearson Education
2. S. Tanenbum and M. V. Steen, Distributed Systems-Principles and Paradigms, PHI
3. G.Coulouris , J.Dollimore and T. Kindbirg, Distributed Systems, Concepts and Design, Pearson Education.
4. K. McNiff, E. Pitt, Java.rmi: The Remote Method Invocation Guide, Addison-Wesley Professional
5. T. B. Downing, Java RMI: Remote Method Invocation, Wiley
6. W. K. Edwards, Core JINI, Prentice Hall Ptr

**Paper Name : Pattern Recognition**

**Paper Code : CSE 811(d)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Introduction:</b> Pattern Recognition: Segmentation and Grouping, Feature Extraction, Classification Learning & Adaption: Supervised learning, Unsupervised learning, Reinforcement Learning <b>Bayes Classifier:</b> Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Naïve Bayes Classifier: Classification using Naïve Bayes Classifier, The Naïve Bayes Probabilistic Model ,Parameter	<b>8L+4T</b>

	estimation , Bayesian Belief Network	
<b>2</b>	<p><b>Hidden Markov Models:</b> Markov Models for Classification, Hidden Markov Models: HMM Parameters, Learning HMMs, Classification Using HMMs</p> <p><b>Decision Trees:</b> Introduction, Decision Trees for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Over-fitting and pruning : Pruning by Finding Irrelevant Attributes, Use of Cross-Validation</p>	<b>12L+4T</b>
<b>3</b>	<p><b>Maximum Likelihood AND Bayesian Parameter Estimation: Bayesian Estimation, Problems of Dimensionality:</b> Accuracy, Dimension and Training Sample Size Component Analysis and Discriminants : Principle Component Analysis(PCA), Fisher Linear Discriminant, Multiple Discriminant Analysis, Expectation-Maximization(EM)</p> <p><b>Support Vector Machines:</b></p> <ul style="list-style-type: none"> <li>• <b>Introduction:</b> Linear Discriminant Functions</li> <li>• <b>Learning the Linear Discriminant Function:</b> Learning the Weight Vector, Multi-class Problems, Generality of Linear Discriminants</li> <li>• <b>SVM for Classification:</b> Linearly Separable Case, Non-linearly Separable Case</li> <li>• <b>SVM Training:</b> SVM for the XOR Problem</li> </ul> <p><b>Neural Networks:</b> Artificial Neuron, Feed-forward Network, Multilayer Perceptron, Deep Learning.</p>	<b>13L+4T</b>
<b>4</b>	<p><b>Clustering:</b> Importance, Hierarchical Algorithms: Divisive Clustering, Agglomerative Clustering, Partitional Clustering: k-Means clustering, Fuzzy k-means Clustering , Clustering Large Data Sets: Possible Solutions, Incremental Clustering, Divide and Conquer Approach</p>	<b>8L+2T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", Wiley Second Edition.
2. V Susheela Devi, M Narasimha Murty, "Pattern Recognition An Introduction", University Press
3. Rajjan Shinghal, "Pattern Recognition Techniques and Applications", Oxford University Press
4. N. Cristianini and J. Shawe-Taylor, "An Introduction to Support Vector Machines", Cambridge Univ. Press, 2000.
5. Pedro Lattore Carmona, J.Salvador Sanchez, Ana L.N. Fred , "Mathematical Methodologies in Pattern Recognition and Machine Learning" Springer Proceedings in Mathematics and Statistics.
6. Christopher M. Bishop. "Pattern Recognition and Machine Learning", Springer-Verlag New York

**Paper Name : Distributed Operating System**

**Paper Code : CSE 811(e)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Point : 3**

**Total Marks : 100**

<b>Module</b>	<b>Detailed Description</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Introduction:</b> Evolution of Modern Operating Systems, Network Operating Systems, Distributed Operating Systems, Issues In Designing Distributed Operating Systems.</p> <p><b>Message Passing:</b> Desirable features of good message passing system, Structure of the message, Synchronization, encoding and decoding, failure handling, Group communication, ordering of messages.</p> <p><b>Remote Procedure call:</b> RPC model, communication protocols, Lightweight RPC.</p>	<b>10L+4T</b>
<b>2</b>	<p><b>Distributed Shared Memory:</b> General architecture, Design and implementation issues, Granularity, Structure, Consistency Models, Replacement Strategies, Page-Based Distributed Shared Memory, Shared-Variable Distributed Shared Memory, Object-Based Distributed Shared Memory, Advantages of DSM.</p> <p><b>Synchronization and Election:</b> Clock Synchronization, logical and physical clock, Clock Synchronization algorithm, Distributed Mutual Exclusion, Distributed Deadlock Detection and Prevention, Election Algorithms.</p>	<b>10L+3T</b>
<b>3</b>	<p><b>Resource Management:</b> Desirable features of a good Global Scheduling Algorithm, Task assignment approach, Load balancing approach, load sharing approach.</p> <p><b>Distributed Process Management:</b> Process Migration, Advantages, threads, Real-Time Distributed Systems, Scheduling.</p> <p><b>Distributed File Systems:</b> Features, Models, File sharing semantics, Replication, Fault Tolerance, Atomic Transactions.</p>	<b>12L+4T</b>
<b>4</b>	<p><b>Naming:</b> Features, system and human oriented names, Distribution based on physical structure of name space, name cache</p> <p><b>Distributed Agreement:</b> Adversaries, Byzantine Agreement, Impossibility of Consensus, Randomized Distributed Agreement.</p>	<b>10L+3T</b>
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. A. S. Tanenbum, Distributed Operating Systems, Pearson Education
2. P.K. Sinha, Distributed Operating Systems- Concepts and Design, PHI Publication
3. R. Chow, T. Johnson, Distributed Operating Systems & Algorithms, Pearson
4. S. Garg, Fundamentals of Distributed Operating Systems, S.K. Kataria & Sons
5. I. A. Dhotre, Distributed Operating Systems, Technical Publications

**Paper Name : Data Analytics**  
**Paper Code : CSE 811(f)**  
**Weekly Load : L: 3 T: 1 P: 0**  
**Credit Point : 3**  
**Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<b>Introduction:</b> Introduction to Data Analytics, Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests	8L+2T
2	<b>Regression:</b> Introduction to Regression- Ordinary Least Squares, Analysis of Variance, Ridge Regression, Lasso Regression	8L+3T
3	<b>Regression and Classification techniques:</b> Logistic Regression, Training a Logistic Regression Classifier, Classification and Regression Trees, Bias-Variance Dichotomy, Model Assessment and Selection, Linear Discriminant Analysis, Ensemble Methods: Random Forest	12L+4T
4	<b>Introduction to Bigdata:</b> Fundamentals of Big Data, Examining Big Data Types, Big Data Technology Components, MapReduce Fundamentals <b>Big Data Analytics:</b> Defining Big Data Analytics, Big Data Analytics Applications	14L+5T
	<b>TOTAL:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Books: Text and/or Reference:**

1. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010.
3. Manoochchri, Murthy, Lander, Big Data Analytics, Pearson Education.
4. Dr. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, MC Press.