

Curriculum for B.E. Degree Courses in *Information Technology (IT)*

Semester- III

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
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	IT 301	Advanced Data Structure	3	1	0	3	100
4	IT 302	Design and Analysis of Algorithm	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
Practical/Sessional papers:							
7	M 352	Numerical Methods and Optimization Techniques Laboratory	0	0	3	2	100
8	IT 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
		Sub total:	18	3	12	24	1000
		Total:	33			24	1000

Semester- IV

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
1	M 401	Discrete Mathematics	3	0	0	2	100
2	IT 401	Operating System	3	1	0	3	100
3	IT 402	Computer Organization and Architecture	3	1	0	3	100
2	IT 403	Object Oriented Technology -I	3	1	0	3	100
5	ECE 422	Microprocessor and Its Applications	3	0	0	3	100
6	HS 401	Values and Ethics (Non-Credit paper)*	3	0	0	0	100
Practical/Sessional papers:							
7	IT 451	Operating System Laboratory	0	0	3	2	100
8	IT 452	Computer Organization and Architecture Laboratory	0	0	3	2	100
9	IT 453	Object Oriented Technology -I 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
		Sub total:	18	3	14	24	1000
		Total:	35			24	1000

* Marks for this paper will not be reflected in total marks for the semester

SEMESTER - V

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
2	IT 501	Computer Network	3	1	0	3	100
	IT 502	Object Oriented Technology-II	3	1	0	3	100
3	IT 503	Database Management System	3	1	0	3	100
4	IT 504	Formal Language and Automata Theory	3	1	0	3	100
5	IT 505	Compiler Design	3	1	0	3	100
6	ECE 521	Communication Engineering	3	0	0	2	100
Practical/Sessional papers:							
7	IT 551	Computer Network Laboratory	0	0	3	2	100
8	IT 552	Object Oriented Technology-II Laboratory	0	0	3	2	100
9	IT 553	Database Management System Laboratory	0	0	3	2	100
10	ECE 571	Communication Engineering Laboratory	0	0	3	2	100
		Sub total:	18	5	12	25	1000
		Total:	35			25	1000

SEMESTER - VI

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
1	IT 601	Big Data Technologies	3	1	0	3	100
2	IT 602	Computer Graphics and Its Applications	3	1	0	3	100
3	IT 603	Internet and Web Technology	3	1	0	3	100
4	IT 604	Computational Intelligence	3	1	0	3	100
5	CSE 602	Software Engineering	3	1	0	3	100
Practical/Sessional papers:							
1	IT 651	Data Science Laboratory	0	0	3	2	100
2	IT 652	Computer Graphics and Its Applications Laboratory	0	0	3	2	100
3	IT 653	Internet and Web Technology Laboratory	0	0	3	2	100
4	IT 654	Computational Intelligence Laboratory	0	0	3	2	100
5	HS 681	Business Communication and Presentation Skills –II	0	0	2	2	100
		Sub total:	15	5	14	25	1000
		Total:	34			25	1000

SEMESTER - VII

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
1	HS 701	Law for Engineers	3	0	0	2	100
2	IT 701	Digital Image Processing	3	1	0	3	100
3	IT 702	Multimedia Technology	3	1	0	3	100
4	IT 703	Data Mining	3	1	0	3	100
5	Refer Appendix-I	Professional Elective – I	3	1	0	3	100
Practical/Sessional papers:							
6	IT 751	Digital Image Processing Laboratory	0	0	3	2	100
7	IT 752	Multimedia Technology Laboratory	0	0	3	2	100
8	IT 753	Data Mining Laboratory	0	0	3	2	100
9	IT 791	Project - I	0	0	3	4	100
10	IT 792	Seminar – I	0	0	3	2	100
		Sub total:	15	4	15	26	1000
		Total:	34			26	1000

SEMESTER - VIII

Sl. No	Paper Code	Name of the Paper	Periods/week			Credits	Marks
			L	T	P		
Theoretical Papers:							
1	IT 801	Machine Learning	3	1	0	3	100
2	IT 802	Cryptography and Network Security	3	1	0	3	100
3	IT 803	Distributed Computing	3	1	0	3	100
4	Refer Appendix-II	ELECTIVE – II	3	1	0	3	100
Practical/Sessional papers:							
5	IT 851	Machine Learning Laboratory	0	0	3	2	100
6	IT 891	Project- II	0	0	6	6	100
7	IT 892	Seminar-II	0	0	3	2	100
8	IT 893	Grand Viva	0	0	0	3	100
		Sub total:	12	4	12	25	800
		Total:	28			25	800

Appendix-I
Elective –I (IT 7th Semester)
List of Electives

Sl. No	Paper code	Name of the paper
1.	IT 711(a)	Cyber Security
2.	IT 711(b)	Data analytics
3.	IT 711(c)	Nature-inspired Computing
4.	IT 711(d)	AI and its application
5.	IT 711(e)	Advance Computer Organization and Architecture
6.	IT 711(f)	VLSI Systems
7.	IT 711(g)	E Commerce
8.	IT711(h)	Information Theory and Coding

Appendix-II
Elective _II (IT 8th Semester)
List of Electives

Sl No.	Paper code	Name of the paper
1.	IT 811 (a)	Digital Forensic
2.	IT 811 (b)	Quantum Computing and Its Application
3.	IT 811 (c)	Cloud Computing
4.	IT 811 (d)	Bioinformatics
5.	IT 811 (e)	Deep Learning
6.	IT 811 (f)	Computer Vision and Robotics
7.	IT 811 (g)	Mobile Operating System and Applications
8.	IT 811(h)	Graph Theory and Combinatorics

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
1	Complex Analysis: 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.	15L
2	Probability: 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.	12L
3	Statistics: 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.	6L
4	Estimation: 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.	9L
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

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

Module	Detailed Description	Lecture / Tutorial Period
1	Numerical Methods: Error Formulation Numerical Interpolation: Finite differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation, error analysis. Numerical Differentiation and Integration: Numerical differentiation using interpolating polynomial, Trapezoidal rule, Simpson's 1/3 rd rule of integration, error analysis.	15L
2	Numerical solution of polynomial and transcendental equations: 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. Numerical solution of ODE: 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.	12L
3	Introduction: Historical Development, Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems. Linear Programming: Graphical method, Simplex method, Big-M Method, Revised simplex method, Duality in linear programming (LP), Sensitivity analysis, Transportation, assignment and other applications. Game theory and its applications: Maximin, Minimax Principle, Two-person-zero-sum game, Dominance principle, Graphical Method.	6L
4	Non Linear Programming: Unconstrained optimization techniques, Direct search methods, Constrained optimization, Direct and indirect methods, Optimization with calculus, Kuhn-Tucker conditions. PERT and CPM	9L
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

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: IT 301

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

Credit Point: 3

Total Marks: 100

Module	Detailed Description	Lecture / Tutorial Period
1.	Sorting: Merge Sort, Quick Sort, Bucket Sort, Radix Sort, Counting Sort.	10L+2T
2.	Heap: Heap Sort, Balanced search tree as heaps, Array based heaps, Heap-ordered trees and half-ordered trees, Skew heaps, Bi-nomial heaps, Changing keys in heaps, Fibonacci heaps. Priority Queue: Models and simple implementation, Double ended priority queues, Binary Heap and application.	12L+5T
3.	Tree: M-way search tree, B-tree, B ⁺ tree, AVL tree, KD tree. Hashing : Hash function, Different types of hash table - Universal hashing and perfect hashing	10L+5T
4	Graph: Definition, basic terminologies, representation of graph, graph traversal methods, applications of graph.	10L+2T
	TOTAL:	42L + 14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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: Design and Analysis Of Algorithm

Paper Code: IT 302

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

Credit Point: 3

Total Marks: 100

Module	Detailed Description	Lecture / Tutorial Period
1.	Introduction: Algorithm, Flowchart, Review of proof techniques Asymptotic Notations: Complexity analysis of well-known algorithms – Asymptotic Notations – Big O, Ω , Θ notations -- Recurrence equations – Solving recurrence equations – Master Theorem. Greedy Algorithms: General Method– KnapsackProblem, Job Scheduling Problem and Others.	11L+4T
2.	Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum– Strassen’s Matrix Multiplication Problem. Dynamic Programming: General Method –0/1 Knapsack – Travelling Salesperson Problem and Others	11L+4T

3.	Backtracking: General Method – N-Queens problem – Sum of Subsets – graph coloring –Hamiltonian problem. Branch and Bound: General Method-0/1 Knapsack	8L+2T
4.	Graph: Topological sort, Spanning tree, Minimum spanning tree, Shortest path, Connected component, Connected component finding algorithms (Strongly connected components & Bi-connected component). All pair shortest path problem-single source shortest path problem P & NP class: Deterministic & non deterministic algorithms, Class of P & NP, Cook’s theorem, NP- completeness, standard NP-complete problems, standard NP-hard problems, reduction techniques.	12L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Text and/or Reference:

1. Introduction to Algorithms, 2nd Edition, Cormen, Leiserson, Rivest, Stein. PHI.
2. Fundamentals of Computer Algorithms, E.Horowitz&Sahani, Galgotia
3. Computer Algorithms, S.Baase, PHI
4. Fundamentals of Algorithmics, Bartly&Bassard, PHI
5. The Design and Analysis of Algorithms, A. Aho, J. Hopcroft and J. Ullman, PHI
6. Algorithm Design , J Kleinberg, and E Tardos, Pearson.

Paper Name : Principles of Electronic Devices
Paper Code : ECE- 322
Weekly Load : L: 3 T: 0 P:0
Credit Point : 02
Total Marks : 100

Module	Detailed Description	Lecture/ Tutorial Period
1.	BJT and Circuits: 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.	11L
2.	FET: JFET types, Device structure and operation , Volt-amp characteristics. MOSFET 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).	8L
3.	Operational amplifiers : Ideal operational amplifier(OP-AMP), parameters, Characteristics. Inverting and noninverting configurations; Common OPAMP ICs: Gain-frequency and Slew rate etc. <u>Applications of Op-AMP:</u> Inverting, Non-Inverting amplifiers; Instrumentation Amplifier, Integrators, Differentiators; Comparators; Schmitt triggers, Active filters, Linear regulators etc.	10L
4	Feedback , oscillators and Application Specific ICs: 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.	13L
	Total	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

Tex/References:

- 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

Module	Detailed Description	Lecture / Tutorial Period
1	<p>Number system and binary codes: 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. Conversion of binary to gray code and vice versa. Error detecting and correcting code using Hamming and parity code. ASCII code.</p>	11L+4T
2	<p>Logic gates and logic expressions: 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 & 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>	6L+6T
3	<p>Digital circuits: Combinational Logic Circuits: 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. Sequential Logic Circuits: 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.</p>	10L +2L

	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).	
4	Analysis and synthesis of synchronous sequential circuits and Interface Circuits: 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.	15L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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

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: IT 351****Weekly Load: L: 0 T: 0 P: 3****Credit Point: 2****Total Marks: 100**

Unit	Detailed Description	Lecture / Tutorial Period
1.	Implementation of Merge Sort, Quick Sort, Bucket Sort, Radix Sort, Counting Sort.	9P
2.	Implementation of heap, heap sort, Binomial heap/ Fibonacci heap.	9P
3.	Implementation of Priority queue and applications.	6P
4.	Implementation of B-tree, B ⁺ tree, AVL tree.	9P
5.	Implementation of different hash functions.	6P
6	Implementation of BFS and DFS algorithms on graph.	3P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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

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**

Unit	Detailed Description	Practical Period
1	To Study and Verify the Truth Table of Different Basic Logic Gates (NOT, AND, OR, NAND, NOR, EX-OR)	3P
2	To Study and Implementation of Different Basic Logic Gates using Universal Gates (NAND, NOR) and verification of De-Morgan's theorem.	3P
3	Design and Verify the logic circuit of Half Adder and Full Adder Using Basic Logic Gates.	3P
4	Design and Verify the logic circuit of Half Subtractor and Full Subtractor Using Basic Logic Gates.	3P
5	Design and Verify of 2x4 line Decoder Using Basic Logic Gates and Study of Decoder IC 74138.	3P
6	Design of 4:1 Multiplexer Using Basic Logic Gates and Study of Multiplexer IC 74153.	3P
7	Study of BCD to Decimal Decoder Driver by Using Decoder Driver IC 7447 and Seven Segment LED Display Device LTS-542.	3P
8	Design and Verify of S-R, J-K, D and T type Flip Flop Using Basic Logic Gates.	3P
9	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.	3P
10	Design and Study of Asynchronous (Ripple) Counter of given modulus by using IC 7476.	3P
11	Design and Study of 8 bit A/D Converters	6P
12	Design and Study of 8 bit D/A Converters	6P
	Total:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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	Cartesian product in set theory: 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	Algebraic structures I: 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	Algebraic structures II: 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	Graph Theory: 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
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

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: Operating System**Paper Code: IT 401****Weekly Load: L: 3 T: 1 P:0****Credit Unit: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
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1.	<p>Introduction: Introduction to OS. Operating system functions, Different types of O.S.: batch, multi-programmed, time-sharing, and real-time, operating system structure, system calls.</p> <p>Processes: 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.</p> <p>Threads: Concepts, Process vs. Thread, User level vs. Kernel level threads, Different multithreaded models, Thread Libraries, Thread Pools, Concept of LWP.</p>	10L+4T
2.	<p>Process Synchronization: Concepts, Critical Section Problem, Solutions to critical section, critical region, synchronization hardware, monitors, classical problems of synchronization, semaphores.</p> <p>Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.</p>	10L+3T
3.	<p>Memory Management: Address binding, logical vs. physical address space, swapping, contiguous memory allocation, paging, Structure of Page Table, noncontiguous memory allocation-segmentation, hardware support for paging and segmentation, virtual memory concepts-demand paging and demand segmentation, page replacement algorithms, allocation of frames, thrashing.</p>	10L+3T
4.	<p>File Systems: file concept, access methods, directory structure, file system structure, allocation, File sharing and protection, free-space management , directory implementation.</p> <p>Disk and I/O Management: Disk structure, disk scheduling algorithms, disk management, I/O Structure, Different modes of data transfer.</p> <p>Protection & Security: Goals of protection, domain of protection, security problem, authentication.</p> <p>Case Study on Linux</p> <p>Introduction, Features of Linux, Structure of Linux operating system, Security in Linux, Introduction to Linux File system, Basic commands in Linux.</p>	12L+4T
TOTAL:		42L+14T
Total Week Required:		14
No. Of Week Reserved:		02

Books: Text Books / References:

1. “Operating System Design & Implementation”, Tanenbaum A.S., Prentice Hall.
2. “Operating System Concepts”, Galvin, Silberschatz A. and Peterson J. L., Galvin, Wiley.
3. “Operating System”, Dhamdhare: TMH
4. “Operating Systems”, Stallings, William, Maxwell McMillan International Editions, 1992.
5. “An Introduction to Operating Systems”, Dietel H. N., Addison Wesley.
6. “Operating System : Concept & Design”, Milenkovic M., , McGraw Hill.
7. “Your Unix: The Ultimate Guide”, Sumitabha Das, McGraw Hill
8. “Operating Systems: A Modern Perspective”, Gary J. Nutt, Addison-Wesley.
9. “Design of the Unix Operating Systems”, Maurice Bach, Prentice-Hall of India.

Paper Name: Computer Organization and Architecture

Paper Code: IT 402

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

Credit Unit: 3

Total Marks: 100

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

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, McGraw 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: IT 403****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial / Period

1.	<p>Introduction: 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>Development of programming Language (C++ and Java): 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 & do, Decisions – if, if Else, switch Statements, Logical Operators, Control Statements – break, continue, Structured & Enumerated variables, array, Storage Classes, Functions-call by value, call by reference parameters, Inline functions, Default arguments, const arguments, Function overloading, Friend Function</p>	8L+3T
2.	<p>Classes and objects: 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 & inner classes, String class, Using Command –line Arguments, Varargs: Variable-Length Arguments</p> <p>Inheritance: Superclass Variable Referencing Subclass Object, Use of super, Dynamic Method Dispatch, Overriding, Abstract Classes, Virtual base classes, The Object Class</p> <p>Operator Overloading and Virtual Function for C++: 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>	14L+3T
3.	<p>Packages & Interfaces: 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>Exception handling: Types of errors, Exception Types, Uncaught Exception, Using try-catch-throw, throws, finally, creating own exception subclasses</p> <p>Threading: Java thread model, Creating single & multiple thread, Thread priorities, Thread synchronization, Inter thread Communication, Suspending Resuming and stopping threads.</p> <p>Enumerations, Autoboxing and Annotations: Enumeration Fundamentals, Type Wrappers, Autoboxing and Methods, Annotation, Closures</p>	10L+4T

4.	<p>Generics and Java Structures: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> <p>Input/ Output: I/O Basics-Streams, Byte Streams, Character Streams, Reading and writing console Input/Output, Reading and writing files, Object serialization.</p> <p>Abstract Window Toolkit (AWT): AWT Classes. Window Fundamentals: Component, container, Panel, Window, Frame, designing interface using Labels, Buttons, Check Boxes, Lists, TextField, TextArea, Layout Managers, Event handling</p>	10L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

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	<p>Introduction and Architecture of 8085 microprocessor: 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.</p>	9L+2T
2	<p>Assembly Language Programming using 8085 CPU: 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.</p>	10L+4T

3	Memory and Memory interfacing, Interrupt structure of 8085 and I/O interfacing technique: Memory elements; RAM, ROM, PROM, EPROM, EEPROM, Memory constituents. Memory expansion; Interfacing of RAM, ROM, EPROM & DRAM etc, EPROM programming. & their uses. 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	Interfacing Chips: 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
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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. Rafiquezaman;PHI.
5. Advanced Microprocessor & Peripherals-Ray & Bhurchnadi, Tata- McGrowHill.
6. Fundamentals of Microprocessors and Microcontrollers – B. Ram, Dhanpat Rai.

Paper Name : Values and Ethics
Paper Code : HS 401
Weekly load : L: 3 T: 0 P: 0
Credit Point : 0
Total Marks :100

Module	Detailed Description	Lecture / Tutorial Period
1	Nature of professional ethics: Introduction, definition, morals & 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. Ethical decision making: Values, morals, standards, corporate social responsibility, attitude and beliefs, ethical values and dimensions dilemmas- decision making, organization and power politics.	11L
2	Effects of technological growth: Energy Crisis, Rapid technological growth, environmental degradation and pollution, human operator in Engineering projects and industries, problems of man, machine, interaction. Impact of assembly line and automation.	8L
3	Ethics in profession: 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. Managing ethics: Building a value system, role of law enforcement, training in ethics, ethics in commercial and operational profession, ethics in finance,	15L

	ethics in HRM, ethics in Global Business, ethics and IT.	
4	Engineering Ethics: 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.	8L
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Blending the best of the East & West, Dr. Subir Chowdhury, 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: Operating System Laboratory**Paper Code: IT 451****Weekly Load: L: 3 T: 1 P:0****Credit Unit: 3****Total Marks: 100**

UNIT	Detailed Description	Practical Period
1.	Commands for handling file system, combining commands-pipe, commands for sorting and filtering, signals, working with shell, shell variables, shell scripting	21P
2.	Process creation, replacing and duplicating a process image, Zombie and Orphan process creation, process synchronization using wait system call, working with POSIX threads, Programming with semaphores.	15P
3.	Basic linux administration-user management, process monitoring.	6P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text Books/References:

1. "Your Unix: The Ultimate Guide", Sumitabha Das, McGraw Hill
2. "Shell Programming", Y. Kanetkar, BPB Publication
3. "Unix Network Programming", W.R. Stevens, PHI
4. "Design Unix Operating System", Bach, PHI
5. "The Unix Programming Environment", Kernighan and Pike, PHI

Paper Name: Computer Organization and Architecture Laboratory

Paper Code: IT 452

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

Credit Unit: 2

Total Marks: 100

Unit	Detailed Description	Practical Period
1.	Design & Implementation of different computational subunits of an Arithmetic Unit	9P
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
	Total :	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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: IT 453

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
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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 Laboratory

Paper Code : ECE 472

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

Credit Point : 2

Total Marks : 100

Unit	Detailed Description	Practical Period
1	Basic assembly language programs writing and execution using 8085 Microprocessor Trainer kit like: 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	Higher level assembly language programs writing and execution using 8085 Microprocessor Trainer kit like: 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	Experiments using 8255 PPI chip on the trainer kit: e.g. subroutine for delay, reading switch state and glowing LEDs accordingly, square wave generation etc.	6P
4	Experiment with Intel 8259 (Programmable Interrupt Controller) chip: 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	Experiments with Intel 8253(Programmable Interval Timer) chip: Programming 8253 chip in various modes to generate different waveforms and to study the waveforms in CRO.	6P
6	Interfacing of Microprocessor Trainer Kits with PC: 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	Study the operation of microprocessor based Stepper Motor Controller: Study of the programs for speed controlling, direction or angle of rotation controlling etc.	6P
	Total :	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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. Rafiquezaman;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

Unit	Detailed Description	Practical Period
1	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;	
2	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	
3	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;	
4	Language Laboratory emphasizing Listening and comprehension skills; Reading\ Skills; Sound Structure of English and intonation patterns	
	Total :	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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: IT 501
Weekly Load: L: 3 T: 1 P: 0
Credit Point:3
Total Marks: 100

Module	Detailed Description	Lecture/ Tutorial Period

1.	<p>Overview Of Data Communication And Networking: Overview on the term Computer Network, Distributed System, Client-Server model; Main features of computer network. Terminologies- Protocol Standards, Host, Medium/Channel, direction of data flow(simplex, half duplex, full duplex), Network types - LAN, MAN, WAN; Inter-network.</p> <p>Network Models: Layered architecture: Advantage and Disadvantages, Service, function. Network design issues; Peer-to-Peer communication in layered architecture. ISO OSI model- layers, Functions of each layer, communication through OSI. TCP/IP model- layers, Functions of each layer, Similarities and Differences between OSI and TCP/IP model, Connection-oriented and connection-less service, Physical and logical address.</p> <p>Network Topology: Mesh, Bus, Tree, Ring, Star, Hybrid; Transmission Modes- Simplex, Half-duplex, Full-duplex</p>	10L+4T
2.	<p>Physical Layer: Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & non-guided); TDM, FDM, WDM; Switching Techniques- Circuit switching, Packet Switching, Message Switching; ISDN, ATM.</p> <p>Data link Layer: Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;</p>	10L+2T
3.	<p>Medium Access Sub Layer: 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> <p>Network Layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: Internet address, Classful address, sub netting; Routing : techniques, static vs. dynamic routing , routing table for Classful 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>	12L+6T
4.	<p>Transport Layer: Process to process delivery: UDP, TCP, Client-server communication, different types of ports, Socket.</p> <p>Application Layer: DNS; SMTP, SNMP, FTP, HTTP & WWW</p> <p>Security: Encryption and Decryption methods, user authentication, Firewalls.</p>	10L+2T
	Total:	42L+ 14T
	Total Week Required:	14
	No. of Week Reserved:	02

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 Code: IT 502

Paper Name: Object Oriented Technology-II

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

Credit Point : 3

Total Marks :100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	<p>Introduction: Object oriented modeling, The Rumbaugh OMT, The Booch methodology, Jacobson's OOSE methodologies</p> <p>Introduction to UML: 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>Static structural view (Models):</p> <ul style="list-style-type: none"> • Class diagram: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 & interface Cohesion, Coupling, • Object diagram: Notations and modeling, relations among objects (links). <p>Factional view(models):</p> <ul style="list-style-type: none"> • Use case diagram: Requirement Capture with Use case, Building blocks of Use Case diagram, Relationships between use cases - extend, include, generalize. • Activity diagram: Elements of Activity Diagram - Action state, Activity state, Object, node, Control and Object flow, Transition (Fork, Merge, Join), Partition - Swim Lane. 	11L+4T
2.	<p>Behavioral (Dynamic structural view):</p> <ul style="list-style-type: none"> • State diagram: Notations, events,. State Diagram states, transition and condition, state diagram behavior, completion transition, sending signals. • Interaction diagrams: Sequence and Collaboration diagram - Iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in diagram. <p>Architectural view:</p> <ul style="list-style-type: none"> • Component Diagram: Logical architecture, Hardware architecture, Process architecture, Implementation architecture. <p>Environmental View:</p> <ul style="list-style-type: none"> • Deployment diagram: Nodes and their relationships. <p>Software Re-usability: Introduction to Design Patterns.</p>	10L+5T
3.	<p>Distributed object model: Distributed object computing, interoperability and middleware standards CORBA and COM/DCOM.</p> <p>Object Oriented Database: 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.</p>	12L+4T
4.	<p>J2EE: 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</p>	9L+1T

	API for XML Parsing (JAXP), Security Services (JAAS), Web Services etc. Application component APIs: Enterprise JavaBeans (EJB), Java Servlet, Java Server Pages (JSP).	
	Total:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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: Database Management System**Paper Code: IT 503****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1.	<p>Introduction: 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>Database Design and the Entity Relationship (E-R) Model: 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>Relational Model: 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>	14L+3T

2.	<p>Structured Query Language (SQL): Domain types, Basic structures, set operations, null values, aggregate functions, nested subqueries, Modifications of database, join expressions, relations, views, transaction, integrity constraints, Authorization, Functions and procedures, Triggers.</p> <p>Relational Database Design: Decomposition and Synthesis approach of database design, Functional dependencies (FDs), closure, cover, Atomic domains and first normal form (NF) , Decomposition using FDs, NFsbased on primary keys, second and third NFs, Boyce-CoddNF, Multivalued dependency and fourth NF, Join dependencies and fifth NF, domain-key normal form (DKNF).</p>	8L+3T
3.	<p>Storage, File Structure, Indexing and Hashing: 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>Query Processing and Optimization: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>	10L+3T
4.	<p>Transaction: Properties of the transactions, States of transactions, Transaction Definition in SQL</p> <p>Concurrency Management andDeadlock Handling: Concurrency Control Mechanisms, Conflict and View Serializability, Recoverable schedules, Cascading Rollbacks, CascadelessSchedules,Lock-Based Protocols, Granularity of locking, Timestamp-Based Protocols.Deadlock detection strategies, wait-for graph</p> <p>Recovery system: 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>	10L+5T
	TOTAL:	42L +14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Textand/orReference:

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: Formal Language and Automata Theory

Paper Code: IT 504

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

Credit Unit: 3

Total Marks: 100

Module	Detailed Description	Lecture/ Tutorial Period
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1.	Theory of Automata: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages Automaton, Transition System, Mealy and Moore machines. Regular languages and Finite Automata: 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.	12L+4T
2.	Context-Free languages: 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.	10L+4T
3.	Push-Down Automata: Deterministic and Non-deterministic Push down Automata, Acceptance by PDA, Correspondence between PDA and CFG.	10L+4T
4.	Turing Machines: Models of computation and Church-Turing Thesis, Turing Machine and its variations, Universal Turing Machines, Recursively enumerable and recursive languages, Unrestricted grammars and TMs. Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.	10L+2T
	Total:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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, AnIntroduction to Formal Languages and Automata, Narosa Publishing House.

Paper Name: Compiler Design**Paper Code: IT 505****Weekly Load: L: 3 T: 1 P: 0****Credit Unit: 4****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1	Introduction : Overview of the Translation Process, design of assembler, object file formats, linker-its Input and output, phases of linker design, loader and its type,binary image format. Types of Compiler, Analysis of the Source Program, The Phases of a Compiler design. Lexical Analysis : 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	10L+4T
2	Syntax Analysis : 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.	15L+6T

	Syntax Directed Translation: 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,	
3	Run Time Environments : 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. Intermediate Code Generation: Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).	9L+3T
4	Code optimization: Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization. Code generations: Issues in the design of code generator, a simple code generator, Register allocation & assignment.	8L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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. Santanu Chattopadhyay, "System Software", PHI.

Paper Name : Communication Engineering**Paper Code : ECE 521****Weekly Load : L: 3 T: 0 P: 0****Credit Point : 2****Total Marks : 100**

Module	Detailed Description	Lecture / Tutorial Period
1	Signals, Fourier series and Fourier Transform: 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.	12L
2	CW Modulation: Basic concepts and necessity of Modulation. Classifications of CW modulation. Amplitude Modulation: 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	10L

	modulator, envelope detector etc.) Angle Modulation: 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.)	
3	Pulse and Digital Modulation: 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.	12L
4	Communication Systems: Concepts of Telephone switching network, Computer communication, Cellular phone, Satellite communication, Optical Communication etc.	8L
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

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: IT 551****Weekly Load: L :0 T:0 P: 3****Credit Point:2****Total Marks :100**

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

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. Kernighan and Ritchie, The UNIX programming environment , PHI

Paper Name: Object Oriented Technology –II Laboratory

Paper Code: IT 552

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

Credit Point: 2

Total Marks: 100

UNIT	Detailed Description	Practical Period
1.	Forward engineering (Code and Test case generation) and Reverse Engineering using UML diagram.	21P
2.	Implementing Types, Object Views, methods in Oracle- Working with Abstract Data Types, Implementing Object Views, methods	10P
3.	Advanced Object Oriented Concepts in Oracle - Row Objects vs. Column Objects, Object Tables and OIDs, Object Views with REFS, Object PL/SQL, Objects in the Database	11P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

1. Grady Booch, James Rumbaugh, IvarJacobson : The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.
3. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
4. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
5. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
6. Mark Priestley: Practical Object-Oriented Design with UML,TATA McGrawHill
7. Craig Larman Applying UML and Patterns: An introduction to Object - Oriented Analysis and Design and Unified Process, Pearson Education.
8. Ali Bahrami: Object Oriented Systems Development, Irwin McGraw-Hill.
9. Byrla: Oracle Database 12C: The Complete Reference, McGraw Hill Education.

Paper Name: Database Management System Laboratory

Paper Code: IT 553

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

Credit Point: 2

Total Marks: 100

UNIT	Detailed Description	Practical Period
1.	Creating table, inserting data, updating table data, data record deletion, viewing data, modifying table structure, renaming and destroying table.	6P
2.	Arithmetic, logical operator, range searching, pattern matching, numeric function- scalar & group functions, string functions, Date function, table conversion functions.	6P
3.	Null value concept, primary key, and foreign key, unique, creating constraints,creating Indexes.	3P
4.	Grouping data, join, sub-queries, union , intersection, minus clause, indexing, view, granting and revoking permissions.	3P
5.	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.	9P
6.	Stored procedure and functions, package, trigger.	6P
7.	Use of host language inter-race with embedded SQL.	6P

8.	Use of user interfaces and report generation utilities typically available with RDBMS products.	3P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. SQL, PL/SQL The Programming Language of ORACLE- Ivan Bayross (BPB Publications)
2. Oracle Complete Reference, Oracle Press.

Paper Name : Communication Engineering Laboratory**Paper Code : ECE 571****Weekly Load : L :0 T:0 P: 3****Credit Point : 2****Total Marks : 100**

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

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: Big Data Technologies****Paper Code: IT 601****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Fundamentals of Big Data: Defining Big Data, Big Data Types- Defining Structured AND Unstructured Data, The Big Data Journey, Exploring the Big Data Stack Map Reduce Fundamentals: Understanding the map Function, Adding the reduce Function, Putting map and reduce Together, Optimizing Map Reduce Tasks.	14L+5T
2.	Introduction to Hadoop: Understanding the Hadoop Distributed File System (HDFS), Name Nodes, Data nodes, HadoopMapReduce	8L+3T
3.	Hadoop Foundation and Ecosystem: Building a Big Data Foundation with the Hadoop Ecosystem, Managing Resources and Applications with Hadoop YARN, Storing Big Data with HBase, Mining Big Data with Hive, Interacting with the Hadoop Ecosystem, Pig and Pig Latin, Introduction to MongoDB	14L+4T
4.	Big data & Machine learning Machine learning tools-Spark &SparkML	6L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

1. Big data. Architettura, tecnologie e metodi per l'utilizzo di grandibasi di dati, A. Rezzani, Apogeo Education, 2013.
2. HadoopFor Dummies, Dirk deRoos, For Dummies, 2014.

Paper Name: Computer Graphics and Its Applications**Paper Code: IT 602****Weekly Load: L: 3 T: 1 P: 0****Credit Unit: 3****Total Marks: 100**

UNIT	<u>Detailed Description</u>	Lecture / Tutorial Period
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1.	Module-1 Introduction to Computer Graphics & Graphics Systems : Overview of computer graphics & its uses; Classification, characteristics & components & applications of computer graphics; Representing pictures; Basic Terminologies: Pixel, Resolution & its different types, Dots, Dot Pitch, Aspect ratio; Raster scan display: Refresh rate & Interlacing, Retrace, CRT, Shadow mask, Aperture grill, Bit planes, Color depth, Color palette, Frame buffer, Video controller, General architecture of Raster Scan display; Active & Passive graphics devices; Computer graphics software. Scan Conversion: Points & lines, Line drawing algorithms: DDA algorithm, Advantages & Disadvantages; Bresenham's line algorithm; Circle generation algorithm: Basic concepts, DDA circle drawing algorithm, Midpoint circle drawing algorithm, Brsenham's circle drawing algorithm; Ellipse generation algorithm: Basic concepts, Midpoint ellipse generation algorithm; Aliasing, Antialiasing, Methods of antialiasing.	12L+4T
2.	Polygon and Filling algorithms: Inside & 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. 2D Transformation: Basic transformations: translation, rotation, scaling, reflection, shear; Transformation between coordinate systems; Homogeneous coordinates & Combined transformations; Inverse transformation: Rotation about an arbitrary point, General fixed point scaling, Reflection through an arbitrary line.	10L+4T
3.	Viewing and Clipping: Viewing transformation: Viewing pipeline, Window to viewport co-ordinate transformation; Clipping: Point clipping, Line clipping -- Cohen-Sutherland algorithm, Liang-Barsky algorithm, Polygon clipping – Sutherland-Hodgeman algorithm, Weiler-Atherton algorithm; Text clipping. 3D transformation and Projection: 3D transformations: translation, rotation, scaling, reflection & shearing. Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, reflection through an arbitrary plane; 3D Projection: Parallel projection – Orthographic, Axonometric, Oblique; Perspective projection – transformation matrix, vanishing points, Single-point, Two-point, Three-point perspective transformation.	10L+2T
4.	Curves: Curve generation algorithm: DDA method, approximation method, Spline representation, Continuity, Piecewise Cubic Spline, Bezier curves – Cubic Bezier, Mid-point Bezier, B-spline curves. Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back faces detection, BSP tree method, Painter's algorithm, Scan-line algorithm; Hidden line elimination method, wire frame methods. Color & Shading Models: Introduction, Modeling Light Intensities and Sources, Diffuse Reflection, Lambert's Cosine Law, Specular Reflection, Half-toning, Color Models - RGB Color, CMY Color.	10L+4T
	Total :	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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 : Internet and Web Technology
Paper Code : IT 603
Weekly Load : L:3 T:1 P:0
Credit Point : 3
Total Marks :100

Module	Detailed Description	Lecture/ Tutorial Period
1.	<p>An Overview on Internet: Need for an Internet, Evolution of Internet, Concept of Internet, Intranet and Extranet, URI, URL, URN, Concept of Search Engine, Types of Search Engine, Search Engine Optimization.</p> <p>TCP/IP Protocol Suite: HTTP, FTP, SMTP, DNS, TCP, UDP, ICMP, IP, Concept of Unicast Routing and Multicast Routing, Multicast Routing Protocols.</p> <p>Mobile IP: 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+3T
2.	<p>Internet of Things: Concept of IoT, Machine to Machine, Remote Monitoring, Sensing, and Controlling, IoT protocols Architecture, Brief Introduction to IoT Hardware Platform.</p> <p>Introduction to Web: Web Architecture, Web Applications, Web servers, Web Browsers, Internet standards.</p> <p>Hyper Text Markup Language: Elements, Attributes, Tags, Tables, Forms, Frames.</p> <p>Cascading Style Sheets: Advantages, Rules, CSS and page Layout</p>	8L+4T
3.	<p>JavaScript and DHTML: Regular Expression, Event Handling, W3C Event Handling Model, HTML DOM, JavaScript and HTML DOM, JavaScript and HTML Forms, AJAX.</p> <p>XML Technologies: XML, Namespace, DTD, W3C XML Schema, XPath, XQuery, Parsing XML, XML DOM, XSLT, XSL-FO.</p> <p>Applets: Client-side Java, Life Cycle, Writing an Applet, Compiling an Applet, The Applet Tag, Security, Utility Methods, Using Status Bar, AppletContext Interface, Document Base and Code Base, Passing Parameter, Event Handling, Communication between Two Applets, Loading Web Pages.</p>	11L+3T
4.	<p>Servlets: 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>Java Server Pages: 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,</p> <p>JDBC: 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>	11L+4T
	Total	42L+ 14T
	Total Week Required	14
	No. of Week Reserved	02

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: Computational Intelligence

Paper Code: IT 604

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

Credit Point: 3

Total Marks: 100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introduction: Definition of Artificial Intelligence (AI),Approaches to AI, Basic concept of soft computing; Difference between soft computing and hard computing; elements of soft computing. Problem Solving and Search techniques: Problems, Problem Space & Search: Defining the problem as state space search, Uninform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uninform search strategies. Heuristic Search Strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, Constraint satisfaction problems.	12L+4T
2.	Artificial Neural network: 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: heaviside, signum, sigmoid, hyperbolic tangent function; Approxiation functions, McCulloh-Pitts, Hebb Net, Perceptron (limitations, convergence theorem, learning curves), Back propagation NN, ADALINE, MADALINE	10L+3T
3.	Fuzzy Sets and Logic : 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, Fuzzy Clustering Rough Set: Introduction,Indiscernibility, Set Approximation, Reducts and Core, Rough Membership, Dependency of Attributes, Discernibility Matrix, Rough membership, Discretization, Rough sets and reasoning from data, Rough based Clustering	12L+5T
4.	Genetic Algorithm (GA) : 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.	8L+2T
	TOTAL:	42L+14T
	Total Week Required:	14

	No. Of Week Reserved:	02
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Text Books / References:

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. Neural networks, fuzzy logic and genetic algorithms synthesis & applications--S. Rajasekharan& G.A. VijaylakshmiPai, PHI
4. Neural networks- A comprehensive foundation-- Simon Haykin, Pearson.
5. Neural networks-- Fausett, Pearson.
6. Neural networks & Fuzzy systems- A dynamical system approach to machine intelligence-- Bart Kosko, PHI.
7. Fuzzy logic with engineering applications-- Ross, McGraw-Hill.
8. Fuzzy sets & Fuzzy logic- Theory & Applications--Klir& Yuan, PHI.
9. Fuzzy logic- intelligence, control & information-- Yen &Langani, Pearson.
10. Pattern recognition principles--Tou& Gonzalez, Addison Wesley.
11. Pattern classification-- Duda, Hart, Stork, John Willey& Sons, 2001.
12. Genetic algorithm in search, optimization & machine learning-- D.E. Goldberg, Pearson Edu., 2003.
13. Z. Pawlak, Rough sets: theoretical aspects of reasoning about data, Dordrecht, Netherlands: Kluwer Academic, 1991.

Paper Name: Software Engineering**Paper Code: CSE 602****Weekly Load: L: 3 T: 0 P: 0****Credit Point: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1	<p>Introduction: 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>Software Development Life Cycle and Process Models: 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>Software certification: Requirement of certification, Types, Certification of: Product, Process, Person, Third party certification.</p>	14L+4T
2	<p>Software Requirement Specification: Problem analysis, Requirement Specification, Requirement Types, Requirement Gathering Techniques, feasibility Study Validation, metrics, Use Case diagram, ER Diagram.</p> <p>Techniques for Software Size and Cost Estimation: Software Project Planning: 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>	8L+3T

3	<p>System Design: Problem Partitioning, Abstraction, Top-down and bottom-up design, Structured approach, Modularity, Coupling and cohesion, DFD and Structure chart.</p> <p>Coding: 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>	9L+4T
4	<p>Testing: 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>Software Reliability: 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>Software Maintenance: 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>	11L+3T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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: Data Science Laboratory**Paper Code: IT 651****Weekly Load: L: 0 T: 0 P: 3****Credit Point: 2****Total Marks: 100**

UNIT	Detailed Description	Lecture / Tutorial Period
1.	Python Basics -data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation; String manipulations; manipulating files and directories, os and sys modules; creating and reading a formatted file (csv or tab-separated).	15P
2.	Lists and Functions -Lists, tuples, and dictionaries; Design with functions: arguments and return values; formal vs. actual arguments, named arguments.	5P

3.	Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects.	5P
4.	Use of some Important Packages- Numpy, Matplotlib, Pandas	10P
5.	Business Analytics using Python/R-Programming	7P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. TanejaSheetal, Kumar Naveen: Python Programming: A modular approach (Pearson Publications)
2. Lubanovic Bill: Introducing Python (Shroff Publishers)
3. Isaac D. Cody : Data Analytics and Python Programming 2 Bundle Manuscript(United Computer GeeksPublications)

Paper Name: Computer Graphics and Its Applications Laboratory**Paper Code: IT 652****Weekly Load: L: 0 T: 0 P: 3****Credit Unit: 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
	Total :	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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. 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. Mukhopadhyay and A. Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas Publishing House

Paper Name : Internet and Web Technology Laboratory**Paper Code : IT 653****Weekly Load : L:0 T:0 P:3****Credit Point : 2****Total Marks :100**

Unit	Detailed Description	Lecture/ Tutorial 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 Servlets and JSP for server side application for real life problems.	8P
7.	Concept of MEAN Stack, Initial Setup, Server Side implementation using Node.js and Express, Front-End implementation using AngularJS, Database implementation of MongoDB.	8P
	Total	42P
	Total Week Required	14
	No. of Week Reserved	02

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: Computational Intelligence Laboratory

Paper Code: IT 654

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

Credit Point: 3

Total Marks: 100

Unit	<u>Detailed Description</u>	Practical Period
1.	Assignments on AI searching techniques	5P
2.	Assignments on Single layer, multilayer neural networks, back propagation technique.	10P
3.	Assignments on Fuzzy Logic, graphical techniques of inference (Mamdani, Sugeno- Takagi model).	10P
4.	Assignments on Rough Set , dimensionality reduction, discernibility Matrix discretization.	10P
5.	Assignments on Genetic algorithm.	7P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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. S. Rajasekaran and G. A.VijayalakshmiPai - Neural networks, fuzzy logic and genetic algorithms synthesis & applications-PHI
4. D. K. Pratihari - Soft Computing: Fundamentals and Applications- Alpha Science International Ltd
5. S. Haykin- Neural networks- A comprehensive foundation- Pearson.
6. B. Kosko- Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence-PHI.
7. D.E. Goldberg -Genetic algorithm in search, optimization & machine learning-Pearson Edu.
8. Z. Pawlak, Rough sets: theoretical aspects of reasoning about data, Dordrecht, Netherlands: Kluwer Academic, 1991.

Paper Name : Business Communication and Presentation Skills II

Paper Code : HS 681

Weekly Load : L: 0 T: 0 P: 2

Credit Point : 2

Total Marks : 100

Unit	Detailed Description	Practical Period
1	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 whilespeaking; Planning and preparing a model presentation; Organizing the presentation to suit theaudience and context; Basics of public speaking; Preparing for a speech	
2	Career Oriental 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 interviewquestions and how to answer them; Group Discussion: structure and dynamics; Techniques ofeffective participation in group discussion; Preparing for group discussion;	
3	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	
4	Language laboratory training in speaking skills covering oral presentations, mock interviews and model group discussions through the choice of appropriate programmes	
	Total :	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

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**

Module	Detailed Description	Lecture / Tutorial Period
1	<p>Constitutional Law 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>Arbitration, Conciliation and ADR system 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>	10L
2	<p>Human Rights and Public International Law 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 & Political Rights 1966 including Optional Protocol – I (Individual Complaint Mechanism) & 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 & Practice of Treaties and Law of Sea.</p> <p>Right to Information Act, 2005 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>Gender Studies covering Meaning of gender, international perspective and national perspective; Laws relating women in India; Judicial approach and responses- Vishaka V/s State of Rajasthan 1997 SC; Rights enforcement mechanism in India; Landmark judicial decisions of Supreme Court relating to women.</p>	11L

3	<p>Law relating to Intellectual property 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.</p>	10L
4	<p>General Principles of Contract under Indian Contract Act, 1872 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.</p> <p>Labour Laws covering Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923.</p> <p>Corporate Law 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.</p>	11L
	TOTAL:	42L
	Total Week Required:	14
	No. Of Week Reserved:	02

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. Wadhera (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: Digital Image Processing

Paper Code: IT 701

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

Credit Point: 3

Total Marks: 100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	<p>Introduction: Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.</p> <p>Digital Image Formation: A Simple Image Model, Geometric Model-Basic Transformation (Translation, Scaling, Rotation),Perspective Projection, Sampling & Quantization - Uniform & Non uniform.</p> <p>Mathematical Preliminaries :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.</p>	12L+4T
2.	<p>Image Enhancement :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;</p> <p>Enhancement in the frequency domain - Low pass filtering, High pass filtering.</p> <p>Image Restoration: 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.</p>	10L+4T
3.	<p>Image Segmentation :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.</p> <p>Image Representation and Description: 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.</p>	10L+3T

4.	Image Compression: Image Compression Models, Elements of Information Theory ,Lossy and Error-Free Compression , Huffman Coding, Image Compression Standards Morphological Image Processing: 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, Image Classification.	10L+3T
	TOTAL:	42L+14L
	Total Week Required:	14
	No. Of Week Reserved:	02

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: Multimedia Technology**Paper Code: IT 702****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introduction to Multimedia: Multimedia presentation and production, Multimedia and hypermedia, Digital Representation, Types of Multimedia Components (static and time variant), Hardware and software requirements, Uses of multimedia. Text: Representation of textual information, Design considerations, Character set and codes, Text types – Plain Text, Rich Text, Formatted and unformatted Text, Hypertext, Text formats (ASCII, RTF, and HTML). Different Text Compression Techniques.	10L+2T
2.	Image: Concept of image, Image Representation (Pixel mapping and Vector Graphics techniques), Different Color models, Image Resolution, Image enhancement and filtering techniques, Image compression (Lossless and Lossy Image Compression Techniques), Image encoding (RLE, Huffman, Arithmetic), Image formats (BMP, JFIF/JPEG, GIF, TIFF). Audio: Fundamental concepts of sound, Dynamic range of human hearing, Modulation and demodulation techniques, Digital representation of Sound, (Sampling Rate, Sampling Size, Quantization), Audio compression standards (Sub band Encoding, MP3, WAV, RIFF, RM), MIDI protocol, MIDI file format, Audio Transmission.	10L+4T
3.	Video: Analogue and digital video, Raster scanning technique, Interlaced and non-interlaced scanning, Transmission of video signals, Color video signals, Video Coding standards (MJPEG, MPEG, AVI), Video Editing. Animation: Definition of animation, Tools and techniques, Animation control techniques, Double buffering, Warping and Morphing, 3D animation techniques-Basic concepts, Polygonal/NURBS modeling,	12L+4T

4.	<p>Multimedia Devices: Input devices – Scanner, CCD Camera, Microphone, Output devices – Printer, CDROM, DVD, Woofer; Architecture of Sound Card and Frame Grabber Card.</p> <p>Virtual Reality Techniques: Immersive and non-immersive VR, VR devices, Virtual Reality Modeling Language (VRML), Distributed VR</p> <p>Multimedia Architecture: User Interface, Windows Multimedia Support, Distributed Multimedia Applications, Real Time Protocols, Playback Architectures, Streaming Technologies, Temporal Relationships, Synchronization, Multimedia Database System.</p> <p>Multimedia Application Development: Multimedia application development life cycle, Authoring tools and metaphors, Windows/Windows multimedia application programming</p>	10L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. R. Steinmetz and K. Nahrstedt, Multimedia: Computing, Communications & Applications, Pearson Ed.
2. N. K. Sharda, Multimedia Information System, PHI.
3. F. Halsall, Multimedia Communications, Pearson Ed.
4. K. Buford, Multimedia Systems, Pearson Ed.
5. F. Hoffstetter, Multimedia Literacy, McGraw Hill.
6. R. Steinmetz and K. Nahrstedt, Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing, PHI.
7. J. Jeffcoate, Multimedia in Practice: Technology and Application, PHI.
8. P. K. Andleigh & K. Thakrar, Multimedia Systems Design, PH

Paper Name: Data Mining

Paper Code: IT 703

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

Credit Point: 3

Total Marks: 100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	<p>Introduction to Data Mining: Process of Knowledge Discovery, Types of Data, Data Mining Functionalities.</p> <p>Describing Data: Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity, Data Visualization Techniques.</p> <p>Data Preprocessing: Data Summarization, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization, Concept Hierarchy Generation.</p>	8L+4T
2.	<p>Frequent Pattern Mining, Association Rule Generation, Correlation Analysis: Frequent Itemset Mining methods –Apriori Algorithm, FP-Tree Growth. Association Rules & their types, Association to Correlation.</p>	8L+2T
3.	<p>Classification and Prediction: 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> <p>Cluster Analysis: Categories of Clustering Methods: Partitioning, Hierarchical, Density-based, Grid-based methods, Clustering of High-Dimensional Data, Evaluation of Clustering-Measuring Clustering Quality.</p>	12L+6T

4.	Outlier Detection: 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. Data Warehousing: Basic Concepts of Data Warehousing, OLAP and Data Cube, overview of design and implementation of a Data Warehouse.	14L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

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. Witten and E. Frank, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier.

Paper Name: Digital Image Processing Lab.

Paper Code: IT 751

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

Credit Point: 2

Total Marks: 100

UNIT	<u>Detailed Description(Use Matlab/Python)</u>	Practical Period
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
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

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: Multimedia Technology Lab

Paper Code: IT 752

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

Credit Point: 2

Total Marks: 100

UNIT	<u>Detailed Description</u>	Practical Period
1.	Multimedia based web content creation: Hands on Text Editing/Representation tools.	2P
2.	Image editing: Enhancing images using different Adobe Photoshop tools viz., cropping, dodging, spot healing etc., working with layers, cloning.	4P

3.	Sound capturing & editing: Capturing audio files using Sound Forge, merging audio files together, adding echo effects, changing sampling criteria etc.	3P
4.	Video editing: Learning video capturing, rendering, subtitling using Adobe Premier.	4P
5.	2D Animation: Creating sample animations using Flash, database access with Flash, Action scripts.	6P
6.	3D Animation: Hands on Maya, idea about Maya tools and interface, creating 3D models using Polygon, NURBS, Subdivision surface and Volume primitives, Working with camera and lighting techniques, Dynamics and Simulation using Fluid/Fur/Cloth effects, rendering techniques.	
7.	Windows/Windows Multimedia Programming: Handling multimedia file formats, Audio Programming, Video Programming, Putting it all together 7P	7P
8.	Introduction to VRML Pad, Crotona VRML client, Cosmo Player, Developing simple virtual worlds, idea about VRML nodes, routing 6P	6P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

1. Adobe, Adobe Photoshop 6.0: Classroom in a book, Pearson Ed.
2. Macromedia Flash5 fast and easy Web Development, Design, PHI
3. Lozano, Multimedia- Sound & Video, PHI
4. Adobe Flash CS4 Professional Classroom in a Book by Adobe Creative Team
5. Win32 API Programming by Steve Brown, BPB publications
6. VRML Primer by Rick Carey
7. Learning Maya 7: Foundation by Alias Learning Tools

Paper Name: Data Mining Laboratory**Paper Code:IT 753****Weekly Load: L: 0 T: 0 P: 3****Credit Point: 2****Total Marks: 100**

UNIT	<u>Detailed Description</u>	Practical Period
1.	Assignments on Data Preprocessing	8P
2.	Assignments on Frequent Pattern Mining, Association Rule Generation, Correlation Analysis	8P
3.	Assignments on Data Classification	9P
4.	Assignments on Data Clustering	9P
5.	Assignments on Outlier Detection	8P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

4. J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers.
5. M. H. Dunham, Data Mining Introductory and Advanced Topics, Printice Hall.
6. I. H. Written & E. Frank, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier.

Paper Name: Cyber Security and computer forensics**Paper Code: IT 711(a)****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1.	Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and Legislation , Privacy considerations, International security activity. Cybercrime on Mobile & Wireless devices: Security Threats and Attacks, Security challenges posted by mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking, Network Sniffers, Different viruses on laptop.	11L+4T
2.	Phishing & Identity Theft: Phising methods, ID Theft; Online identity method. Tools and Methods used in Cyber crime: Proxy servers, password checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: Buffer over flow.	9L+3T
3.	Cybercrime & Cyber security: Public key certificate, Malware analysis, System Security, Web server Security, Application server Security, Wireless Security, Linux Systems Security, Cryptography and Digital Signature, Network Monitoring Tools. Constitutional & Human Rights Issues in Cyberspace Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection	10L+3T
4.	Cyber Crimes & Legal Framework Cyber Crimes against Individuals, Institution and State , Passive attack, Active attacks, Computer Network intrusion, Hacking, Digital Forgery , Cyber Stalking/Harassment, Identity Theft & Fraud , Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000. Intellectual Property Issues in Cyber Space and Cyber Law Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Name Related issues, Different Types of Civil Wrongs under the IT Act, 2000. Case Study on Cyber Crime.	12L+4T
	Total	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer Verlag, 1997.

Paper Name: Data Analytics**Paper Code: IT 711 (b)****Weekly Load: L: 3 T:1 P: 0****Credit Point: 3****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introduction: Introduction to Data Analytics, Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests	8L+2T

2	Regression: Introduction to Regression- Ordinary Least Squares, Analysis of Variance, Ridge Regression, Lasso Regression	8L+3T
3.	Regression and Classification techniques: 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.	Introduction to Bigdata: Fundamentals of Big Data, Examining Big Data Types, Big Data Technology Components, MapReduce Fundamentals Big Data Analytics: Defining Big Data Analytics, Big Data Analytics Applications	14L+5T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

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] Manoochehri, Murthy, Lander, Big Data Analytics, Pearson Education.
- [4] Dr. ArvindSathi, Big Data Analytics: Disruptive Technologies for Changing the Game, MC Press.

Paper Name: Nature Inspired Computing**Paper Code: IT 711(c)****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Evolutionary Algorithm: Genetic Algorithm: Principle of Optimization, Optimization Problems, Definition of GA, Differences with traditional method, Various operations of GA, Elitist Model of GAs, Single Objective Optimization Problem (SOOP), Constraints Handling in GA, Scheduling GA, Multi Objective Genetic Algorithms (MOGA), Multi-Objective Optimization Problem (MOOP), Evolutionary Multi objective Optimization (EMO), Hybridization with Local Search.	10L+4T
2.	Differential Evolution(DE): Introduction, Initialization, DE mutation operator, crossover operator, control parameters, selection, Example of DE in objective function	8L+2T
3.	Swarm Intelligence: Ant Colony Optimization(ACO): Introduction, ACO algorithm, Example of using ACO in TSP problem, Particle Swarm optimization(PSO): Multimodal problems, PSO algorithm, mathematical and graphical representation, comparison with other evolutionary algorithms, Variants of PSO,	12L+4T
4.	Artificial Bee Colony (ABC) algorithm: working principle, decision process. algorithm, choice of parameters, Bio Inspired Algorithm: Biogeography based optimization(BBO): BBO algorithm, migration, mutation, benchmark function and BBO result	12L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. D.E. Goldberg -Genetic algorithm in search, optimization & machine learning-Pearson Edu.
2. K. Deb - Multi-Objective Optimization using Evolutionary Algorithms – Wiley
3. Differential Evolution: A Practical Approach to Global Optimization by Kenneth Price, Rainer M. Storn, and SanyaPandita
4. Swarm intelligence by James F. Kennedy
5. Swarm Intelligence: Introduction and Applications by by Christian Blum , Daniel Merkle
6. Evolutionary Computation with Biogeography-based Optimization by Haiping Ma, Dan Simon
7. Optimization: Algorithms and Applications by by Rajesh Kumar Arora

Paper Name: AI and Its Applications

Paper Code: IT 711(d)

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

Credit Point: 3

Total Marks: 100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	<p>Introduction: Definition of AI, Features of AI, Typical AI problems ,Practical Impact of AI ,Approaches to AI ,Limits of AI Today, AI History. Brief introduction to Agent technology.</p> <p>Problem Solving and Search techniques: Problems, Problem Space & Search: Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs. Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.</p>	9L+3T
2.	<p>Heuristic Search Strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, Constraint satisfaction problems, local search for constraint satisfaction problems.</p> <p>Adversarial search: Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning.</p>	7L+3T
3.	<p>Knowledge Representation and Reasoning:Definition & importance of knowledge, Knowledge based system, Representation & mappings, Approaches & issues, Knowledge Organization, Knowledge manipulation, Logic programming, Forward vs. backward reasoning, Matching, Control Knowledge. Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory.</p> <p>Propositional & Predicate Logic: 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, Isa relationship, Computable functions, predicate resolutions, Clause form, Substitutions, Question answering, Natural deduction.</p>	12L+3T

4.	<p>Advanced Topics :Planning-- Components of planning system, Goal stack planning, Non-linear planning, Hierarchical planning, and Reactive system. Understanding-- Understanding as constraint satisfaction. Learning-- Basic concept, Learning Spectrum, learning by taking advice, Learning in problem solving, Learning from examples, Explanation based learning.</p> <p>Expert system-- Representing & using domain knowledge, expert system shells, explanation, Knowledge acquisition.</p> <p>Logic programming using Prolog & Lisp: Defining Programs, Basic Flow of Control, Atoms and Lists, Basic Debugging, Building Up List Structure, More on Predicates, Properties, Pointers, Cell Notation and the Internals (Almost), Destructive Modification of Lists, The for Function, Recursion, Scope of Variables, Input/output, Macros</p>	14L+5T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence a Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS
7. Guy Steele, Common Lisp: The Language, Digital Press, 2nd Edition, 1990.
8. Herbert A. Simon, The Sciences of the Artificial, MIT Press, 3rd Edition (2nd printing), 1998

Paper Name: Advanced Computer Organization and Architecture

Paper Code: IT 711(e)

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

Credit Point: 3

Total Marks: 100

Module	Detailed Description	Lecture / Tutorial Period
1.	<p>Introduction: Evolution of computer architecture, Flynn's classification, System performance.</p> <p>Parallelism, Partitioning and Flow Mechanism: Condition of parallelism – data, resource and control dependencies, Bernstein's Condition, Hardware & Software parallelism; Program partitioning & Scheduling – Grain Sizes & Latency, Grain Packing & Scheduling, Static Multiprocessor Scheduling; Program Flow Mechanisms - Control Flow, Data Flow, Demand Driven Mechanisms, comparisons.</p>	10L+4T
2.	<p>Interconnection Network Architectures: Properties & Routing of different types of networks, Multistage Dynamic networks - Crossbar Switches.</p> <p>Pipelines: Linear pipelines – Synchronous & Asynchronous model, Speedup, Efficiency, Throughput; Non-linear pipelines – Reservation & 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>	10L+4T

3.	Superscalar Architecture: Super pipeline architecture, superscalar design, Difference between superscalar & super pipeline; Multi-pipeline scheduling, Super pipeline superscalar performance. Vector & Array Processor: 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. Memory Interleaving: Low order, high order techniques, Memory Bandwidth.	12L+4T
4.	Multiprocessors: Loosely & 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. Advanced Processor Technology: RISC, CISC, Symbolic Processor and characteristics, Difference between RISC and CISC.	10L+2T
	Total	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Texts/References:

- I. Carl Hamacher, Zvonko Vranesic, Safwat, Computer Organization, McGraw Hill.
- II. J.P.Hayes, Computer Architecture and Organization, McGraw Hill.
- III. William Stallings, Computer Organization and Architecture, Pearson
- IV. K.Hwang, F.Briggs, Parallel processing and Computers Architecture, Tata McGraw Hill
- V. Hennessey, Patterson, Computer Architecture, Elsevier.
- VI. Kai Hwang, Advanced Computer Architecture, McGraw Hill International.

Paper Name: VLSI Systems

Paper Code: IT 711(f)

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

Credit Point: 3

Total Marks: 100

Module	Detailed Description	Lecture / Tutorial Period
1.	Introduction to VLSI system design: ICs, Classification of ICs, Generations of ICs, Moore's Law, Deviation of Moore's Law. MOS Transistors: Physics of MOS transistors, NMOS, PMOS, Realization of NOT, NAND, NOR using PMOS, CMOS. Integrated Circuit Fabrication: Basic IC, NMOS, n-well CMOS Pass Transistors: Steering Logic, Degraded Signal Passing Phenomenon, Transmission Gates.	10L+3T
2.	MOS Scaling: Types of Scaling, Effects of Scaling. Design Rules: Layout Design Rules, Lambda & Micron Design Rules. Stick Diagram: Layout Stick Diagrams, Compactor, Example of a MOS. Delay: MOS Transistor Delays, Rise & Fall Time Delays.	10L+4T
3.	Power Consumption: Static & Dynamic Power, Switching Activity, Different Power Reduction Techniques of VLSI circuits. Static Logic design: Static NMOS and CMOS combinational networks, OAI, AOI logic gates, Pseudo NMOS. Dynamic Logic Design: Dynamic CMOS, Cascading Problem, Domino CMOS structures, Charge Sharing, NORA logic circuit. Clock Generation and Distribution: Clock Duty Cycle, Clock Skew, Generation Circuits, Distribution Networks.	14L+6T
4.	VLSI Design Cycle: System Specification, Functional Design, Logic Design, Circuit Design, Physical design, Fabrication & Packing. Basic idea of Physical design: Partitioning, Placement, Floor planning, Routing.	8L+1T

	Total =	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Texts/References:

- I. Kang , Digital CMOS IC Design, Tata McGraw Hill .
- II. Weste, Harris, Banerjee, CMOS VLSI Design , Pearson
- III. Eshraghian, Weste, Principles of CMOS VLSI Design , Pearson
- IV. K Parhi, VLSI Digital Signal Processing, Wiley & Sons.
- V. Millman, Halkias, Integrated Electronics, Tata McGraw Hill.

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

Module	Detailed Description	Lecture / Tutorial Period
1.	Introduction to E-Commerce 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.	8L+3T
2.	E-Commerce Technologies: Supporting technologies and tools, Architecture (e.g. Java e-commerce solution), Protocols and standards, Security, Business models, Payment mechanisms Application of E-Commerce in Business 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.	14L+5T
3.	E-Commerce Recommender Systems Basic concepts, Types of Recommender Systems, Collaborative Filtering Algorithms, Scalability, Trust and Security in Recommender Systems	12L+4T
4.	E-Commerce in India 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.	8L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books:Textand/orReference:

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 LiorRokach, Recommender System Handbook, Springer Nature.
6. Charu C. Aggarwal, Recommender Systems: The Textbook , Springer.

Paper Name: Information Theory and Coding**Paper Code: IT 711(h)****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introduction: Meaning of Information Theory, Encoding information, A problem in information transmission	10L+2T
2.	Information and sources: Zero memory information source, Extension of zero memory source, The Markov information source, The adjoint source	8L+3T
3.	Properties of codes: Uniquely decodable Codes, Instantaneous Codes, The Kraft inequality Coding information sources: Average length of a code, Shannon's theorem, Finding Binary compact codes-Huffman Codes, Code efficiency and redundancy	12L+5T
4.	Error control coding: Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.	12L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Information Theory And Coding by Norman Abramson McGraw-Hill Electronic Science Series
2. Digital and analog communication systems, K. Sam Shanmugam, John Wiley, 1996.
3. Digital communication, Simon Haykin, John Wiley, 2003.
4. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
5. Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008

Semester- VIII**Paper Name: Machine Learning****Paper Code: IT 801****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 4****Total Marks: 100**

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introductory Topics: Introduction to machine intelligence; Problems, data, and tools; Visualization Linear Regression and Feature Selection: SSE; gradient descent; closed form; normal equations; features Over fitting and complexity; training, validation, test data, Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Naïve Bayes Classifier: Classification using Naïve Bayes Classifier, The Naïve Bayes Probabilistic Model, Parameter estimation, Bayesian Belief Network	12L+5T

2.	Decision Trees: 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 Maximum Likelihood AND Bayesian Parameter Estimation: Bayesian Estimation, Problems of Dimensionality, Component Analysis and Discriminants :Principle Component Analysis(PCA), Fisher Linear Discriminant, Multiple Discriminant Analysis, Expectation-Maximization(EM) Algorithm	12L+4T
3.	Support Vector Machines: Linear Discriminant Functions, , Learning the Weight Vector, Multi-class Problems, Generality of Linear Discriminants, Linearly Separable Case, Non-linearly Separable Case, SVM Training:SVM for the XOR Problem	8L+2T
4.	Ensemble Methods: Bagging, random forests, boosting Introduction to Reinforcement Learning. Introduction to Deep learning.	10L+3T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Pattern recognition principles--Tou & Gonzalez, Addison Wesley.
2. Pattern classification-- Duda, Hart, Stork, John Wiley & Sons, 2001.
3. Deep Learning (Adaptive Computation and Machine Learning series) by Ian Goodfellow (Author), Yoshua Bengio (Author), Aaron Courville
4. Pattern Recognition and Machine Learning by Christopher Bishop
5. Bayesian Reasoning and Machine Learning by David Barber
6. Understanding Machine Learning: From Theory to Algorithms by Shai Ben-David and Shai Shalev-Shwartz
7. Machine Learning: A Probabilistic Perspective by Kevin R Murphy
8. Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms by Aoife D'Arcy, Brian Mac Namee, and John D. Kelleher

Paper Name: Cryptography and Network Security**Paper Code: IT 802****Weekly Load: L: 3 T: 1 P: 0****Credit Unit: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1.	Overview and Security Attacks: Security Approaches, Principles of security, Types of attacks: Active attack - interruption, modification, fabrication; Passive attack – release of message contents, traffic analysis; Viruses, Worms, Trojan horse Symmetric Ciphers: Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard, Introduction to Finite Fields, Advanced Encryption Standard, RC4, Confidentiality Using Symmetric Encryption	12L+4T
2.	Public-Key Encryption and Hash Functions: Introduction to Number Theory, Public-Key Cryptography and RSA, Key Management; Diffie-Hellman, ECC Message Authentication and Hash Functions: Hash and MAC Algorithms, Digital Signatures and Authentication Protocols	12L+4T
3.	Database Security: Database Access Control, Inference, Statistical Database, Database Encryption Internet Security Protocols and Standards: IPSec, SSL and TLS, PGP and S/MIME	9L+3T

4.	Internet Authentication Applications: Kerberos, X.509, Public Key Infrastructure Security Appliances: Intrusion Detection Systems, Firewalls and Intrusion Prevention Systems	9L+3T
	Total	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

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

Paper Name : Distributed Computing**Paper Code : IT 803****Weekly Load : L : 3 T : 1 P : 0****Credit Point : 3****Total Marks :100**

Module	Detailed Description	Lecture/ Tutorial Period
1.	Introduction to Distributed System: 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 Middleware: 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.	10L+3T
2.	Clock Synchronization: Physical Clocks, Global Positioning System, Clock Synchronization Algorithms, LOGICAL CLOCKS, Lamport's Logical Clocks Vector Clocks, Centralized and Decentralized Algorithms. Code Migration: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Application of Code Migration using Agent.	10L+3T
3.	Java RMI & Mobile Agent: 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. Distributed File System: Architecture of NFS, communication in NFS, synchronization, Security in NFS.	12L+3T

4.	<p>Introduction To Fault Tolerance: Basic Concepts, Failure Models, Failure Masking by Redundancy PROCESS RESILIENCE-Design Issues, Failure Masking and Replication Agreement in Faulty Systems Failure Detection DISTRIBUTED COMMIT-Two-Phase Commit, Three-Phase Commit.</p> <p>Distributed coordination-based systems JINI: Runtime Environment, Architecture, Discovery Protocol, Join Protocol, Lookup Service, Distributed Event, Distributed Leasing, Transactions, Surrogate Architecture.</p> <p>Case Study: GARUDA Project, WLHC Grid.</p>	10L+5T
	Total	42L+14T
	Total Week Required	14
	No. of Week Reserved	02

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.

Paper Name: Machine Learning Laboratory**Paper Code: IT 851****Weekly Load: L: 0 T: 0 P: 3****Credit Point: 2****Total Marks: 100**

Unit	<u>Detailed Description</u>	Practical Period
1.	Assignments on Linear regression	8P
2.	Assignments related Feature Selection, feature reduction	8P
3.	Assignments on Linear Classifier	8P
4.	Assignments on Support vector machines and large-margin classifiers	8P
5.	Problem on Ensemble Methods	5P
6.	Assignments related on Deep Learning	5P
	TOTAL:	42P
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Pattern classification-- Duda, Hart, Stork, John Willey & Sons, 2001.
2. Deep Learning (Adaptive Computation and Machine Learning series) by Ian Goodfellow (Author), Yoshua Bengio (Author), Aaron Courville
3. Pattern Recognition and Machine Learning by Christopher Bishop
4. Bayesian Reasoning and Machine Learning by David Barber
5. Understanding Machine Learning: From Theory to Algorithms by Shai Ben-David and Shai Shalev-Shwartz
6. Machine Learning: A Probabilistic Perspective by Kevin R Murphy

Paper Name: Digital forensics**Paper Code: IT 811(a)****Weekly Load: L: 3 T: 1 P: 0****Credit Point: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1.	Introduction to Digital Forensics: Forensics Soundness, Forensics analysis fundamentals, Crime reconstruction, Network and The Internet	6L+2T
2.	Forensics analysis: Application of Scientific method to digital forensic, Uses of digital forensic analysis, Data gathering and observation, Hypothesis formation, Evaluating hypothesis.	5L+2T
3.	Electronic Discovery: Legal Context, Case management, Identification of Electronic Data, Forensic preservation of data, Data processing, Production of electronic data.	3L+1T
4.	Intrusion Investigation: Methodologies, Case management and reporting, Common Initial Observations, Scope assessment, Collection, Analyzing Digital Evidence, Combination Correction, Feeding analysis back into detection phase.	5L+2T
5.	Windows Forensics Analysis: Windows everywhere, NTFS overview, Forensics analysis of the NTFS master file table (MFT), Metadata, Artifacts of user activities, Deletion and Destruction of Data, Windows Internet and Communication Activities, windows Process Memory, Bit Locker and Encrypting file system.	6L+2T
6.	Unix Forensic Analysis: Introduction to UNIX, Boot Process, Forensic Duplication Consideration, File System, User Accounts, System Configuration, Artifacts of User Activities, Internet Communication, Firefox 3, Cache.	4L+1T
7.	Macintosh Forensic Analysis: Introduction, Imaging and File System, Property List, User Accounts, Application, System, User Folders: Media Files, Wrap Up.	6L+2T
8.	Embedded System Analysis: Introduction, Definition and Operation, Processing Traces, Data Collection, Information Recovery, Analysis and Interpretation of Results, The future.	4L+1T
9.	Network Investigation: Introduction, Overview of Enterprise Networks, Overview of Protocols, Evidence Preservation as Networks, Collecting and Interpreting Network Device Configuration, Forensic Examination of Network Traffic, Network Log Correlation- A technical perspective.	3L+1T
10	Mobile Network Investigation: Introduction, Mobile Network Technology, Investigations of Mobile Systems, Types of Evidence, where to seek data for investigations, Interception of Digital Evidence on Mobile Network.	
		42L+14T

Books:Text and/or Reference:

1. Text Book: “ Handbook of Digital Forensics and Investigation”, EOGHAN CASEY.

Paper Name : Quantum Computing and Its Application

Paper Code : IT 811(b)

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

Credit Point : 3

Total Marks :100

Module	Detailed Description	Lecture/ Tutorial Period
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1.	Introduction to Quantum Computing: Need for Quantum Computing, Basic Principles Of Quantum Mechanics, The Postulates Of Quantum Theory, Dirac Notation, Quantum Information, No cloning theorem & Quantum Teleportation, Classical vs Quantum Computation. Quantum Gates and Circuits: Qubit, Bloch Sphere, Measuring the State of Qubit, The Quantum Circuit Model, The Single Qubit Gates, Rotations of the Bloch sphere, Controlled Gates, The Bell basis, Universal Quantum Gates, Preparation Of The Initial State, Designing of Quantum Different circuits.	14L+4T
2.	Quantum Algorithms: Introduction to Quantum Algorithm, Deutsch Algorithm, Deutsch-Jozsa Algorithm, Simon's Algorithm, Quantum Phase Estimation and Quantum Fourier Transform, Shor's Algorithm, Grover's Search Algorithm, Quantum Counting, Quantum Search, Quantum Sort.	12L+2T
3.	Quantum Communication & Cryptography: Density Matrix & Bloch Sphere, Schmidt Decomposition, Measurement of The Density Matrix for a Qubit, POVM Measurements, Introduction to Quantum Cryptography, BB84 Protocol, E91 Protocol, Quantum teleportation.	8L+2T
4.	Quantum Computing Implementation: Idea of Physical Realization of Quantum Computers using Photon based Technology, Nuclear Magnetic Resonance, Ions in Traps, Implementation of Different Quantum Algorithms and Circuits using Software Tools, Study of Quantum Programming Languages. Quantum Inspired Machine Learning Algorithms: Importance of Hybridization, Concept of Quantum Inspired Algorithm, Quantum Inspired Evolutionary Algorithms, Quantum Inspired Neural Networks and Quantum Inspired Clustering Algorithms.	8L+6T
	Total	42L +14T
	Total Week Required	14
	No. of Week Reserved	02

Books: Text and/or Reference:

1. M. A. Nielsen, I. L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press.
2. P. Kaye, R. Laflamme, and M. Mosca, An introduction to Quantum Computing, Oxford University Press.
3. V. Sahni, Quantum Computing, Tata McGraw-Hill Publishing Company
4. S. Bhattacharyya, U. Maulik and P. Dutta, Quantum Inspired Computational Intelligence: Research and Applications, Elsevier
5. E. Hassanien, M. Elhoseny and J. Kacprzyk, Quantum Computing: An Environment for Intelligent Large Scale Real Application, Springer

Paper Name : Cloud Computing**Paper Code : IT 811(c)****Weekly Load : L: 3 T : 1 P : 0****Credit Point : 3****Total Marks :100**

Module	Detailed Description	Lecture/ Tutorial Period
1.	Introduction to Cloud Computing: Cloud Computing-History, Need for Cloud Computing, Basic Concepts & Terminology, Goals & Benefits, Risks & Challenges, Roles and Boundaries, Cloud Characteristics, Advantages and Disadvantages of Cloud Computing.	8L+2T

2.	Cloud Delivery Models: Concept of Cloud Delivery Models, Infrastructure as a Service, Platform as a Service, Software as a Service, Comparing Cloud Delivery Models, Combining Cloud Delivery Model. Cloud Deployment Models: Concept of Cloud Deployment Models, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Other Models.	12L+4T
3.	Virtualization & Data Center Technology: Concept of Virtualization, Different Types of Virtualizations, Virtualization Management, Overview of Data Center Technology, Multitenant Technology.	10L+3T
4.	Cloud Security & Risk: Different Security Issues in Cloud Environment, Different Types of Threats, Cloud Security Threats, Cloud Security Services, Risks in Cloud Computing, Risk Management. Cloud Computing Tools and Applications: Introduction to Different Cloud Computing Tools (CloudSim, OpenNebula, Nimbus), Case Study on different Cloud Applications (Microsoft Cloud Services, Amazon Cloud Services, Google Cloud Applications), Advanced Cloud Applications (Mobile Cloud, Multimedia Cloud, Green Cloud).	12L+5T
	Total	42L +14T
	Total Week Required	14
	No. of Week Reserved	02

Books: Text and/or Reference:

1. R. Puttini, T. Erl, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall.
2. M. Miller, Cloud Computing: Web-Based Application That Change the Way You Work and Collaborate Online, Que Publishing.
3. T. Velte, Cloud Computing A Practical Approach, Mcgraw Hill Education.
4. A. Srinivasan, J. Suresh, Cloud Computing: A Practical Approach for Learning and Implementation, Pearson.

Paper Name: Bio-Informatics**Paper Code: IT 811(d)****Weekly Load: L : 3 T :1 P : 0****Credit Point: 3****Total Marks :100**

Module	Detailed Description	Lecture/ Tutorial Period
1.	Introduction to Molecular Biology: Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA: Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation, Introduction to Metabolic Pathways. Sequence Databases : Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. Sequence database search programs - BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed	9L+3T

2.	DNA Sequence Analysis : DNA Mapping and Assembly: Size of Human DNA, Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignments, Dynamic Programming Concept, Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman,	15L+5T
3.	Introduction Probabilistic models used in Computational Biology : Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics: Gene finding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model: Architecture, Principle and Application in Bioinformatics. Computer aided drug design.	12L+4T
4.	Biological Data Classification and Clustering: Assigning protein function and predicting splice sites: Decision Tree Gene Expression Clustering. K Means Algorithm.	6L +2T
	Total	42L+14T
	Total Week Required	14
	No. of Week Reserved	02

Books: Text and/or Reference:

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

Paper Name: Deep Learning**Paper Code: IT 811(e)****Weekly Load: L: 3 T: 1 P: 0****Credit Unit: 3****Total Marks: 100**

Module	Detailed Description	Lecture / Tutorial Period
1.	Basics: Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm. Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders.	10L+3T
2.	Deep Neural Networks: Difficulty of training deep neural networks, Greedy layerwise training. Better Training of Neural Networks: Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization). Recurrent Neural Networks: Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.	14L+6T
3.	Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann	8L+2T

	Machines.	
4.	Recent trends: Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning. Applications: Vision, NLP, Speech (just an overview of different applications in 2-3 lectures)	10L+3T
	Total	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Text and/or Reference:

1. Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.
2. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996.
3. Pattern Recognition and Machine Learning, Christopher Bishop, 2007.

Paper Name: Computer Vision and Robotics

Paper Code: IT 811(f)

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

Credit Point: 3

Total Marks: 100

Module	<u>Detailed Description</u>	Lecture / Tutorial Period
1.	Introduction: Overview of Robotics, Mechanical Design of robots, sensors, actuators, gearboxes, robot end-effectors, resolution, accuracy, precision. Overview of computer vision and robotic applications of vision. Elements of a vision system, lighting, sensors, optics. Geometry of imaging, projections, distortions, depth of field. Digitization, brightness, color space, color depth, image formats. Camera calibration. Describing the position and orientation of objects in 3D space. Coordinate frames, position, orientation and velocity vectors in 3D, coordinate transformations. Applies directly to Computer Graphics. A robot's joint angles (positions) and the end-effector pose (position and orientation), A robot's joint speeds and the end-effector translational and angular velocity (position and orientation).	12L+4T
2.	Binary images, thresholding, histograms. Area/moment statistics, morphological operations. Segmentation, blob analysis, labeling. Spatial operations and transformations: Pixel neighborhoods, convolution. Mean, Gaussian, Laplacian, gradient filters. Edge detection, Canny, Hough transform. Visual servoing, image based position based tracking, snakes. 3D Vision, multi-camera geometry, stereo and model based vision. Range imaging and robotic applications. A robot's joint angles, velocities, accelerations and inertial properties, and the loads on the actuators	14L+6T
3.	Inverse Kinematics: Given where I want to be what should the joint angles be; what should be the speed of actuators to attain a certain velocity at the tip? Does not always have a solution, sometimes has multiple solutions. Mathematically define a path in space and control the robot to follow that path	8L+2T
4.	Contact tasks, force sensing and control., Haptic interfaces parallel kinematics Overview of mobile robotics, applications. Sensors and estimation. Distributed robotics.	8L+2T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text Books / References:

1. Computer Vision: A Modern Approach, David A. Forsyth, Jean Ponce
2. Machine vision, R. Jain, R. Kasturi, and B.G. Schunk, McGraw- Hill
3. Robotics: Control, Sensing, Vision and Intelligence Fu, Gonzales and Lee, McGraw Hill
4. Introduction to Robotics, Graig J. J., Pearson Education
5. Fundamentals of Robotics-analysis and control, Robert Schilling (PHI).
6. Image processing, Analysis, and Machine Vision Milan Sonka, Vaclav Hlavac, Roger Boyle Thomson Learning
7. Robert Haralick and Linda Shapiro, Computer and Robot Vision, Vol I, II, Addison-Wesley

Paper Name: Mobile Operating System and Application

Paper Code: IT 811 (g)

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

Credit Unit: 3

Total Marks: 100

Module	Detailed Description	Lecture / Tutorial Period
1.	<p>Introduction to Android OS: History of Mobile Software Development, Open Handset Alliance, What is an Android, Difference between I-phone OS (apple) and Android OS, Define terms- HTML, XML and WML.</p> <p>Setting up Android Development Environment: Configuring Development Environment, Difference between JVM and DVM, Android platform Architecture, Advantage of DVM over JVM, Android Emulator.</p> <p>Building your first Android Application: Creating and Configuring a New Android Project, Core Files and Directories of the Android Application, Creating a AVD, Launch Configurations for a Project, Running Android Application in the Emulator, Debugging Android Application in the Emulator, Adding Logging Support to Android Application, Adding Some Media Support to Application, Adding Location-Based Services to Application, Debugging Application on the Hardware</p>	8L+3T
2.	<p>Understanding the Anatomy of an Android Application: meaning of an Anatomy, Explaining activity with their states, methods used in android activity life cycle, Android activity life cycle.</p> <p>Defining Application using the Android Manifest file: Core files and Directories of the Android Application, contents of the Android Manifest file, editing the Android manifest file, Registering Activities and Other in Application.</p> <p>Managing Application Resources: Identifying Resources, Storing Application Resources, Understanding Resource Directory Hierarchy, Resource Value Types, Setting Simple Resource Values Using Eclipse, Working with String, String Arrays, Boolean, Integer, Colors, Dimensions, Drawables, Images resources etc, Working with Layouts, Using Layout Resources Programmatically.</p>	12L+4T
3.	<p>Exploring User Interface Screen Elements: Introducing the Android View, Android Control, Android Layout, Displaying Text to Users with TextView, Configuring Layout and Sizing, Using Buttons, Check Boxes, Radio Groups, Spinner, ProgressBar etc.</p> <p>Designing User Interfaces with Layouts: Creating User Interfaces in Android, Creating Layouts Using XML Resources and Programmatically, Scrollview, GridView, ListView, Spinner etc.</p> <p>Drawing and Working with Animation: Design Working with Canvases and Paints, Drawing Ovals and Circles, Frame by frame & tween animation etc.</p> <p>Explore Data Storage Techniques: Working with SharedPreferences, Features of SQLite, storing data in SQLite.</p>	12L+5T

4.	<p>Explore Google Map: Feature of Google map, version of Google map APIs, integration of Google map into an Android application</p> <p>Working with other components: Use of TimePicker&DatePicker, Different Dialogboxes, Option menu & context menu, Send/read SMS, JSON & Application with JSON.</p> <p>iPhone OS: Introduction to iPhone Architecture, Essential COCOA TouchClasses, Interface Builder, Nib File, COCOA and MVC Framework, Overview of features of latest iOS.</p>	10L+6T
	Total	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text and/or Reference:

1. Shane Conder & Lauren Darcey, Android Wireless Application Development, Second edition, Pearson
2. Pradeep Kothari, Android Application Development (with Kitkat Support), Black Book, Dreamtech
3. Dawn Griffiths and David Griffiths, Head First Android Development, O'Reilly
4. Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 2/e, Big Nerd Ranch Guides
5. by Carmen Delessio, Lauren Darcey, Shane Conder, Android Application Development in 24 Hours, 4/e, Sams Teach Yourself
6. Christopher Allen, Shannon Appelcline, iPhone In Action, Introduction to Web and SDK Development, Manning Publications.

Paper Name: Graph Theory and Combinatorics

Paper Code: IT 811(h)

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

Credit Point: 3

Total Marks: 100

Module	Detailed Description	Lecture/ Tutorial Period
1.	<p>Introduction: Paths, cycles, walk; Eulerian trails, Hamiltonian cycles-sufficient conditions. Bipartite, Degree, Regular.</p> <p>Tree: Trees and their characterization, diameter, center, degree sequences and realizability, Shortest Path Problem, Dijkstra's Algorithm, Fundamental Circuits, Shortest Spanning Trees - Kruskal's Algorithm, Prim's Algorithm;</p>	12L+4T
2	<p>Cut Set: Cut Sets, Fundamental Cut Sets and Cut Vertices.</p> <p>Planarity: Planar and Dual Graphs, independence and chromatic numbers, Boolean function minimization, matching in partition.</p>	10L+4T
3.	<p>Graphs – algorithms: Metric Representation of Graphs, Networks, Flow Augmenting Path, Ford-Fulkerson Algorithm for Maximum Flow.</p>	8L+2T
4	<p>Combinatorics: Permutation, Combination of multisets, Pigeonhole principle, Formal power series and recurrence relation, Stirling numbers, Principle of inclusion-exclusion.</p>	12L+4T
	TOTAL:	42L+14T
	Total Week Required:	14
	No. Of Week Reserved:	02

Books: Text Books / References:

1. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI
2. West, "Introduction to graph theory" Pearson Education
3. Discrete Mathematics and Graph Theory by Bhavanari S
4. Graph Theory and Combinatorics by H S G Rao