13. COURSES OF STUDY AND SCHEME OF ASSESSMENT – 2012 REGULATIONS

M.Sc. THEORETICAL COMPUTER SCIENCE

(Total Credits to be earned: 230)

Course Code	Course Title	Hours/Week			Credit	Maximum marks		
		Lecture	Tutorial	Practical		CA	FE	Total
SEMESTER 1								
THEORY								
12XT11	ENGLISH FOR PROFESSIONAL SKILLS	3	0	0	3	50	50	100
12XT12	MATHEMATICAL METHODS	3	2	0	4	50	50	100
12XT13	MATERIALS SCIENCE	4	0	0	4	50	50	100
12XT14	ANALOG AND DIGITAL ELECTRONICS	4	0	0	4	50	50	100
12XT15	C PROGRAMMING	3	0	0	3	50	50	100
PRACTICAL								
12XT16	MATERIALS SCIENCE AND DIGITAL ELECTRONICS LAB	0	0	4	2	100	-	100
12XT17	C PROGRAMMING LAB	0	0	3	2	100	-	100
12XT18	ENGINEERING GRAPHICS AND GEOMETRIC MODELLING	2	0	3	4	100	-	100
	Total 31 Hrs	**19**	**2**	**10**	**26**			
SEMESTER 2								
THEORY								
12XT21	DISCRETE STRUCTURES	4	0	0	4	50	50	100
12XT22	COMPLEX VARIABLES AND TRANSFORMS	3	2	0	4	50	50	100
12XT23	PROBABILITY AND STATISTICS	3	2	0	4	50	50	100
12XT24	DATA STRUCTURES AND ALGORITHMS	4	0	0	4	50	50	100
12XT25	OBJECT ORIENTED PROGRAMMING	4	0	0	4	50	50	100
PRACTICAL								
12XT26	MATHEMATICAL COMPUTING AND STATISTICAL PACKAGES L AB	0	0	3	2	100	-	100
12XT27	DATA STRUCTURES LAB	0	0	3	2	100	-	100
12XT28	OBJECT ORIENTED PROGRAMMINGLAB (C++ AND PYTHON)	0	0	3	2	100	-	100
	Total 31 Hrs	**18**	**4**	**9**	**26**			

Course Code	Course Title	Hours/Week			Credit	Maximum marks		
		Lecture	Tutorial	Practical		CA	FE	Total
SEMESTER 3								
THEORY								
12XT31	STOCHASTIC PROCESSES	3	2	0	4	50	50	100
12XT32	GRAPH THEORY	4	0	0	4	50	50	100
12XT33	ABSTRACT ALGEBRA	4	0	0	4	50	50	100
12XT34	ADVANCED DATA STRUCTURES	4	0	0	4	50	50	100
12XT35	COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING	4	0	0	4	50	50	100
PRACTICAL								
12XT36	JAVA PROGRAMMING LAB	2	0	3	4	100	-	100
12XT37	ADVANCED DATA STRUCTURES LAB	0	0	3	2	100	-	100
12XT38	ASSEMBLY LANGUAGE PROGRAMMING LAB	0	0	3	2	100	-	100
	Total 32 Hrs	**21**	**2**	**9**	**28**			
SEMESTER 4								
THEORY								
12XT41	LINEAR ALGEBRA AND NUMERICAL ANALYSIS	3	2	0	4	50	50	100
12XT42	COMPUTATIONAL NUMBER THEORY AND CRYPTOGRAPHY	4	0	0	4	50	50	100
12XT43	OPTIMIZATION TECHNIQUES	3	2	0	4	50	50	100
12XT44	OPERATING SYSTEMS	3	0	0	3	50	50	100
12XT45	COMPUTER NETWORKS AND TCP/IP	4	0	0	4	50	50	100
PRACTICAL								
12XT46	OPTIMIZATION TECHNIQUES LAB	0	0	3	2	100	-	100
12XT47	OPERATING SYSTEMS LAB (LINUX)	2	0	3	4	100	-	100
12XT48	COMPUTER NETWORKS AND TCP/IP LAB	0	0	3	2	100	-	100
	Total 32 Hrs	**19**	**4**	**9**	**27**			

CA – Continuous Assessment **FE - Final Examination**

Course Code	Course Title	Hours/Week			Credit	Maximum marks		
		Lecture	Tutorial	Practical		CA	FE	Total
SEMESTER 5								
THEORY								
12XT51	THEORY OF COMPUTING	4	0	0	4	50	50	100
12XT52	SOFTWARE ENGINEERING	4	0	0	4	50	50	100
12XT53	COMPUTER GRAPHICS AND VISUALIZATION	4	0	0	4	50	50	100
12XT54	DATABASE DESIGN	4	0	0	4	50	50	100
12XT55	DESIGN AND ANALYSIS OF ALGORITHMS	4	0	0	4	50	50	100
PRACTICAL								
12XT56	COMPUTER GRAPHICS AND VISUALIZATION LAB	0	0	3	2	100	-	100
12XT57	RDBMS LAB	0	0	3	2	100	-	100
12XT58	DESIGN AND ANALYSIS OF ALGORITHMS LAB	0	0	3	2	100	-	100
	Total 29 Hrs	**20**	**0**	**9**	**26**			
SEMESTER 6								
THEORY								
12XT61	MACHINE LEARNING	3	0	2	4	50	50	100
12XT62	SECURITY IN COMPUTING	4	0	0	4	50	50	100
12XT63	PRINCIPLES OF COMPILER DESIGN	4	0	0	4	50	50	100
12XT64	ARTIFICIAL INTELLIGENCE	3	0	0	3	50	50	100
12XT65	ELECTIVE – I	3	0	2	4	50	50	100
PRACTICAL								
12XT66	SECURITY IN COMPUTING LAB	0	0	3	2	100	-	100
12XT67	COMPILER DESIGN LAB	0	0	3	2	100	-	100
12XT68	ARTIFICIAL INTELLIGENCE LAB	0	0	3	2	100	-	100
	Total 30 Hrs	**17**	**0**	**13**	**25**			

Course Code	Course Title	Hours/Week			Credit	Maximum marks		
		Lecture	Tutorial	Practical		CA	FE	Total
SEMESTER 7								
12XT01	PROJECT WORK I – INDUSTRY / RESEARCH PROJECT	**0**	**0**	**-**	**12**	50	50	100
SEMESTER 8								
THEORY								
12XT81	GAME THEORY	4	0	0	4	50	50	100
12XT82	PARALLEL AND DISTRIBUTED COMPUTING	3	0	0	3	50	50	100
12XT83	MATHEMATICAL MODELLING	4	0	0	4	50	50	100
12XT84	ELECTIVE – II	3	0	2	4	50	50	100
12XT85	ELECTIVE – III (SELF STUDY)	3	0	2	4	50	50	100
PRACTICAL								
12XT86	PARALLEL AND DISTRIBUTED COMPUTING LAB	0	0	3	2	100	-	100
12XT87	MATHEMATICAL MODELLING LAB	0	0	3	2	100	-	100
12XT88	RESEARCH SPECIALIZATION LAB	0	1	3	2	100	-	100
	Total 31 Hrs	**17**	**1**	**13**	**25**			
SEMESTER 9								
THEORY								
12XT91	INTELLIGENT INFORMATION RETRIEVAL	3	0	0	3	50	50	100
12XT92	COMPUTATIONAL GEOMETRY	3	0	0	3	50	50	100
12XT93	DATA MINING	3	0	0	3	50	50	100
12XT94	ELECTIVE – IV	3	0	2	4	50	50	100
12XT95	ELECTIVE – V (SELF STUDY)	3	0	2	4	50	50	100
PRACTICAL								
12XT96	INTELLIGENT INFORMATION RETRIEVAL LAB	0	0	3	2	100	-	100
12XT97	COMPUTATIONAL GEOMETRY LAB	0	0	3	2	100	-	100
12XT98	DATA MINING LAB	0	0	3	2	100	-	100
	Total 28 Hrs	**15**	**0**	**13**	**23**			
SEMESTER 10								
12XT02	PROJECT WORK II – INDUSTRY / RESEARCH PROJECT	**0**	**0**	**-**	**12**	50	50	100

CA – Continuous Assessment **FE - Final Examination**

ELECTIVES

12XTE1	PRINCIPLES OF PROGRAMMING LANGUAGES
12XTE2	APPROXIMATION ALGORITHMS
12XTE3	NATURAL LANGUAGE PROCESSING
12XTE4	RANDOMIZED ALGORITHMS
12XTE5	ADVANCED COMPUTER GRAPHICS
12XTE6	MULTI PARADIGM PROGRAMMING LANGUAGES
12XTE7	WIRELESS NETWORKS
12XTE8	PROGRAM SEMANTIC ANALYSIS
12XTE9	SEMANTIC WEB
12XTEA	PERVASIVE COMPUTING
12XTEB	NETWORK ALGORITHMICS
12XTEC	SOFTWARE PATTERNS
12XTED	CLOUD COMPUTING
12XTEE	SOFTWARE PROCESS MANAGEMENT
12XTEF	SOCIAL NETWORK ANALYSIS
12XTEG	DATA COMPRESSION

SEMESTER - I

12XT11 ENGLISH FOR PROFESSIONAL SKILLS

3 0 0 3

READING COMPREHENSION: Developing Reading Skills like Skimming and Scanning for information, Critical Reading, Inferential, Cognition, and analytical Skills- appropriate reading texts to be used from general, scientific, and literary genres. (10)

PRINCIPLES OF CLEAR WRITING: The fundamental aspects of formal writing like objectivity, conciseness, clarity, simplicity, coherence, parallelism, unity, cohesion and accuracy to be focused Writing in different ways to create an emphasis – samples from news items, creative articles and reports to be used. (4)

TECHNICAL WRITING: Technical Style, Mechanics, Critical Evaluation of different types of technical texts and different genres of technical writing. – Format and different types of formal reports – Technical Papers. (4)

CORRESPONDENCE: Memos, Principles of Official, Social, and E-mail Correspondence to be focused. (4)

FOCUS ON SOFT SKILLS: Intra and Interpersonal Communication, Telephone Etiquette, Body language and Interview Techniques. (5)

PRACTICALS: Listening exercises using Language Laboratory, Making short speeches, Group Discussions and Role-Plays. (18)

Total L:45

TEXTBOOK

1. Teaching Material prepared by the Faculty, Department of English

REFERENCES

1. Meenakshi Raman and Sangeeta Sharma, “Technical Communication”, Oxford University Press, New Delhi, 2009.
2. Dorothy E Zemach and Lynn Stafford – Yilmaz, ”Writers at Work**:** The Essay”, Cambridge University Press, Cambridge, 2008.
3. Jill Singleton, “Writers at Work: The Paragraph”, Cambridge University Press, Cambridge, 2005.
4. Garry Adams and Terry Peck, “Useful Exercises for IELTS”, Adams and Austen Press, Sydney, 2001.
5. IMS Learning Resources, “Communication Skills Builder”, IMS Publications, Mumbai, 2008.
6. Aysha Viswamohan, “English for Technical Communication”, Tata McGraw Hill, New Delhi, 2008.
7. Mark Ibboston, “Cambridge English for Engineering”, Cambridge University Press, 2011.
8. Suresh Kumar E and Sreehari P, “A Handbook for English Language Laboratories”, Osmania University, Hyderabad, 2011.

12XT12 MATHEMATICAL METHODS

3 2 0 4

BASIC CONCEPTS: Sequences – increasing, decreasing, bounded, function limit properties - Series – convergence and divergence – alternating series test, absolute convergence – ratio test, power series. Limit, continuity, piecewise continuity, periodic, differentiable, integrable, absolutely integrable, graphs of standard functions, fundamental theorem of calculus. (12+7)

FUNCTIONS OF TWO VARIABLES: Models, partial derivative and its geometrical interpretation. Stationary points – maxima, minima and saddles. Taylor series about a point. Constrained maxima and minima – Lagrange multiplier method. (5+4)

MULTIPLE INTEGRALS: Evaluation of multiple integrals - Change of order of integration - Applications of multiple integrals to find area and volume of solid. (9+5)

FOURIER SERIES: Even and odd functions, Dirichlet’s conditions, statement of Fourier theorem, Fourier coefficients, change of scale, Half-range sine and cosine series, RMS value, Parseval’s theorem, Applications to signals and systems. (7+6)

ORDINARY DIFFERENTIAL EQUATIONS: Linear Differential Equations of first order - Exact differential equations, Integrating factors, Bernoulli equations -Linear Differential Equations of higher order with constant coefficients -Euler's equation with variable coefficients - Simultaneous equations - Method of variation of parameters. Modeling simple systems. (12+8)

Total: L:45+T:30=75

TEXT BOOKS

1. Thomas G B Jr., Finney RL, “Calculus and Analytic Geometry”, AddisonWesley, Boston, 2000.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, New York, 2011.

REFERENCES

1. Lian, Hungerford, and Holcomb “Mathematics with Applications”, Addison Wesley, Boston, 2010.
2. Riley K F, Hobson M P and Bence S J, "Mathematical Methods for Physics and Engineering", Cambridge University Press, Cambridge, 2006.
3. Ray Wyile C and Raymond Wyile C, “Advanced Engineering Mathematics”, McGraw Hill, New York,2001.
4. Roland E Thomas, Albert J Rosa, “The Analysis and Design of Linear Circuits”, John Wiley & Sons, New York, 2009.
5. Michael D Greenberg, “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 2009.
6. Thomas L Harman, James B Dabney, Norman John Richert, “Advanced Engineering Mathematics with MATLAB”, Brooks/Cole, Belmont, 2000.

12XT13 MATERIALS SCIENCE

4 0 0 4

LASERS AND FIBER OPTICS: Principle of Laser: spontaneous and stimulated emission, types of laser: He-Ne, CO2 and Nd:YAG laser. Applications: Laser diodes, holography, cutting, drilling, welding. Principle of Fiber optics. Modes of propagation. Classification based on materials, refractive index profile, modes. Splicing. Losses in optical fiber. Fiber optical communication system, Light sources and Detectors. Fiber optic sensors – temperature, displacement and strain. (12)

CONDUCTORS AND APPLICATIONS : Drude Lorentz theory of electrical conduction, Band theory of solids. Factors affecting resistivity of metals – temperature, alloying, magnetic field and strain. Applications of conductors – Strain gauge, conducting material, and resistance thermometer. (12)

SEMICONDUCTORS AND DEVICES: Elemental and compound semiconductors. Intrinsic and extrinsic semiconductors - Properties. Hall effect - Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient. Application of Semiconductors –Solar Cells, LED and LCD. Introduction to semiconductor memory devices: Random Access Memory (RAM), Read only Memory (ROM), DRAM CCD. (12)

MAGNETIC MATERIALS AND MEMORY DEVICES: Origin of magnetism, Classification, Ferro magnetic materials – Properties. Domain theory of ferromagnetism. Hysteresis. Hard and soft magnetic materials. Ferrite – structure and properties. Applications – optical, magnetic and magneto optical memory devices. (12)

ADVANCED MATERIALS AND APPLICATIONS: NANO MATERIALS -Synthesis - PVD and ball milling techniques. properties, applications. Shape Memory alloys (SMA) – Characteristics, properties of NiTi alloy, application in MEMS. Superconductivity- types of superconductors - High Tc superconductors, Application of superconductors -SQUID, Levitation and cryotron. (12)

Total L:60

TEXT BOOKS

1. William D Callister Jr., David G. Rethwisch, "Material Science and Engineering", John Wiley & Sons, New York, 2010.
2. Rajendran and Marikani, ”Materials Science", Tata McGraw Hill, New Delhi, 2004.

REFERENCES

1. Leonid V Azaroff and James J Brophy, "Electronic Processes in Materials”, McGraw Hill, New York, 1991.
2. Raghavan V, “Materials Science and Engineering- A First Course”, Prentice Hall, New Delhi, 2004.
3. Sze SM, “Modern Semiconductor Device Physics”, John Wiley & Sons, New York, 1998.

12XT14 ANALOG AND DIGITAL ELECTRONICS

4 0 0 4

SEMICONDUCTOR DEVICES AND CIRCUITS: (Qualitative treatment only) Fundamental aspects of semiconductors - PN junction diode -Zener diode - Rectifiers - Zener voltage regulators - Filters - Bipolar Junction Transistors - Transistor Amplifiers - Field Effect Transistor. (7)

NUMBER SYSTEM AND CODES: Binary - Octal - Hexadecimal - BCD - excess three - Gray codes - Error correcting and detecting codes. (7)

DIGITAL CIRCUITS AND GATES: AND, OR, NOT, NAND and NOR gates - exclusive OR gates. Positive and negative logic systems - Digital integrated circuits-Characteristics -TTL and MOS logic circuits - Comparison. (6)

BOOLEAN ALGEBRA AND KARNAUGH MAPS: Boolean relations - Laws and theorems - Simplifications - Karnaugh maps and simplifications - Don’t care conditions - NAND-NAND realizations. (7)

COMBINATIONAL LOGIC: Design and Implementation of Half and Full adders - Subtractors - Parallel adders - Carry look ahead addition - Encoders and decoders - Multiplexers and De-multiplexers. (8)

SEQUENTIAL LOGIC: R-S, J-K, D and T type Flip-Flops - Binary counters: Ripple and synchronous types - UP/DOWN counters - Decade counters - Shift registers - Ring counters (7)

OPERATIONAL AMPLIFIERS: Definition of terms - Inverting and non-inverting amplifiers, inverting summing amplifier, integrators and differentiators. (9)

A/D AND D/A CONVERTORS: DACs: weighted and binary ladder types - ADCs: counter, dual slope, successive approximation types. (9)

Total L:60

TEXT BOOKS

1. Leach DP, "Digital Principles & Applications", Tata McGraw Hill, New Delhi, 2006.
2. Mottershed A, "Electronic devices and circuits", Prentice Hall, New Delhi, 2008.

REFERENCES

1. Gothamann H, "Digital Electronics: An Introduction to Theory and Practice", Prentice Hall, New Delhi, 2000.
2. Paul Horowitz and Winfield Hill, "The Art of Electronics" Second edition, Cambridge University, Cambridge, 1989.
3. Hamachar V C, Vranesic Z G and Zaky S G, "Computer Organization", McGraw Hill, New York, 2001.

12XT15 C PROGRAMMING

3 0 0 3

PROBLEM SOLVING: Introduction to Problem Solving- Program development- Analyzing and Defining the Problem- Modular Design – Algorithm-Flow Chart - What is a programming language-Types of programming language- Program Development Environment. (3)

C LANGUAGE: Introduction to C Language - C character set - Identifiers and Keywords - Data Types - Constants - Variables - Arrays - Declarations - Expressions - Statements - Symbolic constants - Operators and Expressions - Library Functions - Data Input and Output Functions. (6)

CONTROL STATEMENTS: While Statement - Do While Statement –For Loop–Nested Loop - If Else - Switch - Break - Continue - Comma Operator – Goto Statement. (4)

FUNCTIONS: Defining Function - Accessing a Function - Passing Arguments to Functions - Specifying Arguments Data Types - Function Prototypes - Storage Classes - Auto - Static - Extern and Register Variables. (6)

ARRAYS: Defining Array –Processing array - Passing array to a function - Multi dimensional array - Array and strings. (5)

POINTERS: Declarations - Pointers to a function - Pointers and one dimensional arrays - Operating a pointer - Pointer and multi-dimensional arrays - arrays of pointers - passing functions to other functions. (7)

STRUCTURES AND UNIONS: Definition of Structure and Union - Processing a structure - User defined data types - Structures and pointers - Passing structure to functions - Self-referential structures. (6)

FILES: File concepts – Operations on Files – Types of Files, Various Read and Write Functions on Files. (4)
Enumerated Data Type – Typedef - Preprocessor Directives - Command Line Arguments. (4)

Total: L:45

TEXT BOOKS

1. Kernighan B W and Ritchie D M, "C Programming Language (ANSI C)", Pearson Education, New Jersey, 2005.
2. Deitel H M and Deitel P J, "C How to Program", Prentice Hall, New Delhi, 2012.

REFERENCES

1. Herbert Schildt, "C The Complete Reference", McGraw Hill, New York, 2000.
2. Michael Schneider G, Steven W, Weingart and David M Perlman, "An Introduction to Programming and Problem Solving with Pascal", John Wiley & Sons, New York, 1998.
3. Gottfried B, "Programming With C", Mc Graw Hill, New York, 1996.

12XT16 MATERIALS SCIENCE AND DIGITAL ELECTRONICS LAB

0 0 4 2

MATERIALS SCIENCE LABORATORY

1. Resistivity of an Alloy – Carey Foster's Bridge
2. Band Gap of Thermistor – Post Office Box
3. Thermal Conductivity of Metallic Wire – Wiedmann Franz law
4. Temperature co-efficient of Resistance – Post Office Box
5. Efficiency of Solar Cell
6. Band Gap Determination – Reverse Saturation Current
7. Photodiode Characteristics
8. Determination of Wavelength of laser source using grating

DIGITAL ELECTRONICS LABORATORY

1. Study of basic logic gates and realization of logic gates using universal gates.
2. Multiplexer and demultiplexer.
3. Half and full adder / subtractor.
4. Encoder and decoder.
5. Binary decade counter.
6. BCD to seven segment decoder.
7. Study of D/A converter.
8. Crystal Oscillator using logic gates

Total P:60

12XT17 C PROGRAMMING LAB

0 0 3 2

1. Simple programs to understand the concepts of data types.
2. Familiarizing conditional, control and repetition statements.
3. Usage of single and double dimensional arrays including storage operations.
4. Implementation of functions, recursive functions.
5. Defining and handling structures, array of structures and union.
6. Implementation of pointers, operation on pointers dynamic storage allocation.
7. Creating and processing data files.

Note:
Separate Problem Sheets will be provided in due course.

Total P:45

12XT18 ENGINEERING GRAPHICS AND GEOMETRIC MODELLING

2 0 3 4

INTRODUCTION: BIS specifications - lines, lettering, and dimensioning. Projection –types. (4)

FIRST ANGLE PROJECTION: Introduction- Projection of points, lines, planes, and solids –parallel, perpendicular and inclined to planes. (8)

ISOMETRIC PROJECTION: Introduction- prismatic and cylindrical components. (2)

INTERACTIVE GRAPHICS: Parametric modeling –1D, 2D and 3D geometry – transformations - display – points, lines using software. (4)

CURVES: Types- parametric curves generation-displaying - evaluating points on curves. (4)

SURFACES: Types- parametric surface generation-displaying - evaluating points on surfaces. (5)

SOLIDS: Generation of part models using Computer Aided Geometric Modeling software. (3)

LAB
Engineering Graphics using CAD

1. Introduction to CAD Software.
2. Exercise on first angle projection of
   a. Points b. Lines
3. Exercise on projection of
   a. Planes b. Solids
4. Exercise on conversion of isometric to orthographic projection.
5. Exercise on orthographic to isometric projection.
6. Exercise on Sectioning of regular solids.
7. Exercise on Perspective projection of simple solids.

Geometric Modeling using a graphical programming language

8. Modeling and displaying a point and line using orthographic projection and performing simple geometric transformation.
9. Modeling and displaying of parametrically represented analytical curves
   a. Circle b. Ellipse
10. Modeling and displaying of parametrically represented synthetic curves
    a. Bezier Curve b. B-spline
11. Modeling and displaying of parametrically represented NURBS curve.
12. Modeling and displaying of parametrically represented synthetic surface.
    a. Planar surface b. Ruled surface
13. Modeling and displaying of Bezier surface.
14. Modeling and displaying of B-Spline surface.

Total:L:30 + P:45=75

TEXT BOOKS

1. "A Primer on Engineering Drawing using Pro Engineer", Department of Production Engineering and CAD/CAM Centre, PSG College of Technology, Coimbatore, 2012.
2. Michael E. Mortensen, "Geometric Modeling (Digitized)", Industrial Press, California, 2011.

REFERENCES

1. David F Rogers, Alan Adams J., "Mathematical Elements in Computer Graphics (Digitized)", McGraw Hill, New York, 2007.
2. David Solomon, "Computer Graphics and Geometric Modeling", Springer, New York, 1999.
3. Michael E Mortenson, "Geometric Modeling(Digitized)", Industrial Press, California, 2011.
4. Martti Mantyla, "An Introduction to Solid Modeling (Digitized)", Computer Science Press, New York, 2007.

SEMESTER – 2

12XT21 DISCRETE STRUCTURES

4 0 0 4

MATHEMATICAL LOGIC: Proposition - Logical operators - Truth tables – Laws of Logic – equivalences – Rules of inference - Validity of arguments – consistency of specifications – Propositional Calculus – Quantifiers and universe of discourse. (12)

PROOF TECHNIQUES: Introduction – Methods of proving theorems – Direct proofs, Proof by contraposition, vacuous and trivial proofs, proofs by contradiction – Mistakes in proofs – Mathematical induction – strong mathematical induction and well ordering - Program correctness. (8)

RELATIONS AND FUNCTIONS: Definition and properties of Binary Relations – Representing Relations – Closures of Relations – Composition of Relations – Equivalence Relations – Partitions and Covering of Sets – Partial Orderings – n – ary Relations and their Applications. Functions-Injective, Surjective, Bijective functions, Composition, identity and inverse. (10)

COMBINATORICS: Basics of counting – The Pigeonhole principle - Permutations and Combinations with and without repetition, Permutations with indistinguishable elements, distribution of objects - Generating permutations and combinations in lexicographic order. (12)

RECURRENCE RELATIONS: Some Recurrence Relation Models, Solutions of recurrence relations by substitution and generating functions, the method of characteristic roots, solution of non-homogeneous finite order linear recurrence relations- Divide and conquer recurrence relations, Masters theorem. (10)

LATTICES: Lattices as partially ordered set – Properties of Lattices– Lattices as algebraic system – Sublattices – Direct product and Homomorphism – Some special lattices. (8)

Total L:60

TEXT BOOKS

1. Kenneth H Rosen, “Discrete Mathematics and its Application”, McGraw Hill, New York, 2011.
2. Judith L. Gersting, “Mathematical Structures for Computer Science”, W.H. Freeman and Company, New York, 2006.
3. Tremblay J P and Manohar R, “Discrete Mathematical structures with application to Computer Science”, Tata McGraw Hill, New Delhi, 2003.

REFERENCES

1. Doerr Alan and Levasseur K, "Applied Discrete Structures for Computer Science", Galgotia Publications, New Delhi, 2002.
2. Benard Kolman, Robert C Busby and Sharan Ross, "Discrete Mathematical Structures", Pearson Education, New Delhi, 2009.
3. Ralph P Grimaldi, “Discrete and Combinatorial Mathematics – An Applied Introduction”, Addison Wesley, New Delhi, 2009.

12XT22 COMPLEX VARIABLES AND TRANSFORMS

3 2 0 4

COMPLEX VARIABLES : Analytic functions - Cauchy - Riemann equations in Cartesian and Polar- Coordinates - Statement of sufficient conditions- Properties of Analytic Functions - Finding analytic function whose real/ imaginary part is given- conformal mapping, Bilinear map- Complex integration - Cauchy 's fundamental theorem and formula - Taylor's series-Laurent's series - Singularities - Residue theorem- Cauchy's lemma and Jordan's lemma- Evaluation of real integrals using contour integration along semi-circle and unit circle. (12+8)

TRANSFORM METHODS: Concept of Transformation - Examples for Transformations. (2+1)

LAPLACE TRANSFORM: Definition - Transforms of Standard Functions - Transform of unit step function - Dirac delta function. – Transforms of derivatives and integrals -Transforms of Periodic functions - Inverse Laplace transform- Convolution Theorem. Method of solving ordinary linear differential equations with constant coefficient and solving integral equations by Laplace transform technique. Some applications to engineering problems. (11+9)

FOURIER TRANSFORM : Fourier integrals - Fourier transform- Fourier sine and cosine transform - Transforms of standard functions - Properties, Convolution theorem (Statement only) – Discrete Fourier and Fast Fourier Transforms – Discrete Convolution – Periodic sequence and circular convolution – Discrete Fourier Transform – decimation–in-time algorithm – Decimation-in-frequency algorithm – Computation of inverse DFT. (12+8)

Z-TRANSFORM: Z - transform of standard functions, inverse Z-transform – properties of Z – transform – Difference equations – Modeling, Solution of difference equations. (8+4)

Total: L:45 + T:30 = 75

TEXT BOOKS

1. Anthony Croft, Robert Davison, Martin Hargreaves, “Engineering Mathematics – A Foundation for Electronic, Electrical, Communications & Systems Engineers”, Pearson Education, New Delhi, 2009.
2. Ewin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, New York, 2011.

REFERENCES

1. Michael D. Greenberg, “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 2009.
2. Ray Wylie C, Louis C Barret , “Advanced Engineering Mathematics”, McGraw Hill, New York, 2001.
3. Roland E Thomas and Albert J Rosa, “The Design and Analysis of Linear Circuits”, John Wiley & Sons, New York, 2010.
4. Thomas L. Harman, James Dabney, Norman Richert, “Advanced Engineering with MATLAB”, Brooks/Cole, Belmont, 2000.

12XT23 PROBABILITY AND STATISTICS

3 2 0 4

PROBABILITY AND CONCEPT OF RANDOM VARIABLE: Introduction - Sample space and events - Axiomatic approach to probability – Basic theorems. Conditional Probability - Law of multiplication - Law of total probability and Bayes' Theorem - Independence. (7+4)

RANDOM VARIABLES: Discrete and continuous random variables - probability mass function and density function - distribution function - Expectation and variance. Discrete distributions: Binomial, Poisson and Geometric - Continuous distributions: Uniform, Normal, Exponential and Weibull - Joint probability distributions - marginal and conditional distributions - statistical independence , Conditional expectation (12+8)

LIMIT THEOREMS: Moments and moment generating functions- Sums of independent random variables - Limit theorems: Markov and Chebyshev inequalities, Law of Large numbers, Central Limit Theorem. (6+4)

STATISTICAL INFERENCE: Sampling distribution - Estimation: Point estimation, interval estimation - Criteria of a good estimator –Interval estimation of mean, proportion, and variance (single sample and two samples) - Maximum likelihood estimator. Hypothesis Testing: General concepts - Errors in Hypothesis testing - One-and two-tailed tests - Tests concerning mean, proportion, and variance - Tests for Goodness of fit and independence of attributes. (11+7)

CORRELATION AND REGRESSION: introduction - Estimation using the regression line - Correlation analysis -Limitations, errors, and caveats of using regression and correlation analyses - Multiple regression and correlation analysis - Inferences about population parameters – Modeling techniques. (6+5)

ANALYSIS OF VARIANCE: Introduction to design of experiments, Analysis of variance - Completely Randomized Design and Randomized Block Design. (3+2)

Total: L:45 + T:30 =75

TEXT BOOKS

1. Saeed Ghahramani, "Fundamentals of Probability with Stochastic Processes", Prentice Hall, New Delhi, 2005.
2. Trivedi K.S, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", Prentice Hall, New Delhi, 2008.
3. Jay L Devore, "Probability and Statistics for Engineering and Sciences", Cengage Learning, New Delhi, 2012.

REFERENCES

1. Richard I. Levin. David S. Rubin, "Statistics for Management", Pearson Education, New Delhi, 2007.
2. Sheldon M.Ross, "Introduction to Probability Models", Academic Press, California, 2009.
3. Richard A. Johnson, "Probability and Statistics for Engineers and Scientists", Prentice Hall, 2010.
4. Douglas C Montgomery and George C Runges, "Applied Statistics and Probability for Engineers", John Wiley &Sons, New York, 2006.
5. Roy D.Yates and David J Goodman, " Probability and Stochastic Processes – A friendly Introduction for Electrical and Computer Engineers", John Wiley & Sons, USA, 2005.
6. Ronald E. Walpole, Raymond H. Meyers, Sharon L. Meyers, "Probability and Statistics for Engineers and Scientists", Pearson Education, New Delhi, 2007.

12XT24 DATA STRUCTURES AND ALGORITHMS

4 0 0 4

INTRODUCTION: Software Development process – Abstraction - Data structures - Abstract Data Types - Primitive data structures - Analysis of algorithms - Best, worst and average case time complexities - notations. (6)

ARRAYS: Operations - Implementation of one, two, three and multi dimensioned arrays – Sparse and dense matrices - Applications. (4)

STRINGS: Implementation - operations - String applications. SETS: Operations on sets - implementation of sets. (5)

STRUCTURES AND UNIONS: Implementation – operations – Applications (3)

STACKS: Primitive operations - Sequential implementation - Applications: Subroutine handling - Recursion – Expression Processing. (5)

QUEUES: Primitive operations - sequential implementation - Priority Queues - Dequeues - Applications: Image component labeling; Machine shop simulation. (8)

LISTS: Primitive Operations - Singly linked lists, Doubly linked lists, Circular lists, Multiply linked lists - Applications: Addition of Polynomials; Sparse Matrix representation and Operations. – Linked Stacks - Linked queues - Linked Priority queues - Dynamic Storage Management. (12)

TREES: Terminologies - Implementation - BINARY TREE: Properties - Sequential and linked representation - Common binary tree operations - Traversals - Expression trees - Infix, Postfix and Prefix expressions - Threaded trees - Tournament trees - Heaps, Max heap, Min heap. (12)

HASHING: Hash function – Separate chaining – Open addressing – Linear probing – Quadratic probing – Double hashing - rehashing. (5)

Total L:60

TEXT BOOKS

1. Sahni Sartaj, "Data Structures, Algorithms and Applications in C++", Silicon Press, New Jersey, 2004.
2. Aaron M Tanenbaum, Moshe J Augenstein and Yedidyah Langsam, "Data structures using C and C++", Prentice Hall, New Delhi, 2005.

REFERENCES

1. Alfred V.Aho, John E.Hopcraft,Jeffrey D.Ullman,"Data structures and Algorithms",Pearson Education, New Delhi, 2009.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Addison-Wesley, 2007.
3. Nell Dale, "C++ Plus Data Structures", Jones and Bartlett Learning, Burlington, US, 2011.
4. Robert L Kruse and Clovis L Tondo, "Data Structures and Program design in C", Pearson Education, New Delhi, 2007.
5. Angela B Shiflet, "Elementary Data Structures with Pascal", West Publishing, Eagan, 1990.

12XT25 OBJECT ORIENTED PROGRAMMING

4 0 0 4

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Software crisis Software Evolution - Procedure Oriented Programming - Object Oriented Programming Paradigm - Basic Concepts and Benefits of OOP - Object Oriented Programming Language - Application of OOP - Structure of C++ - Tokens, Expressions and Control Structures - Operators in C++ - Manipulators. (8)

FUNCTIONS IN C++: Function Prototyping - Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function - Overloading - Friend and Virtual Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions - Returning Objects - Const Member functions - Pointers to Members. (12)

CONSTRUCTORS: Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors – Destructors overloading (5)

OPERATOR OVERLOADING: Overloading Unary and Binary Operators - Overloading Binary Operators using Friend functions – Operator Type conversion (5)

INHERITANCE: Defining Derived Classes - Single Inheritance - Making a Private Member Inheritable - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Base Classes - Abstract Classes - Constructors in Derived Classes - Member Classes - Nesting of Classes – Composition – Aggregation (11)

POLYMORPHISM: Basics of polymorphism – Types of polymorphism - Compile and Run Time Polymorphism - Virtual function – Object Slicing – Virtual Destructor – Dynamic binding (7)

TEMPLATES & EXCEPTION HANDLING: Introduction to Templates, Generic Functions and Generic Classes – Exception Handling – Examples. (6)

STREAMS: String I/O -Character I/O - Object I/O - I/O with multiple Objects - File pointers - Disk I/O with member functions (6)

Total L:60

TEXT BOOKS

1. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, New Delhi, 2012.
2. Stanley B Lippman, Josee Lajoie, Barbara E. Moo, “The C++ Primer”, Addison Wesley, New Delhi, 2007.

REFERENCES

1. Harvey M. Deitel,andPaul J. Deitel, “C++ How to Program”, Prentice Hall, New Delhi, 2011.
2. Herbert Schildt, “C++ The Complete Reference", Tata McGraw Hill, New Delhi, 2009.

12XT26 MATHEMATICAL COMPUTING AND STATISTICAL PACKAGES LAB

0 0 3 2

1. Programs on differentiation and integration.
2. Finding Fourier series
3. Solving ordinary differential equations using Laplace transform techniques.
4. Solving boundary value problems using Fourier series techniques.
5. Conformal mappings of standard functions.
6. Implementation of classification and tabulation of data and Graphical and diagrammatic presentation of data
7. Perform calculations that measure the central tendency and dispersion of data and Implementation of measures of Skewness, moments and kurtosis.
8. Determination of point and interval estimates.
9. Solving linear regression, polynomial regression and non-linear regression based problems and solving multiple regression and correlation analysis based problems.
10. Solving the problems based on Time series analysis and forecasting and implementing statistical quality control charts. Implementations using mathematical packages like SPSS, MATLAB, MATHEMATICA or MAPLE.

Total P:45

12XT27 DATA STRUCTURES LAB

0 0 3 2

Implementation of the following problems:

1. Sparse and dense Matrix operations using arrays
2. Library of string operations - representing strings using arrays
3. Set operations
4. Stacks using array representation
5. Queues using array representation
6. Linked Lists: Singly linked, Doubly linked and Circular lists
7. Linked Stacks and Queues
8. Conversion and Manipulation of Expressions
9. Binary trees and Threaded trees (with graphical representation)
10. Hash Table linear probing and chaining

Total P :45

12XT28 OBJECT ORIENTED PROGRAMMING LAB (C++ and Python)

0 0 3 2

Exercises pertaining to the following outlines are to be experimented using C++:

1. Arithmetic operations using array of objects and dynamic data members.
2. Creation of a class having read-only member function and processing the objects of that class.
3. Creation of a class which keeps track of the member of its instances. Usage of static data member, constructor and destructor to maintain updated information about active objects.
4. Illustration of a data structure using dynamic objects.
5. Usage of static member to count the number of instances of a class.
6. Illustration for the need of default arguments.
7. Usage of a function to perform the same operation on more than one data type.

8. Creation of a class with generic data member.
9. Overloading the operators to do arithmetic operations on objects.
10. Acquisition of the features of an existing class and creation of a new class with added features in it.
11. Implementation of run time polymorphism.
12. Overloading stream operators and creation of user manipulators.
13. Implementation of derived class which has direct access to both its own members and the public members of the base class.
14. Implementation of Streams to store and maintain Library system, with the features of Book Issue and Book Return.

Exercises pertaining to the following outlines are to be experimented using Python:

1. Write a program that asks the user about textbook prices and reports how overpriced the textbooks are.
2. Create a new function called clubhouseAnimate(objlist) that loops through the window objects in the list and randomly switches them to either yellow (200, 190, 100) or dark (40, 50, 60). You can use a slice like mylist[1:] to loop over all the elements in a list except the first one
3. Create a main function that creates a GraphWin, calls clubhouseInit and assigns its return value to a variable like cbhouse. Then loop over the variable and call the draw method on each primitive object. Then call the getMouse and close methods of your GraphWin object. Test your clubhouse.
4. Problems to practice various image drawing functions
5. Problems to practice lists and objects collections
6. Problems to practice python function and parameters
7. Problems to practice classes, dictionaries and inheritance
8. Problems to practice command line arguments
9. Problems to Create your own Python module packages containing functions and data
10. Problems to Import your own and other Python modules and use contained objects
11. Problems to understand the use local, global and built-in names within functions

Note:
Separate Problem Sheets will be provided for C++ Programming and Python Programming.

TOTAL:P:45

SEMESTER – 3

12XT31 STOCHASTIC PROCESSES

3 2 0 4

STOCHASTIC PROCESSES: Introduction – Classification of Stochastic Processes – Markov Chain: Introduction -Transition Probability Matrices – Chapman Kolmogorov Equations - Classification of States – Limit Theorems – Branching Processes – Time Reversible Markov chains – Markov Decision Processes - Applications. (13+8)

CONTINUOUS TIME MARKOV CHAINS: Introduction – Poisson Process - Birth and Death Processes – Kolmogorov Differential Equations – Pure Birth Process - Pure Death Process - Applications. (10+7)

RENEWAL THEORY: Introduction – Distribution - Renewal Theorems - Residual and Excess Life Times -Alternating Renewal Process - Renewal Reward Processes – Regenerative Processes. (9+6)

GENERAL QUEUEING MODELS: Single and Multiserver Poisson Queues - Single Server Queue with Poisson input and general service M / G/1 – General input and exponential service – G/M/1 Queueing model. (9+6)

BROWNIAN MOTION: First Passage time distribution – The maximum of a Brownian Motion – The Zeros of Brownian Motion – Brownian Motion with Drift - Geometric Brownian Motion. (4+3)

Total: L:45 + T:30 = 75

TEXT BOOKS

1. Saeed Ghahramani, "Fundamentals of Probability with Stochastic Processes", Pearson, New Jersey, 2005.
2. Sheldon M Ross, "Introduction to Probability Models", Academic Press, Burlington, 2009.
3. Roy D.Yates and David J Goodman, " Probability and Stochastic Processes – A friendly Introduction for Electrical and Computer Engineers", John Wiley & Sons, USA, 2005.

REFERENCES

1. Sheldon M Ross, "Stochastic Processes", John Wiley & Sons, New York, 2004.
2. Medhi J, "Stochastic Processes", New Age International Publishers, New Delhi, 2002.
3. Samuel Karlin Howard E.Taylor, "A First course in Stochastic Thomson Duxbury/Brooks Cole, Boston, 2002.
4. Gross.D and Harris C.M, "Fundamentals of Queueing theory" John Wiley & Sons, New York, 2011.

12XT32 GRAPH THEORY

4 0 0 4

BASIC CONCEPTS: Graphs - directed and undirected, subgraphs, graph models, degree of a vertex, degree sequence, Havel-Hakimi theorem, Hand-shaking lemma. Connectivity, walk, path, distance, diameter. Isomorphic graphs. Common classes of graphs – regular, complete, Petersen, cycle, path, tree, k-partite, planar, hypercube, mesh. Spanning trees – Matrix tree theorem, graph decomposition. (10)

CONNECTIVITY: Vertex and edge connectivity, Vertex and edge cuts, relationship between vertex and edge connectivity, bounds for connectivity. Harary's construction of k-connected graphs. (12)

EULERIAN AND HAMILTONIAN GRAPHS: Eulerian graphs, Route inspection problem, Hamiltonian graphs, Dirac's and Ore's theorems, Gray codes, Walecki's construction. (10)

MATCHING, VERTEX-COLORING AND DOMINATION: Matching, Perfect matching, Bipartite matching, Hall's theorem. Vertex-coloring – upper chromatic number, bounds using clique number, Δ(G), Welsh – Powell theorem. Dominating set, domination number, bounds. Applications of the above concepts. (14)

RANDOM GRAPHS: Random graph – Definitions of G(n, p) and G(n, M) models. Ramsey number – definition, Erdos theorem. n-existentially closed graphs, asymptotically almost surely graphs and their existence theorem. Expectation and the first moment method, variance and second moment method, threshold function. Web graph models, applications to social networks. (14)

Total L:60

TEXT BOOKS

1. Anthony Bonato, "A Course on Web Graphs", American Mathematical Society, Rhode Island, 2008.
2. Haynes T W, Hedetniemi and Slater P J, "Fundamentals of Domination in Graphs", Marcel Dekker, New York, 1998.
3. Jonathan Gross and Jay Yellen, "Graph Theory and its Applications", CRC Press, Boca Raton, 2006.

REFERENCES

1. Bela Bollobas, "Random Graphs", Cambridge University Press, Cambridge, 2001.
2. Douglas B West, "Graph Theory", Prentice Hall, New Delhi, 2001.
3. Gary Chartrand and Ping Zhang, "Introduction to Graph Theory", Tata McGraw-Hill, New Delhi, 2006.

12XT33 ABSTRACT ALGEBRA

4 0 0 4

PRELIMINARIES: Set theory, Modular arithmetic, relations and functions. (4)

ALGEBRAIC STRUCTURE: Groups - Definition and Example, Properties of Groups, Permutation Groups, Symmetric Groups, Cyclic Groups, Simple applications. (12)

SUBGROUPS AND NORMAL SUBGROUPS: Subgroups – Definition, Cosets and Lagrange's theorem, Homomorphism, Isomorphism, Automorphism – Cayley's theorem – Normal subgroups – Factor group – Fundamental theorem of group homomorphism – Applications of residue arithmetic to Computers. (15)

GROUPS AND CODING: Coding of Binary information and Error detection – Group codes – Decoding and Error correction. (8)

RINGS: Definition and Properties – Subrings, Ring of Quaternions, Integral domain - Homomorphism – Ideals and Quotient Rings – Euclidean ring - Unique factorization theorem, Domain of Gaussian Integers. Polynomials Rings – Properties, Division Algorithm, Factorization of Polynomials – Primitive polynomials. (12)

FIELDS: Definition – subfields - Finite fields – structure of Finite field, $GF(2^n)$. (9)

Total: L:60

TEXT BOOKS

1. Herstein I. N., "Topics in Algebra", John Wiley & Sons, New Delhi, 2006
2. Joseph A. Gallian, "Contemporary Abstract Algebra", Brooks/Cole, Belmont, 2009.
3. Tremblay J P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGrawHill, New Delhi, 2011.

REFERENCES

1. Ron M Roth, "Introduction to Coding Theory", Cambridge University Press, Cambridge, 2007.
2. Ralph P.Grimaldi and Ramana B V, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education, New Delhi, 2008.

12XT34 ADVANCED DATA STRUCTURES

4 0 0 4

INTRODUCTION: Algorithms – analysis of algorithms – best case and worst case complexities-analysis of some algorithms using simple data structures, Amortized time complexity. (7)

SORTING AND SEARCHING: Insertion sort, selection sort, bubble sort, heap sort, recursive quick sort and merge sort, count sort and radix sort: searching , Linear Search, Binary search. – Algorithms and their time complexities. (8)

BINARY SEARCH TREES : Searching – Insertion and deletion of elements – randomly built binary search trees- analysis: height balancing techniques- AVL trees - Height – searching – insertion and deletion of elements- AVL rotations – analysis: Red Black trees - searching – insertion and deletion of elements – algorithms and their time complexities- applications of AVL and Red black trees (12)

MULTIWAY SEARCH TREES: Indexed Sequential Access – m-way search trees – B-Tree – Searching, insertion and deletion - B+ trees , Tries, dictionary applications. (8)

PRIORITY QUEUES (HEAPS): d-Heaps- Leftist Heaps - Leftist Heaps property and operations- Skew Heaps-Binomial trees and binomial heaps – Operations on binomial heap – Implementation of binomial heaps (9)

DATA STRUCTURES FOR DISJOINT SETS: Disjoint set operations-linked list representation of disjoint sets, disjoint set forests, tree representation, union by rank, find by path compression - analysis. (6)

GRAPHS: Definition – Representations (Adjacency matrix, packed adjacency list and linked adjacency list) – Network representation, shortest path- Dijkstra's algorithm - applications of shortest paths, Graph search methods (Breadth first and depth first traversals)- Applications of depth first search-biconnectivity- finding strong components. (10)

Total L:60

TEXT BOOKS

1. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, “Introduction to Algorithms” , MIT Press, Cambridge, 2009.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Addison-Wesley, New Delhi, 2007.

REFERENCES

1. Robert L Kruse and Clovis L Tondo, “Data Structures and Program design in C”, Pearson Education, New Delhi, 2009.
2. Sahni Sartaj, "Data Structures, Algorithms and Applications in C++", Silicon Press, New Jersey, 2005.

12XT35 COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING

4 0 0 4

DATAREPRESENTATION: Data types - Fixed point and floating point number representation (IEEE format) - Representation of signed numbers – arithmetic operation on signed numbers - Alphanumeric data representation. (6)

REGISTER TRANSFER AND MICRO OPERATIONS: Register transfer language - Inter register transfer - Arithmetic micro operations - Logic micro operations - Shift micro operations - Control functions. (4)

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes- Computer registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions - Input - Output and Interrupts – Complete Computer Description - Design of Basic Computer. (8)

CENTRAL PROCESSING UNIT: Processor Bus organization - Stack organization - Instruction formats - Data transfer and manipulation -–Multiprocessor Organization - RISC and CISC machine characteristics – Control Unit Design -Hardwired and micro programmed control (6)

MEMORY INTERFACING: Memory hierarchy - Main memory: RAM and ROM address spaces - - Cache memory – Cache Hit rate – Hit and Miss Ratio – Associative memory - Memory Interleaving. (8)

PERIPHERAL DEVICES INTERFACING : I/O interface - I/O bus versus memory bus - Isolated I/O versus Memory - Mapped I/O - Example of I/O interface – DMA - Input-Output processor. (7)

INTRODUCTION TO MICROPROCESSORS: Evolution of Microprocessors - Microprocessor based systems– Examples - Instruction Level Parallelism. (5)

INTEL 8086/88 PROCESSOR: Functional units of 8086 – Pipelining in 8086 - Addressing modes – Instruction format - Instructions - assembler directives – Construction of Machine code –Data Transfer and Data Manipulation Instructions (8)

ASSEMBLY LANGUAGE PROGRAMMING: Programs for multi precision addition, subtraction- Block moves- Array processing - String processing- Procedures and Interrupts - Interrupt Service Routines. (8)

T**otal L:60**

TEXT BOOKS

1. Morris Mano, "Computer Systems Architecture", Pearson Education, New Delhi, 2007.
2. Barry B Brey, "The Intel Microprocessors - 8086/88, and 80186,80286,80386, and 80486", Pearson Prentice Hall, New Jersey, 2008

REFERENCES

1. Hamachar V C, Vranesic Z G and Zaky S G, "Computer Organization", McGraw Hill, New Delhi, 2002.
2. John P Hayes, “ Computer Architecture and Organization”, McGraw Hill, New Delhi, 2002.
3. Douglus V Hall, "Microprocessors and Interfacing", McGraw Hill, New Delhi, 2006.
4. James L Antonakos, “An Introduction to the Intel family of Microprocessors”, Pearson Education, New Delhi, 1999.

12XT36 JAVA PROGRAMMING LAB

2 0 3 4

JAVA PROGRAMMING: Introduction - Data Types - Operators - Declarations - Control Structures - Arrays and Strings - Input/ Output- Java Classes - Fundamentals - Methods - Constructors - Scope rules - this keyword - object based vs oriented programming – Inheritance-Reusability - Composing class - Method overloading - Abstract classes - Virtual Functions. (5)

PACKAGES AND INTERFACES: Packages - Access protection - Importing packages - Interface - Defining and Implementing Interface - Applying Interface - Variables in Interfaces. (5)

EXCEPTION HANDLING: Fundamentals - Exception types - Uncaught Exception - Using Try and Catch - Multiple catch clauses - Nested Try statements - Throw - Throws - Java Built-in Exception - Creating your own subclasses. (5)

MULTI THREADED PROGRAMMING: Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Main thread - Creating the Thread - Synchronization - Interthread Communication - Deadlock. (5)

I/O, APPLETS: I/O basics - Stream - Stream Classes - Predefined stream - Reading/Writing console input - Applet fundamentals - Native methods.- GUI Components - Applets - Java Scripts –Swing. (4)

NEW FEATURES IN J2SE V5.0: Generics – Enhanced for Loop – Autobox – Auto unboxing – Enums – Var args – Static import – Annotations – Collections Frame works – List – Set - Map (6)

REFERENCES

1. Patrick Naughton and Herbert Schildt, "JAVA - The Complete Reference", McGraw Hill, New Delhi, 2011.
2. Deitel and Deitel, "JAVA - How to Program", Prentice Hall, New Delhi, 2010.
3. William Stanek and Peter Norton, "Peter Norton's Guide to Java Programming", Sams.Net, New Delhi, 1997.
4. Mark Grand, "JAVA Language Reference", O'Reilly Media, Cambridge, 1997.
5. Horstmann and Cornell, “Core Java”, Prentice Hall, New Delhi, 2001.
6. Jamie Jaworski, “Java Developer’s Guide”, Sams.Net, New Delhi, 1996
7. Ivor Horton, “Beginning Java 2 JDK 5 Edition”, John Wiley & Sons, Indianapolis, 2011.
8. Herbert Schildt ,“Java 2 V.5.O (Tiger) New Features”, McGraw Hill, New Delhi, 2004

PRACTICALS

1. To create runtime polymorphism using abstract class, interface
2. To create callback feature using interface.
3. To create a program for interface inheritance
4. To implement a user defined package
5. To implement a user defined checked exception and unchecked exception
6. To create threads, thread groups
7. To create inter-thread communication using shared memory, piper stream.
8. To implement socket connections (UDP, TCP).

Total: L:30+P:45 = 75

12XT37 ADVANCED DATA STRUCTURES LAB

0 0 3 2

Implementation of the following problems:

1. Problems related to sorting algorithms
2. Problems using linear search and binary search
3. Applications of binary search tree and its operations
4. AVL tree including all rotations
5. B-tree and its operations
6. Disjoint set operations and some applications
7. Problem using heap data structure
8. Implementation of binomial heap and one application
9. Problems related to graphs and graph traversals
10. Implementation of shortest path algorithm

Total: P:45

12XT38 ASSEMBLY LANGUAGE PROGRAMMING LAB

0 0 3 2

1. Implementing the functionality of AND, OR and NOT gates.
2. Conversion of data between different number systems
3. Arithmetic operations of binary numbers using both one's complement and two's complement arithmetic.
4. Implement parity bit generation for a n-bit binary data.
5. Practice on the DEBUGGER and 8086 Emulator Tool
6. Conversion of BCD numbers into ASCII characters and vice versa.
7. Multiprecision addition and subtraction.
8. Packing and unpacking of BCD digits.
9. Programs on Logical and Arithmetic Instructions
10. Implementation of Control Structures (FOR, LOOP, IF.. THEN, DO.. WHILE etc.,)
11. Programs using Arrays and Strings
12. Programs using Special Instructions DAA, XCHG, CMPSW etc…
13. Programs using interrupt functions for input and output.

Total: P:45

SEMESTER – 4

12XT41 LINEAR ALGEBRA AND NUMERICAL ANALYSIS

3 2 0 4

SYSTEM OF LINEAR EQUATIONS: System of linear equations – Row reduction and Echelon forms – Vector equation – Matrix equation Ax=b. Applications**-**Linear models in business, science and engineering. (4+2)

NUMERICAL SOLUTION OF ALGEBRAICSYSTEM OF LINEAR EQUATIONS: Gauss – Jordan elimination, Cholesky method, Crout's method, Gauss – Jacobi method, Gauss – Seidel method. Matrix Inverse by Gauss – Jordan method. (8+6)

VECTOR SPACES: Vector spaces and subspaces – Linear combination, Span, Linear independence and dependence - Null space, Column space, and Row space – Basis and dimension of a vector space – Rank and nullity. Applications to coding theory. (10+6)

LINEAR TRANSFORMATION: Introduction to linear transformations – General Linear Transformations – Kernel and range – Linear Transformations from R^2 to R^2– Change of basis. Applications-Computer Graphics, Cryptography and Image processing. (6+4)

INNER PRODUCT SAPCES: Inner product, Length, and orthogonality – Orthogonal sets – Orthogonal projections – Inner product spaces – Orthonormal bases: Gram-Schmidt process – Best Approximation, Least-squares. (8+6)

EIGEN VALUES, EIGEN VECTORS AND SINGULAR VALUE DECOMPOSITION: Eigen values and Eigen vectors– Eigen vectors and linear transformations – Complex Eigen values – Diagonalization – Diagonalization of symmetric matrices – Singular value decomposition. **Applications to** Markov chains. (6+4)

NUMERICAL APPROACH FOR EIGENVALUES AND EIGENVECTORS: Power method for finding dominant Eigen value and inverse power method for finding smallest Eigen value. (3+2)

Total: L:45 + T:30 = 75

TEXT BOOKS

1. Howard Anton, "Elementary Linear Algebra", John Wiley & Sons, New York, 2010.
2. David C Lay, "Linear Algebra And Its Applications", Pearson Education, New Delhi, 2009.
3. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers with Software and Programming Applications", McGraw Hill, New York, 2004.

REFERENCES

1. Gilbert Strang, "Linear Algebra And Its Applications", Brooks/Cole, Belmont, 2011.
2. George Nakos and David Joyner, "Linear Algebra With Applications", Brooks/Cole, Belmont, 1998.

12XT42 COMPUTATIONAL NUMBER THEORY AND CRYPTOGRAPHY

4 0 0 4

BASICS OF NUMBER THEORY: Divisibility –– Euclidean and Extended Euclidean algorithms, Modular arithmetic- Computing modular inverse – modular exponentiation- efficient algorithms, generators and primitive roots in groups, Fermat's little theorem, Chinese remainder theorem. (9)

BASIC CRYPTOGRAPHIC TECHNIQUES: Encryption and Decryption, Classical ciphers- Substitution ciphers-Polyalphabetic ciphers – one time pad – transposition ciphers – security of classical ciphers. (7)

SYMMETRIC KEY CRYPTOGRAPHY: Stream cipher – Block ciphers – DES – AES– Modes of operation. (8)

PUBLIC KEY CRYPTOGRAPHY: Concept of public key cryptography – RSA cryptosystem- cryptanalysis against RSA- the RSA problem – Integer factorization problem, Discrete log problem, ElGamal cryptosystem, Elliptic curve cryptosystem, need for stronger security notions for public key cryptography, random oracle model. (12)

DATA INTEGRITY TECHNIQUES : Symmetric techniques- Cryptographic hash functions – MAC, asymmetric techniques – Digital signatures – RSA signature, ElGamal signature, Digital signature standard algorithm, strong security notion for digital signatures- provable security for ElGamal signature. (12)

AUTHENTICATION AND KEY DISTRIBUTION PROTOCOLS: Data origin authentication and entity authentication, challenge and response-certificates, **S**chnorr identification scheme, zero knowledge protocol, Diffie-Hellman key pre-distribution, session key distribution – The Needham Schroeder scheme, Kerberos, Diffie- Hellman key agreement scheme, man in the middle attack, station to station key agreement protocol. (12)

Total L:60

TEXT BOOKS

1. Wenbo Mao," Modern Cryptography- Theory and Practice", Pearson Education, New Delhi, 2007.
2. Douglas R Stinson, "Cryptography Theory and Practice", CRC Press, New York, 2006.
3. Victor Shoup, "A Computational introduction to Number Theory and Algebra", Cambridge university Press, Cambridge, 2009.

REFERENCES

1. Ivan Niven, Herbert S Zuckerman and Hugh L Montgomery, "Introduction to the theory of Numbers", John Wiley & Sons, New York, 2008.
2. Alfred J, Menezes, Paul C, Van Oorschot and Scott A Vanstone, "Hand Book of Applied Cryptography", CRC Press, Florida, 2001.

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12XT43 OPTIMIZATION TECHNIQUES

3 2 0 4

LINEAR PROGRAMMING : Graphical method for two dimensional problems – Central problems of Linear Programming – Definitions – Simplex Algorithm – Phase I and Phase II of Simplex Method. ` (10+6)

SIMPLEX MULTIPLIERS: Dual and Primal – Dual Simplex Method – Revised Simplex Method - Sensitivity Analysis – Transportation problem and its solution – Assignment problem and its solution by Hungarian method – Karmakar's method – Statement, Conversion of the Linear Programming problem into the required form, Algorithm. (14+10)

INTEGER PROGRAMMING: Gomory cutting plane methods for all integer and mixed integer programming problems - Branch and Bound method (Land – Dolg and Dakin algorithms) – Zero-One Implicit enumeration Algorithm. (9+6)

DYNAMIC PROGRAMMING: Principle of Optimality – Backward and forward induction methods- Calculus method of solution- Tabular method of solution – Shortest path network problems – Applications in production. (6+4)

PERT: Arrow networks - Time estimates - Earliest expected time, latest allowable occurrence time and slack of events - Critical path - Probability of meeting scheduled date of completion of project. (6+4)

Total: L:45 + T:30 = 75

TEXT BOOKS

1. Hamdy A Taha, “Operations Research – An Introduction”, Prentice Hall, New Delhi, 2008.

REFERENCES

1. Hillier F and Liberman G J, “Introduction to Operations Research”, McGraw Hill, New York, 2010.
2. Kambo N S, “Mathematical Programming Techniques”, East-West Press, New Delhi, 1991.
3. Singiresu S Rao, “Engineering optimization theory and Practice”, John Wiley & Sons, New York, 2009.

12XT44 OPERATING SYSTEMS

3 0 0 3

INTRODUCTION: Abstract view of an operating system - Operating Systems Objectives and Functions – Evolution of Operating Systems - Dual-mode operation - Protecting I/O, memory, CPU, Kernels and micro-kernels – system calls- Structure of Operating System – Components of Computers – various components of operating systems. (5)

PROCESS DESCRIPTION AND CONTROL: Job/process concepts - Process Creation – Process Termination - Process states – Process Description – Process Control. (4)

PROCESS AND THREADS: Relationship between process and threads – Thread State – Thread Synchronization – Types of Thread – Multithreading model. (3)

PROCESS SCHEDULING: Scheduling basics - CPU-I/O interleaving- (non-)preemption - context switching- Types of Scheduling – Scheduling Criteria – Scheduling Algorithms. (5)

PROCESS SYNCHRONIZATION: Concurrent Process – Principles of Concurrency – Race Condition - Mutual Exclusion – Critical section problems – Software support – Hardware Support – Operating System Support – Deadlock: Deadlock Prevention, Avoidance and Detection and recovery. (5)

MEMORY MANAGEMENT: Memory hierarchy – Linking and Loading the process – Memory Management requirement - Fixed partitioning - Dynamic partitioning – Buddy Systems – Simple paging – Multilevel paging – Inverted paging – Simple Segmentation – segmentation and paging. (7)

VIRTUAL MEMORY MANAGEMENT: Need for Virtual Memory management – Demand Paging –Copy on write - Page Fault handling – Demand Segmentation – Combined demand segmentation and paging –Thrashing- working set model. (5)

FILE SYSTEM MANAGEMENT: Files – Access methods - File System Architecture – Functions of File Management –Directory and disk structure – file sharing –File system implementation – directory implementation - File Allocation – free space management. (6)

I/O MANAGEMENT AND DISK SCHEDULING: Organization of I/O function – Evolution of I/O function – Types of I/O devices – Logical Structure of I/O functions – I/O Buffering – Disk I/O – Disk Scheduling algorithms – Disk Cache. (5)

Total: L:45

TEXT BOOKS

1. Silberschatz A, Galvin, PB. and Gagne, G. “Operating System Concepts Essentials”, John Wiley & Sons, Jefferson, 2011.
2. Elmasri, E., Carrick A.G. and Levine, D. “Operating Systems: A Spiral Approach”, McGraw Hill, New Delhi, 2010.

REFERENCES

1. William Stallings, “Operating Systems”, Pearson Education, New Delhi, 2006.
2. McHoes, A.M. and Flynn, I.M. “Understanding Operating Systems”, Cengage Learning, Boston, 2011.
3. Charles Crowely, “Operating System a Design Oriented Approach”, McGraw Hill, New Delhi, 2000.
4. Dhamdhere D M, “Operating Systems: A Concept-based Approach”, McGraw-Hill, New Delhi, 2006.
5. Andrew S Tanenbaum, "Modern Operating System", Prentice Hall, New Delhi, 2008.

12XT45 COMPUTER NETWORKS AND TCP/IP

4 0 0 4

INTRODUCTION: Network goals - Applications of Networks - Design issues for the layers - OSI Reference Model - Types of Network - Network Topologies. (4)

DATA ENCODING: Digital-to-Digital Encoding, Analog-to-Digital Encoding - Digital-to-Analog Encoding, ASK, FSK, PSK, QAM - Bit Rate, Baud Rate.- Sampling Rate. (5)

TRANSMISSION OF DIGITAL DATA: Transmission Impairments - Single and Multiple bit error correction-Error Detection and Correction - Cyclic Redundancy Check Code -.Hamming Code. (5)

DATA COMMUNICATION: Multiplexing - Synchronous and Asynchronous TDM – FDM –CDM - Switching, Circuit Switching, Packet Switching. (5)

DATA LINK CONTROL AND PROTOCOLS: Line Discipline - Flow Control - Sliding Window Protocol - Error Control - Automatic Repeat Request – Stop – and - wait ARQ. Go – back – by - n ARQ, Selective Reject ARQ,- Bit-oriented Protocols – HDLC,PPP. (6)

LOCAL AREA NETWORKS: Random Access protocols- Ethernet – Fast Ethernet – Gigabit Ethernet – Wireless LANs- Blue tooth. (6)

TCP/IP: TCP/IP Protocol Structure - Internet Protocol - UDP – TCP. (7)

ROUTING: DISTANCE vector routing _ Link state Routing – RIP – OSPF- BGP. (6)

APPLICATIONS: FTP, TELNET, SMTP - MIME Format, DNS, HTTP. (7)

INTERNETWORKING: LAN -LAN Connections – Repeaters- Hubs - Bridge – Switches - Routers – Virtual LANs. (4)

ADVANCED NETWORK ARCHITECTURE: Introduction to ATM – ISDN - MPLS (5)

Total L:60

TEXT BOOKS

1. Behrouz A Forouzan, “Data Communications and Networking”, Tata McGraw Hill, New Delhi, 2012
2. Behrouz A Forouzan, “TCP/ IP Protocol Suite”, Tata McGraw Hill, New Delhi, 2009.

REFERENCES

1. Kevin Fall R and Richard Stevens W, "TCP/IP Illustrated, Volume 1: The Protocols”, Addison-Wesley, Ann Arbor, 2011.
2. James F. Kurose, Keith Ross, “Computer Networking: A Top-Down Approach”, Pearson Addison-Wesley, Boston, 2012.
3. Douglas Comer, “Internetworking with TCP/IP”, Prentice Hall, New Delhi, 2005.
4. William Stallings, "Data and Computer Communications", Prentice Hall, New Delhi, 2009.

12XT46 OPTIMIZATION TECHNIQUES LAB

0 0 3 2

1. Solving inequalities using Simplex, Two-phase, Dual simplex methods, Revised simplex method
2. Finding initial basic feasible solution using (i) North-West corner rule(ii) Matrix minimum and (iii) Vogel’s approximation method and also perform optimality test using MODI method.
3. Solving Assignment problem using Hungarian method
4. Gomory;s cutting plane methods for all IPP and mixed IPP
5. Solving Dynamic Programming problems
6. To find the critical path for the given PERT and CPM networks

Total P:45

12XT47 OPERATING SYSTEMS LAB (LINUX)

2 0 3 4

Linux - History - General structure - Unix file system - file abstraction, directories, mount points, implementation details - Processes: memory image, life cycle, start of day. The shell: basic operation, commands, standard I/O, redirection, pipes, signals. Character and block I/O. Process scheduling.

1. Overview of an Operating System, Boots and Shutdown
2. UNIX File System Commands
3. UNIX Commands
4. SHELL Programming
5. Writing programs using UNIX System Calls
6. Process Creation and Execution
7. Thread Creation and Execution
8. Process / Thread Synchronization using semaphore
9. Developing Application using Inter Process communication (using sharedmemory, pipes or message queues)
10. Implementation of Memory Management Schemes
11. Creating Linux Modules

LAB

Implementation of 1-11

Total: L:30+P:45=75

TEXT BOOKS

1. Neil Matthew and Richard Stones, “Beginning Linux programming”, Wiley Publishing, Indianapolis, 2011.
2. Dale Doughherty and Arnold Robbins, “SED & AWK programming”, O’Reilly, Sebastopol, 2007.
3. Kay A Robbins, Steven Robbins, “UNIX System programming Communication, Concurrency and Threads”, Pearson Education, New Jersey, 2004.

REFERENCES

1. Das and Sumitabha , “Unix Concepts And Applications”, Tata McGrawHill, New Delhi, 2006.
2. Richard Stevens W, “UNIX Network Programming”, Pearson Education, New Delhi, 2010.

12XT48 COMPUTER NETWORKS AND TCP/IP LAB

0 0 3 2

1. Familiarize with NS2 simulator
2. Implement Hamming code and CRC check using TCL/tk or Python
3. Implement a primitive email server
4. Familiarize with packet capturing tools in Java and Wireshark
5. Implement a simple firewall system
6. Analyse the existing routing protocols and implement any one of them
7. Write a program where a single entity can communicate with other entities by using IP-multicasting.
8. Assignments using the network simulator

Total P:45

SEMESTER– 5

12XT51 THEORY OF COMPUTING

4 0 0 4

FORMAL LANGUAGES: Four classes of grammar – Regular set – Context free language – Generation trees – Ambiguity – Normal forms (Chomsky and Greibach) – Pumping Lemma. (10)

FINITE AUTOMATA: Finite State Automata – NDFA – Conversion of NDFA to DFA – regular expressions - Equivalence of regular grammar and finite automata, State minimization. (10)

PUSH DOWN AUTOMATA: Definition – Acceptance by final state and empty stack – Equivalence of acceptance by final state and empty stack – Equivalence of PDA and CFL – Definition of DPDA - pumping lemma.

TURING MACHINE: Definition – Models – Construction of a simple turing machine- Programming techniques for turing machine – Extension to the basic turing machine – Restricted turing machine – Turing machine and computers – Halting problem. (14)

UNSOLVABLE PROBLEM AND COMPUTATIONAL FUNCTIONS: Unsolvable problems – Primitive recursive function – recursively enumerable language – Universal Turing machine – Tractable and intractable problems - P and NP problems. (11)

Total: L:60

TEXTBOOK

1. Mishra KLP, Chandrasekaran N, "Theory of Computer Science : Automata Languages and Computation", Prentice Hall, New Delhi, 2008.
2. John C Martin, "Introduction to Languages and the Theory of Computation", McGraw Hill, New York, 2010.

REFERENCES

1. Peter Linz, "Introduction to Formal Languages and Automata", Jones & Bartlett, Sudbury, 2006.
2. John E Hopcroft, Jeffrey D Ullman and Rajeev Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education, New Delhi, 2009.
3. Michael Sipser, "Introduction to Theory of Computation", Cengage Learning, Boston, 2012.

12XT52 SOFTWARE ENGINEERING

4 0 0 4

INTRODUCTION: System - System Development - Types of systems – People involved in the systems development - The project life cycle models - Need for Software Engineering - Objectives and Benefits of Software Engineering - Factors that influence Quality & Productivity – Quality attributes of a software product.

(10)

SOFTWARE PLANNING: Software Project Estimation - Different techniques of Project cost estimation Decomposition techniques - COCOMO & PUTNAM models

(6)

SOFTWARE ANALYSIS: Functional and non-functional requirements- Requirements engineering process – Elicitation – validation and management – software prototyping - Principles of Analysis - Analysis tools - Analysis Models.

(12)

DESIGN CONCEPTS AND PRINCIPLES: Design process and concepts – Levels of Design - Coupling – Cohesion -Design Tools - Software Design Methods – Design Techniques - Design of Input and control - Design of Output

(14)

OBJECT ORIENTED SYSTEMS DEVELOPMENT: Object Oriented Systems Development life Cycle - Object oriented methodologies -Rational Unified Process – Unified Modeling Language –Process workflows – Importance of Modeling – Types of Modeling. (16)

Case Study

(2)

Total L:60

TEXT BOOKS

1. Pressman RS, "Software Engineering – A Practitioner's Approach", Tata McGraw Hill , New Delhi, 2010.
2. Ian Sommerville, "Software Engineering", Pearson Addison Wesley, Boston, 2010.

REFERENCES

1. Shari Lawrence Pfleeger, "Software Engineering Theory and Practice", Pearson Education, New Jersey, 2009.
2. Philippe Krucheten, "The Rational Unified Process – An Introduction", Pearson Education, Boston, 2004.
3. Grady Booch , James Rumbaugh and Ivar Jacobson , "The Unified Modeling Language User Guide", Pearson Education, New Delhi, 1999.
4. Martin Fowler and Kendall Scott, "UML Distilled", Addison Wesley, New Delhi, 1997.
5. John Hunt, "The Unified Process for Practitioners", Springer, Berlin, 2000.
6. Hans-Erik Eriksson, Magnus Penker, Brain Lyons, David Fado, "UML 2 Toolkit", Wiley Publishing, Indianapolis, 2004.

12XT53 COMPUTER GRAPHICS AND VISUALIZATION

4 0 0 4

GRAPHICS INPUT - OUTPUT DEVICES: Raster scan Displays - Random scan displays - Direct view storage tubes - Flat panel displays - Mouse - Track Ball - Joy Stick - Digitizers - Touch panels - LCD. GRAPHICAL USER INTERFACE AND INTERACTIVE INPUT METHODS: The user dialog - Input of graphical data - Input function - Interactive picture construction techniques - Virtual reality environments. (5)

TWO DIMENSIONAL GRAPHICS: Basic transformations - Matrix representation and homogeneous coordinates - Composite transformations - Line drawing algorithms: DDA and Bresenham's algorithms - Circle generation algorithms: Midpoint circle algorithm - Point clipping - Line clipping: Cohen Sutherland algorithm - Polygon clipping: Sutherland Hodgeman algorithm - Line covering. (10)

RASTER GRAPHICS: Fundamentals: generating a raster image, representing a raster image, scan converting a line drawing, displaying characters, speed of scan conversion, natural images - Solid area scan conversion: Scan conversion of polygons, Y-X algorithm, properties of scan conversion algorithms - Interactive raster graphics: painting model, moving parts of an image, feed back images. (10)

CURVES AND SURFACES: Parametric representation of curves - Bezier curves – B-Spline curves - Parametric representation of surfaces - Bezier surfaces - Curved surfaces - Ruled surfaces - Quadric surfaces – Concatenation of two curve segments – Order of Continuity. (7)

IMAGE PROCESSING FUNDAMENTALS: Sampling and Quantization, Image Enhancement - Histogram Processing, Filtering, Edge Detection, Image Transforms. (10)

THREE DIMENSIONAL GRAPHICS: 3D transformations - Viewing 3D graphical data - Orthographic, oblique, perspective projections - Hidden lines and hidden surface removal. (6)

FRACTAL-GEOMETRY METHODS: Tiling the plane - Recursively defined curves - Koch curves - C curves - Dragons - Space filling curves - Fractals - Grammar based models - Graftals - Turtle graphics - *Ray tracing*. (6)

OPENGL: Architecture, The OpenGL API, Primitives and Attributes, Color, Viewing, Control Functions, Programming Event-Driven Input, Transformations, OpenGL Extensions. (6)

Total L:60

TEXT BOOKS

1. Donald Hearn and Pauline Baker M, " Computer Graphics", Pearson Education, New Delhi, 2011.
2. William M. Newmann, Robert F Sproull, “Principles of Interactive Computer Graphics”, McGraw Hill, New Delhi, 2002.

REFERENCES

1. Rankin John R, "Computer Graphics Software Construction", Prentice Hall, New Delhi, 1989.
2. Foley James D, Vandam Andries and Hughes John F, "Computer Graphics: Principles and Practice", Pearson Education, New Delhi, 2002.
3. Rafael C Gonzalez., and Richard Eugene Woods, “Digital Image Processing”, Pearson Education, New Delhi, 2007.
4. Anil K Jain., “Fundamentals of Digital Image Processing”, Pearson Education, New Delhi, 2007.
5. Angel, “Interactive Computer Graphics- A top down approach with OpenGL”, Addison-Wesley, New Delhi, 2008.
6. F S Hill, “Computer Graphics Using OpenGL”, Prentice Hall, New Delhi, 2001.

12XT54 DATABASE DESIGN

4 0 0 4

BASIC CONCEPTS : Introduction to databases – Conventional file Processing – Data Modeling for a database – Three level architecture – Data Independence – Components of a Database Management System (DBMS) – Advantages and disadvantages of a DBMS – System Environment – users of DBMS. (9)

DATA MODELS : Introduction – Data Associations – entities, attributes, relationships – Entity relationship data models (ERD) – Generalization – Aggregation – Conversion of ERD into tables – applications – Introduction to Network data model and Hierarchical data model. (10)

FILE ORGANIZATION : Storage device Characteristics – constituents of a file – Operations on file - Serial files – Sequential files – Index Sequential files – Direct files – Binary and Secondary key retrieval – Indexing using Tree structures. (9)

RELATIONAL MODEL : Introduction – Relational databases – Relational Algebra – Relational algebra queries. (5)

RELATIONAL DATABASE MANIPULATION: Structured Query Language (SQL) - Basic data retrieval – Condition specification - SQL Join – views and update, Query Processing. (8)

DATA BASE DESIGN THEORY: Functional dependencies – axioms – Normal forms based on primary keys – Second Normal form Third Normal form, Boyce – Codd Normal form – examples. Multivalued dependencies – Fourth Normal form – Data base design process – Database Tuning. (10)

DATABASE SECURITY , INTEGRITY AND CONTROL: Security and Integrity threats – Access Controls and measures, Defense mechanisms-Transaction management, and concurrency control mechanisms. (9)

Total L:60

TEXT BOOK

1. Elmasri R and Navathe S.B, "Fundamentals of Database Systems", Pearson Education, New Delhi, 2010.

REFERENCES

1. Bipin C.Desai, "An Introduction to Database System '', West Publisher, Eagan, 2004.
2. Silberschatz A., Korth H and Sudarshan S., "Database System Concepts", McGraw Hill, New Delhi, 2010.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management System", McGraw Hill, New Delhi, 2003.

12XT55 DESIGN AND ANALYSIS OF ALGORITHMS

4 0 0 4

INTRODUCTION: Fundamentals of algorithmic problem solving, deciding an appropriate data structure and algorithm design technique – Methods of specifying an algorithm – proving the correctness – analyzing an algorithm, Asymptotic notations, Recurrences – Master theorem (8)

DIVIDE AND CONQUER: Integer multiplication, Strassen's matrix multiplication, closest pair, Fast Fourier transform. (7)

GREEDY METHOD: Optimal caching, minimum cost spanning tree. (Kruskal and Prim's algorithms) , topological sorting , Huffman codes and data compression. (8)

DYNAMIC PROGRAMMING: Principles of dynamic programming – 0/1 knapsack problem, all pairs shortest problem, optimal binary search trees. (10)

NETWORK FLOW : Flow networks and Flows – Network with multiple sources and working with flows, The Ford – Fulkerson Method, Augmenting paths – Max – Flow min – cut theorem, The Edmonds – Karp algorithm. (7)

NP AND COMPUTATIONAL INTRACTABILITY: Basic concepts – Polynomial time reductions, efficient certification and NP, NP hard and NP complete problems – CO-NP and the asymmetry of NP, Examples, PSPACE-some hard problems in PSPACE-solving the planning problem in polynomial space – Proving problems PSPACE – complete. (9)

COPING WITH NP-COMPLETENESS: Backtracking-n queens problem, Graph coloring problem, Branch and bound Assignment problem , Traveling salesman problem, Approximation algorithm – Introduction – traveling salesman problem. (11)

Total L:60

TEXT BOOKS

1. Thomas H. Cormen, Charles E Leiserson, and Ronald LRivest, "Introduction to Algorithms" , MIT Press, Cambridge, 2009.
2. Jon Kleinberg and Eve Tardos, "Algorithm Design", Pearson Education, New Delhi, 2005.

REFERENCES

1. Anany Levitin, " Introduction to design and analysis of algorithm", Pearson Education, New Delhi, 2011
2. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani ,"Algorithms",Tata McGraw Hill, New Delhi, 2008.

12XT56 COMPUTER GRAPHICS VISUALIZATION LAB

0 0 3 2

1. Drawing a line, circle using algorithms
2. Implementation of 2D Transformations (translation, scaling, rotation)
3. Window – viewport simulation with various aspect ratios
4. Polygon clipping and line clipping using algorithms.
5. Drawing a 2D curve using Bezier generation
6. Drawing a 2D curve using B-Spline generation
7. Model a primitive (car / Aircraft) with OpenGL API
8. Simulate the primitive.
9. Animate the primitive.

Note: Algorithms in the Computer Graphics have to be implemented by the studentusing C++/ OpenGL. (Wherever applicable).

Total P:45

12XT57 RDBMS LAB

0 0 3 2

SQL – ORACLE, SQL SERVER

1. Working with DDL commands of SQL for creation and manipulation of single, multiple tables.
2. Working with DML commands to create / update / fetch records from single / multiple tables
3. Working with PL/SQL, Triggers and stored procedures.
4. Develop a Package using all RDMS features.

List of experiments (Problem Sheets) are to be given and Package need to be developed.

Total P:45

12XT58 DESIGN AND ANALYSIS OF ALGORITHMS LAB

0 0 3 2

To implement the following

1. Problem using closest pair algorithm
2. Prim's minimum cost spanning tree
3. Kruskal's minimum cost spanning tree using min heap data structure, union and find operation
4. Problem related to topological sorting
5. Application of all pairs shortest path problem
6. Optimal binary search tree
7. Optimal caching
8. Application of graph coloring using back tracking
9. TSP using branch – and - bound

Total P:45

SEMESTER – 6

12XT61 MACHINE LEARNING

3 0 2 4

INTRODUCTION: Machine learning - supervised and un supervised learning – Classification – Regression – Generative models – Discriminative models - Model selection and generalization. (3)

INSTANCE BASED LEARNING: k-Nearest neighbor – Classification and regression using kNN. (2)

PROBABILISTIC LEARNING: Bayesian decision theory- Classification- losses and risks – Discriminant functions – Logistic regression. (6)

PARAMETRIC METHODS: Maximum likelihood estimation - Evaluating an estimator – Baye's estimator- Multivariate methods – Estimation of missing values - Multivariate classification and regression. (5)

DIMENSIONALITY REDUCTION: Subset selection - Principal component analysis - Factor analysis - Linear discriminant analysis. (6)

CLUSTERING: Expectation maximization (EM) - K means clustering - Hierarchical clustering – Choosing the number of clusters. (6)

DECISION TREES: Univariate trees – Rule extraction from trees – Pruning trees - Multivariate trees. (5)

SUPPORT VECTOR MACHINES – Classification - Regression (4)

GRAPHICAL MODELS: Bayesian networks – Hidden Markov models : Discrete Markov process – Finding the state sequence – Model selection. (8)

PRACTICALS

1. Download the datasets from UCI machine learning repository / www.kaggle.com for classification and clustering
2. Implement the following Classification algorithms for the above datasets
    a. Naïve Baye's Algorithm
    b. Decision tree
    c. SVM
    d. K nearest neighbor
    e. Neural network
3. Do tenfold cross validation experiments and statistical validation using t-test and ANOVA
4. Implement different clustering techniques
5. Statistical validation of techniques using ANOVA and t-test

Total L:45+P:30 =75

TEXT BOOKS

1. David Barber, " Machine Learning: A Probabilistic Approach", http://www.idiap.ch/~barber, 2006.
2. Christopher M Bishop, "Pattern Recognition and Machine Learning", Springer, New York, 2007.
3. Richard O Duda, Peter E Hart and David G Stork, "Pattern Classification", John Wiley & Sons, New York, 2001.

REFERENCES

1. Tom Mitchell, "Machine Learning", Kluwer Academic Publisher, Norwell, 1997.
2. Alpaydin Ethem, "Introduction to Machine Learning",MIT Press, Cambridge, 2004.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The Elements of Statistical Learning", Springer, Berlin, 2009.

12XT62 SECURITY IN COMPUTING

4 0 0 4

INTRODUCTION: Security goals, Attacks, Services and Mechanisms -Techniques – Understanding threats. (4)

PROGRAM SECURITY: Secure programs, non-Malicious program errors – Buffer overflows – Malware Taxonomy – viruses and other malicious code – Targeted Malicious code – Defense mechanisms. (8)

SECURITY AT APPLICATION LAYER: Email security – PGP – Key rings – PGP certificates – S/MIME – Applications of S/MIME – Web Security – Attacks and defenses. (8)

SECURITY AT TRANSPORT LAYER: SSL Architecture – Four protocols – SSL message formats – Transport layer security (8)

SECURITY AT NETWORK LAYER:, Network Layer Threats and security controls – firewalls – Intrusion detection system – IPSEC – modes – security protocols – security association – Internet key exchange - VPN. (8)

OS SECURITY: Memory and Address protection – Access control – file protection mechanisms – User authentication – Models of security – Trusted OS design. (8)

DATABASE SECURITY: Security Requirements – Reliability and Integrity – Sensitive data – Multilevel Databases (8)

LEGAL ISSUES IN COMPUTER SECURITY: Protecting programs and data – Rights of Employees and Employers – Computer crime, Digital Rights Management (DRM). (8)

Total L:60

TEXT BOOKS

1. Charles P Pfleeger, Shari Lawrence P Fleeger, "Security in Computing", Pearson Education, New Delhi, 2006.
2. Behrouz, A.Forouzan, "Cryptography and Network Security", Tata McGraw Hill, New Delhi, 2008.
3.

REFERENCES

1. Roberta Bragg, Mark Rhodes, Keith Strass Berg J, "Network Security - The complete reference", Tata McGraw Hill, New Delhi, 2006.
2. William Stallings, "Cryptography and Network Security", Prentice Hall, New Delhi, 2006.

12XT63 PRINCIPLES OF COMPILER DESIGN

4 0 0 4

SYSTEMS PROGRAMMING : Language Processors – Data Structures for Language Processing – Introduction to Assemblers, Macro processors, Interpreters - Linkers and Loaders - its need and working. (9)

LEXICAL ANALYSIS: Role of a Lexical Analyzer – Finite Automata – Regular Expressions to Finite Automata – Minimizing the number of states of a Deterministic Finite Automata – Implementation of a lexical analyzer. (8)

PARSING TECHNIQUES: Context free grammars – Derivations and parse trees – Ambiguity – Capabilities of context free grammars. Top down and bottom up parsing – Handles – Shift reduce parsing – Operator precedence parsing – Recursive descent parsing -Predictive parsing. (12)

AUTOMATIC PARSING TECHNIQUES: LR parsers – Canonical collection of LR(0) items – Construction of SLR parsing tables – LR(1) sets of items construction – Construction of canonical LR parsing tables. (11)

SYNTAX DIRECTED TRANSLATION AND INTERMEDIATE CODE: Semantic actions – Implementations of syntax directed translators – Postfix notation, Quadruples, triples , indirect triples –Methods of translation of assignment statements, Boolean expression and control statements - Representing information in a symbol table. (13)

CODE OPTIMIZATION: introduction to code optimization – basic blocks – DAG representation – error detection and recovery - code generation. (7)

Total L:60

TEXT BOOKS

1. John J. Donovan, " Systems Programming", McGraw Hill , New Delhi, 2001.
2. Aho A.V, R.Sethi and Ullman J.D., "Compilers : Principles, Techniques and Tools", Pearson Addison Wesley, New Delhi, 2007

REFERENCES

1. Dhamdhere D.M., "Systems Programming", Tata McGraw Hill, New Delhi, 2001.
2. Kenneth C Louden, "Compiler Construction Principles and Practice", PWS Publishing, Boston, 1997.
3. Holub Allen I. "Compiler Design in C", Prentice Hall, New Delhi, 2001.

12XT64 ARTIFICIAL INTELLIGENCE

3 0 0 3

INTRODUCTION: The foundations of AI - The History of AI- Intelligent agents- Agent based system. (3)

PROBLEM SOLVING: Searching for solution- Uninformed/Blind search - Informed/ Heuristic search - A* search - Hill-climbing search -Constraint satisfaction problem. (6)

KNOWLEDGE REPRESENTATION AND REASONING: Logics – First order logic, Inference in first order logic, Knowledge representation. (4)

PLANNING: The planning problem - Planning with state space search - Partial order search - Planning with proportional logic - Planning and acting in the real world. Adversarial planning. (7)

UNCERTAIN KNOWLEDGE AND PROBABILISTIC REASONING: Uncertainty-Probabilistic reasoning - Semantics of Bayesian network -Approximate inference in Bayesian network , Exact inference in Bayesian network - Probabilistic reasoning over time.(9)

LEARNING: Learning from observation - Knowledge in learning -Statistical learning methods - Reinforcement learning. (8)

DECISION-MAKING: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications. (6)

ROBOTICS: Introduction (2)

Total L:45

TEXT BOOKS

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, New Delhi, 2003.
2. Patrick Hendry Winston, “Artificial Intelligence”, Pearson, New Delhi, 2004

REFERENCES

1. Christopher M.Bishop, “Pattern Recognition and Machine Learning”, Springer, New York, 2007.
2. Elaine Rich Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill, New Delhi, 2001.

12XT66 SECURITY IN COMPUTING LAB

0 0 3 2

1. Design of a Client server application for a basic cryptosystem
2. Performing a frequency analysis attack on a cipher text enciphered with Affine cipher
3. Detection of a Buffer overflow attack
4. Packet Sniffing using Wireshark Tool to perform the traffic analysis attack
5. Generation of keys using pseudorandom generators
6. Implementation of RSA cryptosystem
7. Key distribution using RSA(KDC) – Key hacking
8. Key exchange using Diffie- Hellman technique – MITM attack
9. Authentication of File transfer using Hashing / Message digest
10. Digital signature, generation and verification
11. Implementation of Shamir threshold scheme for secret sharing.
12. Password authentication
13. Transaction security using SQL Injection attacks
14. Security testing for applications.
15. Packages using the concepts of IPSec, SSL and PGP.

Total P:45

12XT67 COMPILER DESIGN LAB

0 0 3 2

1. Implementation of Transition diagram to strip off comment statements from a given source file
2. Design and Implementation of a Symbol Table Manager.
3. Implementation of following parsing algorithms
    a. Recursive descent Parser
    b. Shift reduce parser.
    c. Operator Precedence Parser
4. Implementation of the Syntax directed translation Engine to
    a. Simulate Desk Calculator
    b. Generation of Postfix code.
    c. Post and Pre Code Optimizer.
5. Using LEX and YACC under UNIX environment for compiler design related problems.
6. Using JavaCC tool for designing syntax checker.
7. Case study : Working with following open source compliers.
   open jdk, gcc

Total P:45

12XT68 ARTIFICIAL INTELLIGENCE LAB

0 0 3 2

Lab assignments will be provided for all the topics given below.

1. Implement A* / Hill Climbing algorithms for 8 –puzzle and Missionaries and Cannibals problem.
2. Logic based Exercises.

3. Implementation of planning
4. Implementation of learning algorithms.
5. Implementing decision problems and simple games.
6. Robot motion problem.

Total P:45

SEMESTER – 7

12XT01 PROJECT WORK 1 – INDUSTRY / RESEARCH PROJECT

0 0 – 12

SEMESTER – 8

12XT81 GAME THEORY

4 0 0 4

INTRODUCTION: Game theory the theory of rational choice – Interacting decision makers. (3)

NASHEQUILIBRIUM: Strategic games – Best response – Dominance – Examples from economics, business, environment, military - Symmetric games and symmetric equilibria. Illustrations: Cournot's model of oligopoly, Electoral competition. (10)

MIXED STRATEGIES: Dominance – Equilibrium – Illustrations: Expert diagnosis, Reporting a crime – Formation of players' beliefs. (6)

EXTENSIVE GAMES WITH PERFECT INFORMATION: Strategies and outcomes – Nash equilibrium – Subgame perfect equilibrium - Stackelberg's model of duopoly, Buying votes – Illustrations: Entry into a monopolized industry, Electoral competition with strategic voters, Committee decision making. (10)

GAMES WITH IMPERFECT INFORMATION: Bayesian games – Examples – Strategic information – Transmission – Agenda Control with imperfect Information – Signaling games - Education as a signal of ability. (8)

REPEATED GAMES: The prisoner's dilemma – Finitely repeated and infinitely repeated – Strategies – Nash equilibrium – Subgame – Perfect equilibria and the one – deviation – Property – General results – Finitely replaced games – Variation on a theme: Imperfect observability. (9)

INTRODUCTION TO ALGORITHMIC GAME THEORY: Auction and mechanism design basics - the Vickrey auction - Sponsored Search Auction - Social choice theory - VCG mechanism. Algorithmic Aspects of Equilibria: Existence and computational complexity equilibria - Market Equilibrium - Correlated Equilibrium. Quantifying the inefficiency of equilibria: Routing Games and Congestion Games - Network Formation - Price of Anarchy and Price of Stability - Bandwidth Sharing. (14)

Total L:60

TEXT BOOKS

1. Martin J Osborne, "An Introduction to game theory", Oxford University Press, New York, 2004.
2. N. Nisan, T. Roughgarden, E. Tardos, V. Vazirani, "Algorithmic Game Theory", Cambridge University Press, Cambridge, 2007.

REFERENCES

1. Thomas L.C, "Games, Theory and Applications", Dover Publications, New York, 2011
2. Ken Binmore, "Playing for Real: A Text on Game Theory", Oxford University Press, New York, 2007
3. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly ConnectedWorld", Cambridge University Press, New York, 2010
4. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press, New Jersey, 2008
5. Yoav Shoham, Kevin Leyton-Brown, "Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations", Cambridge University Press, New York, 2008

12XT82 PARALLEL AND DISTRIBUTED COMPUTING

3 0 0 3

INTRODUCTION: Concepts and Terminology - Flynn's Classical Taxonomy – Terminology (4)

PARALLEL COMPUTER MEMORY ARCHITECTURES: Shared Memory -Distributed Memory -Hybrid Distributed-Shared Memory Multiprocessors: Communication and Memory issues - Message Passing Architectures - Vector Processing and SIMD Architectures. (6)

THE CM-2, MASPAR, AND CM-5 ARCHITECTURES - Latency Hiding Architectures -Multithreading Architectures -Dataflow Architectures -Bulk synchronous parallel model - **Asynchronous Parallel Programming Model -** Overview of basic CPU and memory design issues. (6)

PARALLEL PROGRAMMING MODELS: Overview -Shared Memory Model - Threads Model - Message Passing Model - Data Parallel Model - Other Models. (5)

DESIGNING PARALLEL PROGRAMS: Automatic vs. Manual Parallelization - Understand the Problem and the Program - Partitioning -Communications - Synchronization -Data Dependencies - Load Balancing -Granularity -I/O -Limits and Costs of Parallel Programming - Performance Analysis and Tuning - Parallel Examples -Array Processing – Compiler Transformation techniques for High performance computing: - Transformations for parallel Machines. (6)

PRAM ALGORITHMS: PRAM model of computation- Work-Time formalism and Brent's Theorem; algorithm design techniques- parallel prefix, pointer jumping, Euler tours, divide and conquer, symmetry breaking; survey of data-parallel algorithms; relative power of PRAM models. (6)

DISTRIBUTED COMPUTING: Introduction -- Definitions, motivation - Communication Mechanisms- Communication protocols,- RPC- RMI- stream oriented communication- Distributed Algorithms – snapshots - leader election – etc - Synchronization - Traditional synchronization - lock free - clocks. Replication and Coherence-Consistency models and protocols- Fault Tolerance - - group communication -Two- and three- Phase commit -Check pointing -Security - Threats -Control mechanisms -Systems - Distributed File Systems:- NFS – Coda – etc- Middleware - outline of CORBA – Jini -Mobile systems. (6)

DENSE LINEAR ALGEBRA - Matrix transposition - Matrix product - Gaussian elimination -Data distribution -Parallel linear algebra libraries. (6)

Total L:45

TEXT BOOKS

1. Selim G Akl, "Parallel Computation: Models and Methods", Prentice Hall, New Delhi, 1997.
2. Leighton F T, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees and Hyper cubes", Morgan Kaufmann, San Francisco, 1991.
3. Andrew S. Tannenbaum and Maarten van Steen, "Distributed Systems, Principles and Paradigm", Prentice Hall, New Delhi, 2007.

REFERENCES

1. Gibbons A and Rytter W, "Efficient Parallel Algorithms", Cambridge University, New York, 1989.
2. JaJa J, "Introduction to Parallel Algorithms", Addison Wesley, New York, 1997.
3. Lynch N A, "Distributed Algorithms", Morgan Kaufmann, San Francisco, 1996.
4. Tel G, "Introduction to Distributed Algorithms", Cambridge University, New York, 2000.
5. Vijay K Garg, "Elements of Distributed Computing", John Wiley & Sons, New York, 2002.
6. David F. Bacon, Susan L. Graham and Oliver J. Sharp, "Compiler Transformations for High Performance Computing" University of California, Berkeley, 1993.

12XT83 MATHEMATICAL MODELLING

4 0 0 4

INTRODUCTION TO MODELING: Modeling process, Overview of different kinds of model. (3)

EMPIRICAL MODELING WITH DATA FITTING: Error function, least squares method; fitting data with polynomials and splines. (4)

CAUSAL MODELING AND FORECASTING: Introduction, Modeling the causal time series, forecasting by regression analysis, predictions by regression. Planning, development and maintenance of linear models, trend analysis, modeling seasonality and trend, trend removal and cyclical analysis, decomposition analysis. Modeling financial time series. Econometrics and time series models. Non seasonal models: ARIMA process for univariate and multivariate. (12)

PORTFOLIO MODELING AND ANALYSIS: Portfolios, returns and risk, risk-reward analysis, asset pricing models, mean variance portfolio optimization, Markowitz model and efficient frontier calculation algorithm, Capital Asset Pricing Models (CAPM). (5)

DISCRETE-TIME FINANCE: Pricing by arbitrage, risk-neutral probability measures, valuation of contingent claims, and fundamental theorem of asset pricing, Cox-Ross-Rubinstein (CRR) model, pricing and hedging of European and American derivatives as well as fixed-income derivatives in CRR model, general results related to prices of derivatives.

STOCHASTIC CALCULUS: Brownian motion, martingales, Itô's formula, Itô integral, risk-neutral measure, SDE; Risk-neutral measure, Girsanov's theorem for change of measure, martingale representation theorems, representation of Brownian martingales, Feynman-Kac formula. (8)

MODELING WITH BIOINFORMATICS: Introduction, Biological data- types, mode of collection, documentation and submission. Sequence alignment- Definition, significance, dot matrix method, dynamic programming- Global and local alignment tools, scoring matrices and gap penalties. Multiple sequence alignment: Iterative methods. Genetic algorithm, Hidden Markovian models, statistical methods, position specific scoring matrices. (16)

Total: L:60

TEXT BOOKS

1. Giordano F R, Weir M D, and Fox W P,"A First Course in Mathematical Modeling". Brooks/Cole, Belmont, 2008.
2. Christoffersen P, " Elements of Financial Risk Management", Academic Press, Waltham, 2003.
3. Capinski M. and Zastawniak T,"Mathematics for Finance: An Introduction to Financial Engineering", Springer, London, 2010.
4. Mount. DW, "Bioinformatics Sequence and genome analysis ", Cold Spring Harbor Laboratory, New York, 2004

REFERENCES

1. Hamdy ATaha, "Operation Research- An Introduction", Pearson Education, .New Delhi, 2008.
2. Borovkov K, "Elements of Stochastic Modeling", World Scientific, New Jersey, 2003.
3. Shreve S., "Stochastic Calculus for Finance", Springer, Pittsburgh, 2004
4. Salzberg, Searls and Kasif, "Computational Methods in Molecular Biology", Elsevier, Amsterdam, 1998

12XT86 PARALLEL AND DISTRIBUTED COMPUTING LAB

0 0 3 2

1. Basic Master – Worker program and send messages
2. Write a program to find the summation of largest number in a very larger array of integers. (The contents of the array should be equally distributed to all processes).
3. Write a parallel program in SPMD to calculate the PI value using integral approximation method.
4. Simple Matrix multiplication, Transpose, using parallel algorithm.
5. Select your own choice of very dense computational problem having divide and conquer method and implement it in parallel algorithm. And produce the performance chart with 2, 4, 6 and 8 nodes.

Total P:45

12XT87 MATHEMATICAL MODELLING LAB

0 0 3 2

Softwares: MATLAB programming, Mathlab, Mathematica, Maple.
Topics: Some of the major topics to be covered include (not necessarily in the order given):

- Algebraic Models: Linear, Quadratic, and Exponential.
- Polynomial curve fitting and cubic spline curve fitting
- Time series analysis and forecasting models
- Portfolio optimization models
- Cox-Ross-Rubinstein (CRR) model
- Risk analysis models
- Pair wise sequence alignment using dynamic programming
- Multiple sequence alignment using Hidden Markovian models

Total P:45

12XT88 RESEARCH SPECIALIZATION LAB

0 1 3 2

SEMESTER - 9

12XT91 INTELLIGENT INFORMATION RETRIEVAL

3 0 0 3

INTRODUCTION: Overview of IR systems- Historical perspectives- Goals of IR-The impact of IR on the web – the role of AI in IR. (3)

RETRIEVAL MODELS : Similarity measures and ranking – Boolean matching – Vector Space models - ranked retrieval – text similarity measure – TF- IDF (term frequency – Inverse document frequency) weighting- Cosine similarity - Basic tokenizing - stop-word Removal and Stemming-indexing; Inverted indices-Efficient processing with sparse vectors - Probability models – Relevance feedback. (9)

QUERY PROCESSING: Basic query processing- query operations --query expansion; query languages- data structure and file organization of IR - Automatic indexing and indexing models. (4)

EVALUATION: Experimental Evaluation of IR: Recall, Precision and F- measure- R-Precision-MAP-NDCG; Evaluation of benchmark text collections (2)

TEXT REPRESENTATION: Statistical characteristics of text -Word Statistics; Zipf's law; Porter Stemmer; morphology; index term selection; using thesauri. Meta data and markup languages (SGML, HTML, XML). (3)

INFORMATION FILTERING TECHNIQUES: information filtering - Collaborative filtering and content-based filtering- Applications of information filtering- Recommender systems. (5)

TEXT CATEGORIZATION AND CLUSTERING: Categorization algorithms – Rocchio: Naïve Bayes; decision trees – nearest neighbor – LSI -Clustering algorithms: Agglomerative clustering – k-means – expectation maximization (EM)-Dimension reduction-LSI. (6)

WEB SEARCH : IR systems on WWW – Search engines; spidering; meta crawlers; directed spidering – link analysis (hubs and authorities, Google page rank) - Shopping agents - Heterogeneous information resources - intelligent information resources- intelligent web agents- Web mining and applications. (9)

INFORMATION EXTRACTION AND INTEGRATION: Extracting data from text; XML; Semantic web – collecting and integrating specialized information on the web. (4)

Total L:45

TEXT BOOKS

1. Christopher D. Manning, Prabhakar Raghavan & Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press,Cambridge, 2008.
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval", Pearson Addison Wesley, New Delhi, 2011.
3. D.A. Grossman, O. Frieder. "Information Retrieval: Algorithms and Heuristics", Springer, Dordrecht, 2004.

REFERENCES

1. C.J. Van Rijsbergen, "Information Retrieval", ButterWorths, Michigan, 1979.
2. B. Croft, D.Metzler, T.Strohman, "Information Retrieval in Practice", Pearson Addison Wesley, New Delhi, 2010. (on line book)
3. Gerald J Kowalski, Mark T Maybury, "Information Storage and Retrieval systems: Theory and Implementation", Kluwer Academic Publishers, New York, 2009.
4. Ingwersen P, "Information Retrieval Interaction,Taylor Graham, Michigan, 1992.
5. Francesco Ricci, Lior Rokach, Bracha Shapira, Paul B. Kantor, "Recommender Systems – Handbook", Springer, New York, 2010 (on line)

12XT92 COMPUTATIONAL GEOMETRY

3 0 0 3

MATHEMATICAL & GEOMETRICAL REVIEW: Algorithm analysis – sorting, binary search, balanced binary search, divide and conquer, plane sweep, Kd-trees, Dijkstra's algorithm, points, lines and planes, basic geometric objects – polygons, polytopes, convexity, graphs - vertex coloring, planar, Euler's formula. (2)

CONVEX HULLS: Definition, lower bounds, algorithms - Graham's scan, divide and conquer, Jarvis march, 3D hulls. (5)

LINE SEGMENT INTERSECTION: Plane sweep algorithm, Doubly-connected edge list, computing overlay of two subdivisions, Map overlay algorithm, *half-plane intersection*, arrangements of lines. (8)

POLYGON TRIANGULATION: Art gallery problem – introduction, triangulation, *bounds*, partition into monotone pieces, triangulating monotone polygon, placement of guards. (8)

ORTHOGONAL RANGE SEARCHING: 1-D and 2-D range searching, *range trees*. (4)

VORONOI DIAGRAMS: Properties, beach line, computing Voronoi diagram, Delaunay triangulations, computing Delaunay triangulations. (8)

ROBOT MOTION PLANNING: Work space and configuration space, point robot, free space, Minkowski sums for convex and nonconvex polygons, translational motion planning, motion planning with rotations, Point location and trapezoidal maps. Visibility graphs - Shortest paths for a point robot, computing visibility graph, shortest paths for a translating polygonal robot. (10)

Total L:45

TEXT BOOKS

1. M. De Berg, M. van Kreveld, M. Overmars & O.Schwarzkopf, "Computational Geometry - Algorithms and Applications", Springer Verlag, Berlin, 2008.
2. Joseph O'Rourke, "Computational Geometry in C", Cambridge University Press, Cambridge, 1998.

REFERENCES

1. Franco P. Preparata & Michael Ian Shamos, "Computational Geometry - An Introduction", Springer-Verlag, Berlin, 1985.
2. Goodman J E and O'Rourke, "Handbook of Discrete and Computational Geometry", CRC Press, Boca Raton, 2004.
3. Subir Kumar Ghosh, "Visibility Algorithms in the Plane", Cambridge University Press, Cambridge, 2007.

12XT93 DATA MINING

3 0 0 3

INTRODUCTION: Motivation for Data Mining – Importance – Definition – Kinds of data for Data Mining – Data Mining functionalities – Patterns – Classification of Data Mining Systems – Major issues in Data Mining-Overview of Data Mining Techniques. (5)

DATA PREPROCESSING: Types of data, Data cleaning-Smoothing, Handling missing values- Data Reduction –PCA, LDA-Feature subset selection - X^2 and Information Gain- Sampling methods (7)

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic concepts – Efficient and Scalable Frequent Itemset Mining methods – Apriori, FP Tree. (6)

CLASSIFICATION AND PREDICTION: Overview of Classification techniques –Ensemble Learning-bagging, boosting, cascading stacking- Dealing with Class imbalance- Semi supervised learning. (6)

C**LUSTER ANALYSIS:** Cluster Analysis – Types of data in Cluster Analysis –Distance measure for numerical and non-numerical data- A categorization of major clustering methods – density based methods –DBSCAN, OPTICS, DENCLUE- Outlier analysis. (6)

MINING DATASTREAMS: Challenges-Mining time- Series databases and sequence data –Stationary data stream learning-Hoeffding trees- Evolving data stream mining. (5)

MINING MASSIVE DATA SETS-Challenges- Distributed file system – Introduction to Map Reduce- Mining high dimensional association rules-CARPENTER- classifying high-dimensional data- PLANET- clustering high-dimensional Data-BIRCH-Distributed Data Mining. (6)

APPLICATIONS AND TRENDS IN DATA MINING: Spatial Data Mining –Graph Mining- Web Mining –Text Mining. (4)

Total L:45

TEXT BOOKS

1. Jiwai Han and Micheline Kamber , “Data Mining – Concepts and Techniques”, Morgan Kaufmann Publishers, Waltham, 2011.
2. Tan, Steinbach, Kumar, “Introduction to Data Mining”, Pearson Education, New Delhi, 2007.

REFERENCES

1. Anand Rajaraman , Jeffrey Ullman, “Mining Massive Data sets”, Cambridge University Press, Cambridge, 2011.
2. Trevor Hastie, Robert Tibshirani, Jerome Freidman,”The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Springer Series in Statistics, New York, 2009.
3. Ian Witten, Frank Eibe, Mark A Hall, "Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier, Burlington, 2011.

12XT96 INTELLIGENT INFORMATION RETRIEVAL LAB

0 0 3 2

1. Different retrieval models namely Boolean, Vector space and Probability based retrieval.
2. Query refinement techniques
3. Evaluation of the retrieval algorithms.
4. Dimension Reduction techniques
5. Classification and Clustering techniques
6. Recommender systems- Collaborative and Content Based Filtering
7. Information Extraction techniques
8. IR on structured data bases.
9. Web based retrieval - Link based retrieval, combining content and link information
10. Web mining - usage mining, structure mining, content mining

Total: P:45

12XT97 COMPUTATIONAL GEOMETRY LAB

0 0 3 2

Implementation of various algorithms for the following problems in Computational Geometry.

1. Convex hull problems
2. Line and half plane intersections
3. Map overlay problems using Doubly-connected edge list
4. Triangulation and Art gallery problem
5. Orthogonal range searching (1D and 2D) using Kd-trees
6. Construct Voronoi diagrams
7. Translational algorithms for robot motion planning

Total: P:45

12XT98 DATA MINING LAB

0 0 3 2

1. Familiarize with tools like WEKA and statistical package like R
2. Getting to know your Data –Feature Selection
3. Decision Trees
4. Other Classification Methods
5. Ensemble Learning
6. Clustering
7. Association Rules
8. Analyzing data with log linear models and graphical models using R
9. Handling massive data using map reduce
10. A Package using data mining techniques preferably research papers.

Total: P:45

SEMESTER – 10

12XT02 PROJECT WORK II – INDUSTRY / RESEARCH PROJECT

0 0 – 12

ELECTIVES

12XTE1 PRINCIPLES OF PROGRAMMING LANGUAGES

3 0 2 4

INTRODUCTION : The Role of Programming Languages: Toward Higher-level Languages, Problems of Scale, Programming Paradigms, Language Implementation Bridging the Gap - Language Description:- Syntactic Structure: Expression Notations, Abstract Syntax Trees, Lexical Syntax, Context -Free Grammars, Grammars for Expressions, Variants of Grammars. (7)

IMPERATIVE PROGRAMMING: Statements: Structured Programming:- The Need for Structured Programming, Syntax-Directed Control Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with invariants, Proof Rules for Partial Correctness, Control flow in C - Types: Data Representation:- The Role of Types, Basic Types, Arrays Sequences of Elements, Records: Named Fields, Unions and variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking - Procedure Activations:- Introduction to Procedures, Parameter-passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C, Lexical Scope: Nested Procedures and Pascal. (10)

OBJECT ORIENTED PROGRAMMING : Groupings of Data and Operations:- Constructs fro Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation I C++, Templates: Parameterized Types, Implementation of Objects in C++. - Object-Oriented Programming:- What is an Object?, Object-Oriented Thinking - Objects in Smalltalk. (9)

FUNCTIONAL PROGRAMMING: Elements of Functional Programming:- A little Language of expressions, Types : Values and Operations, Function declarations, Approaches to Expression Evaluation, Lexical Scope, Type Checking - Functional Programming in a Typed Languages:- Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception Handling in M, Little quit in Standard ML - Functional Programming with Lists:- Scheme, a Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions, Storage Allocation for Lists. (10)

OTHER PARADIGMS: Logic Programming:- Computing with Relations, Introduction to Prolog, Data Structures in Prolog, Programming techniques, Control in Prolog, Cuts - An Introduction to Concurrent Programming:- Parallelism in Hardware, Streams: Implicit Synchronization, Concurrency as interleaving, Liveness Properties, Safe Access to Shared Data, Concurrency in Ada, Synchronized Access to Shared variables. (9)

PRACTICALS

1. Language tools like lex, yacc.
2. Inter – Intra sequence control mechanism.
3. Parameter passing mechanism in C, C++.
4. Comparing Object oriented concepts in C++, Java.
5. List Operations in Prolog.
6. Fact finding & Theorem proving in Prolog.
7. Recursive functions in Functional programming language.
8. Expression evaluation in functional programming language.

Total: L:45+P:30 = 75

TEXT BOOKS

1. Terrence W.Pratt, Marvin V.Selkowitz and T.V.Gopal, "Programming Languages Design and Implementation", Pearson Education, New Delhi, 2006.
2. Ravi Sethi, "Programming Languages Concepts and Constructs", Pearson Education, New Delhi, 2007.

REFERENCES

1. Robert W. Sebesta, "Concepts of Programming Languages", Pearson Addison Wesley, New Delhi, 2008.
2. Robert Harper, "Programming in standard ML", Carnegie Mellon University, Pittsburg, 2005.
3. Larry C. Paulson, " ML for working Programmer", Cambridge University Press, Cambridge, 1997.
4. Al Kelley and Ira Pohl, "A Book on C", Pearson Education, New Delhi, 2005.

12XTE2 APPROXIMATION ALGORITHMS

3 0 2 4

Introduction: Definition-performance ratios, vertex-cover problem. (4)

COMBINATIONAL ALGORITHMS: lower bounding techniques and Metric TSP, multiway cut problem, the minimum k-cut problem, FPTAS for knapsack, greedy algorithms for Makespan-PTAS for minimum Makespan, Euclidean TSP. (10)

LINER PROGRAMMING RELAXATIONS: LP-duality, min-max relations and LP-duality, rounding applied to vertex cover-simple rounding algorithm-randomized rounding, primal dual method and vertex cover. (9)

CUTS, METRICAL RELAXATIONS AND EMBEDDINGS: multiway cut, sum multicommodity flow, some applications of multicut, rounding for Sparsest Cut via L1 Embeddings. (8)

SEMIDEFINITE PROGRAMMING: Strict quadratic programs and vector programs, properties of positive semi definite matrices, the semi definite programming problem, randomized rounding algorithm, improving the guarantee for MAX-2SAT. (7)

HARDNESS OF APPROXIMATION: reduction, graphs, and hardness factors, the PCP theorem, hardness of MAX-3SAT. (7)

PRACTICALS

1. Implementation of vertex-cover algorithm.
2. Implementation of Greedy algorithm for makespan.
3. Problems related to Euclidean TSP.
4. Implementation of different algorithms with rounding.
5. Implementation of applications of multicut.

Total: L:45+P:30 = 75

TEXT BOOKS

1. Vijay V.Vazirani, "Approximation Algorithms", Springer Verlag, New York, 2003.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, "Introduction toAlgorithms", MIT Press, Cambridge, 2009.

12XTE3 NATURAL LANGUAGE PROCESSING

3 0 2 4

INTRODUCTION : Applications of NLP techniques and key issues - MT - grammar checkers – dictation - document generation - NL interfaces - Natural Language Processing key issues - The different analysis levels used for NLP: morpho-lexical - syntactic – semantic - pragmatic - markup (TEI, UNICODE) - finite state automata - Recursive and augmented transition networks – open problems. (8)

LEXICAL LEVEL: Error-tolerant lexical processing (spelling error correction) - Transducers for the design of morphologic analyzers – Features - Towards syntax: Part-of-speech tagging (Brill, HMM) - Efficient representations for linguistic resources (lexica, grammars,...) tries and finite-state automata (7)

SYNTACTIC LEVEL: Grammars (e.g. Formal/Chomsky hierarchy, DCGs, systemic, case, unification, stochastic) - Parsing (top-down, bottom-up, chart (Earley algorithm), CYK algorithm) - Automated estimation of probabilistic model parameters (inside-outside algorithm) - Data Oriented Parsing - Grammar formalisms and treebanks - Efficient parsing for context-free grammars (CFGs) - Statistical parsing and probabilistic CFGs (PCFGs) - Lexicalized PCFGs. (8)

SEMANTIC LEVEL: Logical forms - Ambiguity resolution - Semantic networks and parsers - Procedural semantics - Montague semantics - Vector Space approaches - Distributional Semantics - Lexical semantics and Word Sense Disambiguation - Compositional semantics. Semantic Role Labeling and Semantic parsing. (7)

PRAGMATIC LEVEL: Knowledge representation – Reasoning - Plan/goal recognition - speech acts/intentions - belief models-discourse – reference. (5)

NATURAL LANGUAGE GENERATION: content determination - sentence planning - surface realization. (3)

SUBJECTIVITY AND SENTIMENT ANALYSIS - Information extraction - Automatic summarization - Information retrieval and Question answering - Named entity recognition and relation extraction - IE using sequence labeling - Machine translation: Basic issues in MT - Statistical translation - word alignment - phrase-based translation and synchronous grammars. (7)

PRACTICALS

1. Implementing word similarity
2. Implementing simple problems related to word disambiguation
3. Simple demonstration of part of speech tagging
4. Lexical analyzer
5. Semantic analyzer

Total: L:45+P:30 = 75

TEXT BOOKS

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, Ne w Delhi, 2008.
2. Ian H. Witten and Eibe Frank, Mark A Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, Morgan Kaufmann, Burlington, 2011.

REFERENCES

1. Christopher Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999
2. James Allen, “Natural Language Understanding”, Addison Wesley, New Delhi, 1995.
3. Steven Bird, Ewan Klein, and Edward Loper, “Natural Language Processing with Python - Analyzing Text with the Natural Language Toolkit”, O'Reilly Media, Sebastopol, 2009.

12XTE4 RANDOMIZED ALGORITHMS

3 0 2 4

INTRODUCTION: Randomized algorithms, min-cut algorithm, randomized quick sort, Las Vegas and Monte Carlo algorithms, computational models and complexity classes. (8)

MOMENT, DEVIATION AND TAIL INEQUALITIES: Markov and Chebyshev inequalities- randomized selection- coupon collector’s problem: the Chernoff bound- routing in a parallel computer- a wiring problem. (8)

PROBABILISTIC METHODS: Overview of the method-maximum satisfiability - finding a large cut, derandomization using conditional expectations; Markov chains-random walks on graphs-connectivity in undirected graphs

DATA STRUCTURES AND GRAPH ALGORITHMS: Random Treaps, hashing, skip lists**:** Shortest paths, minimum spanning trees, mincut (8)

NUMBER THEORETIC ALGORITHMS:, polynomial roots and factoring, primality testing (5)

ONLINE ALGORITHMS: Paging problem-adversary models- paging against an oblivious adversary-relating the adversaries -the adaptive online adversary, k-server problem. (7)

PRACTICALS

1. Implementation of randomized quick sort and solve real time problems using it
2. Find solution for s-t mincut problem adapting min cut algorithm.
3. Implementation of randomized selection and problems related to it.
4. Implementation of treap data structure
5. Problems using randomized hash table.
6. Implement the shortest path and minimum spanning trees algorithms with a graphical interface and output.
7. Implementation of randomized primality testing
8. Implement the K-server on-line algorithms.

Total: L:45+P:30 = 75

TEXT BOOKS

1. Motwani R and Raghavan P,"Randomized Algorithms", Cambridge University Press, Cambridge, 1995.
2. Michael Mitzenmacher and Eli Upfal, "Probability & Computing: Randomized Algorithms and Probabilistic Analysis", Cambridge University Press, Cambridge, 2005

12XTE5 ADVANCED COMPUTER GRAPHICS

3 0 2 4

GEOMETRICAL TRANSFORMATIONS: 2D Transformations- Homogeneous Coordination and metric representation – Composition of 2D transformations – Window to view port transport, Efficiency- Matrix representation of 3D transformations – Composition of 3D transformation – Transformation as a change in coordinate system. Viewing in 3d : Projections – specifying arbitrary 3D viewing – The Mathematics of planar geometric projections – implementing planar geometric projections, Coordinate systems. (6)

OBJECT HIERARCHY: Geometric modeling- Characteristics of retained – mode graphics packages – Defining and displaying structure – Modeling transformations, Hierarchical structure networks. Input devices – interaction techniques And interaction tasks: Interaction hardware – Basic interaction tasks – Composite interaction tasks. DIALOGUE DESIGN: The form and content of user-computer dialogues – User interface styles – Important design considerations – Modes and syntax – Visual design – The design methodology. USER INTERFACE SOFTWARE: Basic interaction – handling models - window management systems – output handling in window systems – Input handling in windows systems – Interaction –technique toolkits – User-interface management systems. (12)

REPRESENTING CURVES AND SURFACES : Polygon meshing – parametric cubic curves, Parametric bicubic surfaces, Quadric surfaces . SOLID MODELLING**:** Representing solids – Regularized Boolean set operations – Primitive instancing – Sweep representations – Boundary representations – Spatial – Partitioning representations – Constructive solid geometry – Comparison of representation – User interfaces for solid modeling. VISIBLE SURFACE DETERMINATION : Function of two variables – Techniques for efficient visible surface algorithms – Algorithms for visible line determination – The z-buffer algorithm – List – priority Algorithm – Area subdivision algorithms – Algorithms for octrees – Algorithms for curved surfaces – Visible ray tracing. (9)

REALISM : Fundamental difficulties – Rendering techniques for line drawing – Rendering techniques for shaded images – Improved object models – Dynamics – steropsis – Improved displays – Interacting with our other senses – *Aliasing and antialiasing.*ACHROMATIC AND COLORED LIGHT **:** Achromatic light – Chromatic color – Color Models for Raster Graphics – Reproducing Color – Using Color in Computer Graphics . illuminations and shading: Illumination models – Shading models For polygons – Surface detail – Shadows – Transparency – Inter object reflections – Physically based illumination models – Extended light sources – Spectral sampling – Improved camera model – Global Illumination algorithms – Recursive ray tracing – Radiosity methods – The rendering pipeline. (10)

IMAGE MANIPULATION AND SHADING: Filtering – Image Processing – Geometric transformations of Images – Multipass transformation – Image Composition – Mechanism for Image Storage – *Special Effects with images*. ANIMATION : Conventional and Computer assisted Animation – Animation languages – Methods of controlling animation - Basic rules of animation – Problems peculiar to animation. (8)

PRACTICAL:

Implement the following using the OpenGL in VC++

1. Using glReeti function, draw
   a) A flurry b) A checkerboard
2. Write the window to view port mapping functions, and use it to draw the since curve in real world coordinates.
3. Using user defined line Toand moveTo functions, plot the Fibonacci series.
4. Write the Canvas class and it's supporting classes. Use the Canvas class to draw a simple meander.
5. Write functions to change the background and foreground colors.
6. Write a function to draw an n-sided polygon (using the basic Canvas class and line To and move To functions)
7. Write a program to draw the Sierpinski gasket.
8. Write a program to draw the graph of a given mathematical function f(x).
9. Write a program to read a data file that contains a collection of Polylines in the appropriate format and draw each polyline.
10. Write a parameterized function to display a house and call it a number of times by passing different values to form a village.
11. Write a program that displays a colored triangle and rectangle and rotates them at different angles along two axis.

Total: L:45+P:30 = 75

TEXTBOOKS

1. Foley, Vandam, Feiner, Hughes , "Computer Graphics Principles & Practice", Pearson Addison Wesley, New Delhi, 2001.
2. Donals Hearn, M.Pauline Baker, "Computer Graphics", Pearson Education, New Delhi, 2011.

REFERENCE

1. Rankin John R, "Computer Graphics Software Construction", Prentice Hall, New Delhi, 1989.

12XTE6 MULTI PARADIGM PROGRAMMING LANGUAGES

3 0 2 4

INTRODUCTION: The need for multiple paradigms – Terms and concepts Design, Analysis, Domains and Families – Commonality and variability analysis - Multi-paradigm design and programming languages. (4)

COMMONALITIES ANALYSIS: The essences of Abstraction - Priming Analysis – Dimensions of Commonality and Commonality Categories - Commonality and Evolution –Examples. (8)

VARIABILITY ANALYSIS: The Spice of life – The commonality base – Positive and negative variability – The domain and range of variability – Binding time – Variability tables , traps, review and dependency. (9)

APPLICATION AND SOLUTION DOMAIN ANALYSIS: The big picture analysis, Domain analysis and beyond – Sub domains in domain analysis. C++ Solution domain overview. (8)

MIXING AND WEAVING PARADIGMS: An overview of multi-paradigm design and activities. Method and design paradigm weavings - Dimensions of Variability and commonality analysis – Codependent design – Design and Structures. Management issues -Augmenting solution design with patterns. (10)

Multi-paradigm programming languages and Programming in C++ and Oz and case – Studies Text editor and language translator. (6)

PRACTICALS

Implementation of Multi paradigm programming concepts using Standard C++

1. Implementation of Abstraction using classes and templates.
2. Implementation of Generic programming : Containers.
   - Reading and sorting integers and floating point numbers
   - Function objects
3. Implementation of class hierarchies and interfaces.
4. Implementation of Multiprogramming paradigm.
   - handling polymorphic objects.

Total: L:45+P:30 = 75

TEXT BOOKS

1. James O Coplien, “Multi-Paradigm Design for C++”, Addison Wesley, New York,1999.
2. Peter Van Roy and Seif Haridi, “Concepts Techniques and Models of Computer Programming”, MIT Press, Cambridge, 2004.

REFERENCE

1. Czarnecki and Eisenecker, “Generative Programming”, Addision Wesley, New York, 2001.

12XTE7 WIRELESS NETWORKS

3 0 2 4

WIRELESS FUNDAMENTALS: Spectrum Allocations – Propagation Modeling – Modern Communications Systems – Multiple Access – Cellular and Ad-hoc-Concepts. (7)

WLAN TECHNOLOGIES: System Architecture – 802.11 PHYs – 802.11 MAC – WPA and 802.11i: Security – 802.11e: MAC Enhancements for Quality of Service – Related Wireless Standards (Hyperlan, HomeRF, Bluetooth, Zigbee, Wireless USB). (10)

AD HOC AND SENSOR NETWORKS: Ad hoc Network- Introduction, Issues in Ad hoc wireless Network, Applications , Sensor Networks – Introduction- unique constraints and challenges- Network Architecture- Advantages and Applications of Sensor Network. – Network Simulator (NS -2) introduction. (10)

WLAN DEPLOYMENT ISSUES: Interference – Resource Allocation – Network Planning, Deployment and Analysis – Performance Tuning – Network Monitoring. (10)

FUTURE TRENDS: Emerging WLAN Related Technologies – 802.11 Trends – Cellular – 802.16 – 802.20 – 802.22 – UWB, Cognitive Radios, Sensor Networks, RFID – 4G and Data Communications Convergence. (8)

PRACTICALS

1. Study of NS-2 simulator.
2. Simulation of a IEEE 802.11 LAN under various conditions using NS-2 simulator (varied number of nodes, traffic rates, and contention window size).
3. Simulation of a priority MAC protocol using NS-2 simulator.
4. Simulation of TCP over error-prone wireless network using NS-2 simulator.
5. Development of Mobile application using blue tooth.

Total: L:45+P:30 = 75

TEXT BOOKS

1. Steve Rackley, “Wireless Networking Technology”, Newnes, Burlington, 2007.
2. Nicopolitidis P, Obaidat MS, Papadimitriou GI, Pomportsis AS, “Wireless Networks”, John Wiley & Sons, West Sussex, 2003.

REFERENCES

1. Matthew Gast, “802.11 @ Wireless Networks: The Definitve Guide”, O’ Reilly, Sebastopol, 2002.
2. C. SivaRam Murthy and B.S Manoj, “Ad hoc Wireless Networks Architecture and Protocols”, Pearson Education, New Delhi, 2005.
3. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks-An Information Processing Approach”, Elsevier, Waltham, 2004.
4. William Stallings, “Wireless Communication and Networks”, Pearson Education, New Delhi, 2009.

12XTE8 PROGRAM SEMANTIC ANALYSIS

3 0 2 4

INTRODUCTION: A Simple Imperative Programming Language - Notion of state of a program in execution (process) using Finite State Transition diagrams - using first-order logic formulae – Operational semantics and denotational semantics. (4)

ANALYZING ASSIGNMENT STATEMENTS: Deriving strongest postcondition from a given pre-condition - and deriving weakest pre-condition from a given post-condition. Dealing with loops: loop invariants - Appropriateness of loop-invariants for proving desired - Post-conditions of programs – Abstract syntax and semantics of loop in ML – Parsing loop. (8)

FORMAL INTRODUCTION TO HOARE LOGIC: syntax and semantics - Notions of partial and total correctness - Axioms and basic inference rules for partial correctness proofs in Hoare logic. (6)

FIXPOINT THEORY: Undefined operations and infinite loops – Recursively defined mappings – Continuous functions and strict extensions of functions. (4)

STRENGTHENING AND WEAKENING OF CONSTRAINTS: Weakest pre-conditions and strongest post-conditions - using Hoare logic proofs - Incompatibility of the strongest loop invariant in sequential programs- reduction from halting problem of Turing machines - Translating programs (with recursive function calls) manipulating variables of finite-domain types to push-down automata. (6)

ANALYSIS OF PROGRAMS WITH VARIABLES OF FINITE-DOMAIN TYPES: Reducing proof obligations in Hoare logic to state Reachability in an appropriate push-down automaton (PDA) - Deciding state Reachability in PDA by checking non-emptiness of an appropriate context-free language - PDA and CFG based techniques for proving properties of programs. (5)

OPERATIONAL SEMANTICS: Proof-theoretical semantics – Declarations of data structures – Procedures and functions – Objects and classes – Continuations and jumps. (7)

TRANSLATING PROGRAMS: The Formal language to corresponding Boolean programs - Semantics preserving syntactic transformations. Translating assignment statements in original program to parallel assignments to predicate-tracking Boolean variables in a Boolean program- Translating procedure call-free programs in a C-like language to Boolean programs. Discovering traces of a Boolean program from corresponding push-down automaton or context-free grammar. (5)

PRACTICALS

1. Study on using a static checkup for the verification of code written in a high level Programming Languages.
2. Implementation of Algebraic semantics.
3. Implementation of fixed point identity in recursion in the Lambda calculus.
4. Implementation of action semantics of a calculator.
5. Formal verification using Hoare Logic with updates for a simple while – language.
6. Proving Program correctness with Hoare's Logic for programs with procedures

Total: L:45+P:30 = 75

REFERENCES

1. Michael Huth and Mark Ryan*,"* Logic in Computer Science: Modeling and Reasoning about Systems" , Cambridge University Press, Cambridge, 2004
2. Bjorn Kirkerud, "Programming language semantics: Imperative and object oriented languages", Thomson computer press, London, 1997.
3. Glynn Winskel, "Formal Semantics of Programming Languages", MIT Press, Cambridge, 1993.

12XTE9 SEMANTIC WEB

3 0 2 4

INTRODUCTION TO SEMANTIC WEB: Today's Web - From Today's Web to the Semantic Web - Examples- Semantic Web Technologies - A Layered Approach. (4)

DESCRIBING STRUCTURED WEB DOCUMENTS USING XML: Introduction to Markup languages - The XML Language - Structuring - Namespaces - Addressing and Querying XML Documents - Processing. (8)

DESCRIBING WEB RESOURCES IN RDF: Introduction to RDF - Basic Ideas - RDF: XML-Based Syntax - RDF Schema: Basic Ideas - RDF Schema - An Axiomatic Semantics for RDF and RDF Schema - A Direct Inference System for RDF and RDFS - Querying in RQL. (9)

WEB ONTOLOGY LANGUAGE: OWL Introduction - The OWL Language - Examples - OWL in OWL - Future Extensions. (8)

LOGIC AND INFERENCE: Introduction - Example of Monotonic Rules: Family Relationships - Monotonic Rules: Syntax - Monotonic Rules: Semantics - Nonmonotonic Rules: Motivation and Syntax - Example of Nonmonotonic Rules - Rule Markup in XML for Monotonic Rules - Rule Markup in XML for Nonmonotonic Rules. (8)

APPLICATIONS: Horizontal Information Products - Data Integration - e-Learning - Web Services - Other Scenarios. (4)

ONTOLOGY ENGINEERING: Constructing Ontologies Manually - Reusing Existing Ontologies - Using Semiautomatic Methods - On-To-Knowledge Semantic Web Architecture. (4)

PRACTICALS

1. Generation of well-formed XML document
2. Creating XML DTD and XSD for the given XML document.
3. Design a XSLT to display the XML document (given as input) based on the constraints given.
4. Generate an RDF graph
5. Create an RDFS ontology (in triple or graph notation)
6. Write an RDF/XML encoding for the given situation.
7. Generation of OWL document
8. A Package to implement the techniques.

Total: L:45+P:30 = 75

TEXTBOOK

1. Grigoris Antoniou and Frank van Harmelen, "A Semantic Web Primer", MIT Press, Cambridge, 2004.

REFERENCES

1. John Davies, Dieter Fensel & Frank van Harmelen, "Towards the Semantic Web", John Wiley& Sons, New York, 2003.
2. Breitman KK, Casanova MA and Truszkowski W, "Semantic Web: Concepts, Technologies and Applications", Springer, Rio de Jeniro, 2007.

12XTEA PERVASIVE COMPUTING

3 0 2 4

Introduction - basics and visions of pervasive computing - Moore's law - living in a digital world - modeling key for pervasive computing properties - pervasive system environment interaction - architectural design for pervasive system - computing devices and their characteristics - pervasive information access devices-smart identification, smart card, labels, tokens-embedded controls, smart sensors, actuators, appliances, home networking, entertainment - various operating systems for pervasive devices - Middleware – Connecting the world – WWAN, SRWC, DECT, Bluetooth, IrDA – mobile internet – internet protocols. (9)

Approaches for developing pervasive applications – categorization - smart services for pervasive application development - developing mobile applications – presentation transcoding – device independent view component – heterogeneity of device platforms - Context Awareness and Mobility to building pervasive applications. (7)

Communication technologies for pervasive computing - audio networks, data networks - wireless data networks - pervasive networks - service oriented networks - network design issues - Managing smart devices in virtual environments, human user-centered and physical environments - pervasive computing issues and outlook. (8)

Context Aware Systems - modeling - mobility awareness - spatial awareness - temporal awareness - ICT system awareness - Intelligent Systems - basic concepts- autonomous systems - reflective and self aware systems - self management and autonomic computing - complex systems. (7)

Location Aware Systems - basic concepts - location modeling - Introduction to location management – DNS Server, server process, client process – location update – location inquiry-location management cost – network topology – mobility pattern, memory less movement model, Markovian Model, Shortest distance model, Gauss-Markov model, Activity Based Model, Mobility Trace, Fluid-flow Model, Gravity Model. (8)

Location Updates - Location relatedness and the query model – location dependent data – location aware queries – location dependent queries – moving object database queries – query classification – query transition steps in LDQ processing. (6)

PRACTICALS

1. Create Application with onClick, onKeyDown, onFocusChanged Event Handlers
2. Create Application with Toast Notifications
3. Create Application with Android's Advanced User Interface Functions
4. Create Android Audio/Video Application
5. Create Application to Create, Modify and Query an SQLite Database
6. Create Application that Works with an Android Content Provider
7. Create application that performs Data Storage and Retrieval from Android External Storage
8. Create Location-Aware application that uses Proximity Alerts and Google Maps API
9. Implementation of small packages to demonstrate all apis.

Design and Implement the query classification and query transition in LDQ processing.
Develop a package

Total: L:45+P:30 = 75

TEXT BOOKS

1. Stefan Poslad, "Ubiquitous Computing - Smart Devices, Environment and Interactions", John Wiley & Sons, New York, 2011.
2. Adelstein F, Gupta SKS, "Fundamentals of Mobile and Pervasive Computing" Tata McGraw-Hill, New York, 2005.
3. Mohammed Ilyas, Imad Mahgoub: "Mobile Computing Handbook", Auerbach Publications, Boca Raton, 2005.

REFERENCES

1. Burkhardt, Henn, Hepper, Rintdorff, Schaeck. "Pervasive Computing", Addison Wesley, New Delhi, 2002.
2. Ashoke Talukdar and Roopa Yavagal, "Mobile Computing", Tata McGraw Hill, New Delhi, 2010.

12XTEB NETWORK ALGORITHMICS

3 0 2 4

INTRODUCTION: Algorithms Vs Algorithmics – What network algorithmics is about – Network bottlenecks – Endnode bottlenecks – Router bottlenecks – characteristics of network algorithmics . (4)

NETWORK IMPLEMENTATION MODELS: Protocols - Hardware - Network device architectures – Operating System Implementation Principles – System Principles – Principles for modularity and efficiency – Principles for speeding up routines – Principles in action. (8)

ENDNODE ALGORITHMICS: Copying data – Transferring Control – Maintaining timers – Protocol Processing. (8)

ROUTER ALGORITHMICS: Exact match lookup – Prefix match look ups – Packet Classification – Switching – Scheduling packets – Computing traffic matrices. (15)

NETWORK SECURITY: Searching for multiple strings in packet payloads – IP trace back via probabilistic marking and logging – Detecting worms. (10)

PRACTICALS

1. Implementation of CRC using a fast implementation technique.
2. Implementation of IP prefix lookup using lulea tries.
3. Implementation of binary search on prefixes
4. Implementation of packet classification using linear search
5. Implementation of packet classification using set pruning trees
6. Implementation of decision trees approach for packet classification.

7. Implementation of packet scheduling algorithms.
8. Implementation of Aho Corasick algorithm.

Total: L:45+P:30 = 75

TEXT BOOKS

1. George Varghese, "Network Algorithmics, An Interdisciplinary Approach to Designing Fast Networked Devices", Morgan Kaufmann, San Francisco, 2006.
2. Michal Pioro and Deepankar Medhi, "Routing Flow and Capacity Design in Communication and Computer Networks", Morgan Kaufmann, San Francisco, 2007.

REFERENCES

1. James D McCabe, "Network Analysis, Architecture and Design", Morgan Kaufmann, Burlington, 2007.
2. Panos C Lekkas, "Network Processors, Architectures, Protocols and Platforms (Telecom Engineering)", McGraw Hill, New York, 2008.

12XTEC SOFTWARE PATTERNS

3 0 2 4

INTRODUCTION TO PATTERNS: Reusable object oriented software, Motivation, Best design practices of object oriented software, Benefits of patterns, Definition, Types, Pattern description, How design patterns solve design problems, Pattern Language, IDIOMS. (6)

DESIGN PATTERNS: Creational pattern – Abstract factory, Builder, Factory method, Prototype, Singleton, Structural patterns – Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Behavioral patterns – Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template method, Visitor, Chain of Responsibility, Case Studies. (15)

ARCHITECTURAL PATTERNS: From Mud to Structure – Layers, Pipes and Filters, Blackboard, Distributed systems – Broker, Interactive Systems – Model View Controller (MVC), Presentation Abstraction Control, Adaptable Systems – Reflection, Microkernel, Case studies. (6)

ANTIPATTERNS: What is an Anti-pattern, Well-known anti-patterns, Why study anti-patterns. (3)

PATTERN MINING: Current techniques and tools for mining design patterns, Comparative study, Benefits of pattern mining, Literature Survey of approaches to pattern discovery. (6)

CODE REFACTORING: What is refactoring, Principles in refactoring, Bad smells in code, Composing methods, Moving features between objects, Organizing data, Simplifying conditional expressions, Making method calls simpler, Dealing with generalization. (9)

PRACTICALS

1. ATM Simulation – Singleton pattern
2. Image Viewer Application – Bridge pattern
3. Address Book Maintenance – Prototype pattern
4. US, Canada Tax and Freight charges – Factory Method pattern
5. The Fast Food Franchise – Builder pattern
6. Computer Models with different architectures – Abstract Factory pattern
7. An Evaluation Application – Decorator pattern

Total: L:45+P:30 = 75

TEXT BOOKS

1. Erich Gamma, Richard Helm, Ralph Johnsons and John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson Education, New Delhi, 2004.
2. Frank Buschman, Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal, "Pattern-Oriented SoftwareArchitecture: A System of Patterns", John Wiley & Sons, New Delhi, 2008.
3. Martin Fowler, Kent Beck, William Opdyke, Don Roberts, "Refactoring: Improving the Design of Existing Code", Addison-Wesley Longman, New York, 2012.

REFERENCES

1. Sherif Yacoub, Hany Ammar, "Pattern-Oriented Analysis and Design: Composing Patterns to Design Software Systems", Pearson Addison-Wesley, Boston, 2003.

2. Partha Kuchana, “Software Architecture Design Patterns in Java”, Auerbach Publications, Boca Raton, 2004.
3. William J. Brown, Raphael C. Malveau, Hays W. “skip” McCormick, Thomas J. Mowbray, “AntiPatterns: Refactoring Software, Architectures, and Projects in Crisis”, John Wiley& Sons, New York, 1998.

12XTED CLOUD COMPUTING

3 0 2 4

INTRODUCTION TO PARALLEL AND DISTRIBUTED COMPUTING: Introduction, Architecture and Distributed computing models and technologies SOA, Web Services. (5)

GRID, CLUSTER AND UTILITY COMPUTING: Introduction, Architecture, Pros & Cons, Real time applications. (4)

INTRODUCTION TO CLOUD COMPUTING : Definition, History, Comparison of Cloud Computing with Grid, Cluster and Utility Computing, Deployment models – Private, Public, Hybrid and Community - Pros and Cons of Cloud Computing . SaaS, PaaS, IaaS etc. (8)

VIRUTUALIZATION : Types of Virtualization, Tools for Virtualization, Architecture of VMM, Virtualization for Cloud. (4)

ADVANCED WEB TECHNOLOGIES:AJAX and Mashup – Programing examples using applications. (4)

MAP REDUCE PARADIGMS: Introduction, GFS Architecture, HDFS Architecture, Hbase, Google big Table, Amazon’s (key value) pair storage and Microsoft’s Azure infrastructure, Map reduce programming examples. (6)

CLOUD COMPUTING FRAMEWORK: Amazon EC3, S3 storage revises, Aneka frame work, IBM blue Cloud. (7)

APPLICATIONS: Distributed search engine and distributed data mining in the cloud. (7)

PRACTICALS
1. Implement a distributed search engine.
2. Implement distributive data mining for an application.
3. Package to be developed using Virtualization and other cloud concepts.

Total: L:45+P:30 = 75

TEXT BOOK

1. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter “Cloud Computing : A Practical Approach” Mc Graw Hill, New York, 2010.

REFERENCES

1. Liu M L, “Distributed Computing Principles and Applications”, Pearson Education, New Delhi, 2005
2. Ron Schmelzer et al, ”XML and Web Services”, Pearson Education, New Delhi, 2002.
3. Dean J and Ghemawat S, “ MapReduce: Simplified Data Processing on Large Clusters”, In: Proceedings of Operating Systems Design and Implementation (OSDI), San Francisco, 2004.
4. DeCandia et al G,” Dynamo Amazon’s Highly Available Key-Value Store”, In Proceedings of the 21st ACM Symposium on Operating Systems Principles, Stevenson, 2007
5. Ghemawat S, Gobioff H and Leung S T, ”The Google File System”, In Proceedings of the 21st ACM Symposium on Operating Systems Principles, Stevenson, 2003.
6. www.gridcomputing.com
7. www.cloudcomputing.com
8. https://computing.llnl.gov/tutorials/parallel_comp/
9. http://www.vmware.com/pdf/virtualization.pdf

12XTEE SOFTWARE PROCESS MANAGEMENT

3 0 2 4

SOFTWARE ENGINEERING: An Introduction - The Personal Software Process - Time Management - The Logic of Time Management - Tracking Time Period and Product Planning - Product Planning - Product Size. (7)

MANAGING YOUR TIME: Elements of Time Management - Managing Commitments - Managing Scheduler - Project Plan - The Project Plan Summary. (7)

SOFTWARE DEVELOPEMNT PROCESS: Defects - Software quality the updated Personal Software Process - Finding Defects - Code Review Checklist - Building a Personal Checklist - Coding Standards - Projecting Defects –Updated Project Plan. (10)

ECONOMICS OF DEFECT REMOVAL DESIGN: Defects - Product Quality - Process Quality. (6)

TEAM SOFTWARE PROCESS (5)

CAPABILITY MATURITY MODEL: Structure - Interpretation - Usage - Key process areas for various levels. (6)

ISO 9001: Elements of ISO 9001 - Improving Quality System - Case Study. (4)

PRACTICALS

1. Time Measurement Assignment.
2. PSP Programming Assignment.
3. Assessing the Quality of the Student's PSP Data and recording observations in the specified format.
4. Estimating the size of the program using PSP Techniques.
5. Design Review.
6. Code Review.
7. Process and Product quality Measurement.
8. Development of Project Plan.
9. Evaluation of the quality of Team's process and Product.
10. TSP Inspection.

Total: L:45+P:30 = 75

TEXT BOOKS

1. Watts. S. Humphrey, "Introduction to Personal Software Process", Addison-Wesley Professional, USA 2000.
2. Watts.S.Humphrey, "Introduction to the Team Software Process", Addison Wesley Longman, USA 2002.

REFERENCES

1. Watts. S. Humphrey, "Managing Technical People: Innovation, Teamwork and the Software People", Addison-Wesley, USA1997.
2. Watts. S. Humphrey, "A Discipline for Software Engineering", Addison-Wesley,USA, 1995.
3. "The Capability Maturity Model", Carnegie Mellon University Software Engineering Institute, Pittsburg, 2002.
4. Pankas Jalote , "CMM in Practice", Pearson Education, Indianapolis, 2002.
5. Darrel Ince, "ISO 9001 and S/W Quality Assurance", Mc-Graw Hill, New Delhi,1994.

12XTEF SOCIAL NETWORK ANALYSIS

3 0 2 4

INTRODUCTION: Motivation - different sources of network data - types of networks - tools for visualizing network data - review of graph theory basics - game theory basics. (9)

GRAPH THEORETIC PROPERTIES OF SOCIAL NETWORKS: Notions of centrality - Strong and weak ties – Homophily - Structural Balance. (5)

DYNAMIC PROPERTIES OF NETWORKS: Information diffusion - networks effects on information diffusion - maximizing influence spread - power law and heavy tail - preferential attachment models - small world phenomenon - cascading behavior on networks - Epidemics. (11)

BEHAVIORAL PROPERTIES ON NETWORKS: Network economics - Bargaining and power in networks - Sponsored search markets. (10)

MINING GRAPHS: Community and cluster detection: random walks - spectral methods - link analysis for web mining. (10)

PRACTICALS

1. Getting acquainted with UCINET and Netdraw.
2. Implementing graph-theoretic concepts using UCINET
3. Working with data entry of network data using a variety of formats.
4. Working with Visualization, Ego networks, Centrality etc.

Total: L:45+P:30 = 75

TEXTBOOK

1. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, Cambridge, 2010.

REFERENCES

1. Stanley Wasserman, Katherine Faust,"Social network analysis: methods and applications", Cambridge University Press, Cambridge,1994.
2. Peter R. Monge, Noshir S. Contractor, "Theories of communication networks", Oxford University Press, New York, 2003.
3. Duncan J Watts. "Six degrees: the science of a connected age", Norton, New York, 2004.
4. Narahari, Y., Garg, D., Ramasuri, N., and Prakash, H, "Game Theoretic Problems in Network Economics and Mechanism Design Solutions", Springer Verlag, London, 2008.
5. Various research papers.

12XTEG DATA COMPRESSION

3 0 2 4

DATA COMPRESSION LEXICON: Introduction to Data Compression - Dawn Age - Coding - Modeling - Ziv and Lampel- Lossy Compression. (4)

MINIMUM REDUNDANCY CODING (THE DAWN AGE): The Shannon - Fano Algorithm, The Huffman Algorithm - Into the Huffman Code : Counting the Symbols, Building the tree - Compression Code. (4)

ADAPTIVE HUFFMAN CODING: Adaptive Coding - Updating the Huffman Tree - The Code. (4)

ARITHMETIC HUFFMAN CODING: Arithmetic Coding - The Code. (6)

STATISTICAL MODELING: Higher-order Modeling - Finite Context Modeling - Adaptive Modeling – Highest- Order Modeling.(4)

DICTIONARY-BASED COMPRESSION: StaticVs.Adaptive - Israeli roots – ARC. (4)

SLIDING WINDOW COMPRESSION: The Algorithm - LZSS Compression - The Code - Compression Code. (5)

LZ78 COMPRESSION: Compression – Decompression.

SPEECH COMPRESSION: Digital Audio Concepts - Lossless Compression of Sound. (5)

VIDEO COMPRESSION: JPEG Compression - Implementing DCT - Complete Code Listing. (5)

PRACTICALS

1. Implement Shannon Fano algorithm and Huffman algorithm.
2. Design compression and decompression program using adaptive Huffman coding.
3. Implement arithmetic coding algorithm.
4. Design compression program using statistical modeling upto 3 order.
5. Design compression and decompression program using L277 algorithm

Total: L:45+P:30 = 75

TEXT BOOK

1. Mark Nelson, "The Data Compression Book", BPB Publications, New Delhi, 2003

REFERENCES

1. Yun Q Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering", CRC Press, Boca Raton, 2008.
2. David S Tanbman and Michael W Marcellin, "JPEG – 2000 Image Compression Fundamentals, Standards and Practice" Kluwer Academic, Dordrecht, 2002.
3. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann, San Francisco, 2006.