Syllabus Workshop on 04-09-2014

University of Kalyani

Department of Computer Science & Engineering

Curriculum for M. Tech.(CSE) W. e. f. 2015-16

Semester I

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks			
		Lecture	T#	P#	Total		S#	Exam.		Total
Theoretical										
CSE 101	Advanced Operating Systems	4	0	0	4	4	20	80		100
CSE 102	Soft Computing & Digital Image Processing	4	0	0	4	4	20	P-20	Th-60^	100
CSE 103	Advanced Mathematics	4	0	0	4	4	20	80		100
CSE 104	Advanced Computer Architecture	4	0	0	4	4	20	80		100
CSE 105	Advanced Design and Analysis of Algorithm	4	0	0	4	4	20	80		100
Practical	**# T – Tutorial, P – Practical, S – Sessional, ^Th – Theory, A - Assignment**									
CSE 101 L	Soft Computing & Image Processing Lab.	-	-	6	6	4	20	A-20,P-50,V-30		100
						Total Credit: 24		**Total Marks: 600**		

Semester II

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks			
		Lecture	T	P	Total		S	Exam.		Total
Theoretical										
CSE 201	Advanced Network Security & TCP/IP Programming	4	0	0	4	4	20	P-20	Th-60	100
CSE 202	Mobile & Wireless Computing	4	0	0	4	4	20	80		100
CSE 203	Advanced Database System	4	0	0	4	4	20	P-20	Th-60	100
CSE 204 E	Elective I(CS)	4	0	0	4	4	20	80		100
CSE 205 E	Elective II (IT)	4	0	0	4	4	20	80		100
Practical										
CSE 201 L	Advanced Communication Lab.	0	0	6	6	4	20	A-20,P-50,V-30		100
						Total Credit: 24		**Total Marks: 600**		

Semester III

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks			
		Lecture	T	P	Total		S	Exam		Total
Theoretical										
CSE 301	Remote Sensing GIS, GPS	4	0	0	4	4	20	80		100
CSE 302 E	Elective III (CA)	4	0	0	4	4	20	P-20	Th-60	100
CSE 303 D	Thesis I	-	-	18	18	12	R-100, P-100, V-100*			300
Practical	*** R-Report, P- Presentation, V - Viva**									
CSE 301 L	Satellite Image Processing & GIS Lab	-	-	6	6	4	20	A-20,P-50,V-30		100
						Total Credit:24		**Total Marks: 600**		

Semester IV

Paper Code	Paper Name	Weekly Contact Period (WCP)				Credit	Marks			
		Lecture	T	P	Total		Report	Presentation	Viva	Total
Dissertation										
CSE 401D	Thesis II	-	-	24	24	16	200	100	100	400
CSE 402S	Seminar	-	-	-	-	6	30	30	40	100
CSE 403GV	Grand Viva	-	-	-	-	6	-	-	100	100
						Total Credit: 28			**Total Marks: 600**	

Total Marks for Two Year (4-Semesters) M. Tech.(CSE) Course is 2400, Total Credit is 100.

For sessional at least two intermediate exams are to be taken, average mark will be the sessional marks for each subject. Corrected paper of these intermediate exams is to be returned to the respective students. Topic must be different for each students in Seminar.

Elective I(Computer Science(CS))

I. Parallel Architecture/Processing and Grid Computing
II. Theory of Programming Languages/Computing
III. Real Time Systems
IV. Pattern Recognition

Elective II(Information Technology(IT))

I. Web Mining and Internet Technology
II. Data Warehousing and Data Mining
III. Management Information Systems
IV. Advanced Software Engineering
V. Data Compression & Error Correction
VI. Optical Networks
VII. Embedded Systems
VIII. Business Intelligence

Elective III(Computer Application(CA))

I. Bioinformatics
II. Artificial Intelligence and Expert Systems
III. VLSI Technology
IV. Speech & Natural Language Processing
V. Network Administration
VI. Cloud Computing
VII. Authentication & Steganography
VIII. Software Architecture
IX. Green Computing

Subject Code:- CSE 101

Advance Operating Systems

- Introduction – overview of operating system concepts – Process management and Scheduling , Memory management : partitioning, paging, segmentation, virtual memory, Device and File management.
- Distributed Systems – Hardware and Software concepts – Design issues; Communication in Distributed systems : Layered protocols - ATM networks - Client Server model – Remote Procedure Calls.
- Synchronization : Clock synchronization – Mutual exclusion – Election algorithms, - Atomic transactions – Deadlocks; Processes : Threads – System models – processor allocation – Scheduling – Fault tolerance – Real time distributed systems.
- Shared memory : Consistency models – Page based distributed shared memory – Shared variables – Object based distributed shared memory; Distributed File Systems : Design and Implementation.
- Case Study: Introduction to Amoeba – Object and Capabilities – memory management – Communication – Amoeba Servers.

TEXT BOOKS

- Andrew S Tanenbaum , " Distributed Operating Systems " , Pearson Education India, 2001.

REFERENCE BOOKS

- Mukesh Singhal, Niranjan G Shivratri , " Advanced Concepts in Operating Systems", McGraw Hill International, 1994.
- Pradeep K Sinha , " Distributed Operating Systems Concepts and Design ", PHI, 2002.

Subject Code:- CSE 102

Image Processing

- Light,Luminance, Brightness and Contrast, Eye, Monochrome vision model, Image processing problems and applications, Vision , camera, Digital processing system, 2-D sampling theory, Aliasing , Image quantization, Lloyd Max Quantizer, Dither, Color images, Linear systems and shift invariance, Fourier Transform, Z-Transform, Matriz theory results, Block matrices and Kronecker products.

- 2-D orthogonal and Unitary transforms , 1-D and 2-D DFT , Cosine , Sine , Walsh Hadamard , Haar , Slant , Karhunen-loeve , Singular value decomposition transforms.

- Point operations – contrast stretching , clipping and thresholding, density slicing, Histogram equalization , modification and specification , spatial operations – spatial averaging , low pass , high pass , band pass filtering, direction smoothing , medium filtering , generalized ceptrum and homomorphic filtering , edge enhancement using 2-D IIR and FIR filters , color enhancement.

- Image observation models, sources of degradation, inverse and Wiener filtering , geometric mean filter , non linear filters , smoothing splines and interpolation , constrained least square restoration.

- Image data rates , pixel coding , predictive techniques , transform coding and vector DPCM. Block truncation coding , Wavelet transform coding of images, color image coding, Random transform , back projection operator , inverse random transform , back projection algorithm , fan beam and algebraic restoration techniques.

TEXT BOOKS

Anil Jain K. "Fundamentals of Digital Image Processing", PHI, 1999.
William Pratt , "Digital Image Processing", Wiley Interscience, 2nd edition 1991

REFERENCE BOOKS

Gonzales, Rafael and Windz, "Digital Image Processing", 2nd edition , Addison- Wesley.,1998
Maner Sid-Ahmed A., "Image Processing", McGraw Hill International Edition, 1995.
Andrion Low-"Introductory computer Vision and Image Processing" , MCGraw Hill International Edition.

Soft Computing

- **Fuzzy Logic and Approximate Reasoning**:
  Conventional and fuzzy sets: Basic concepts of fuzzy logic
  Fuzzy expressions: Basic principles of fuzzy logic and fuzzy inference rules, fuzzy relations, fuzzy operators, realization of fuzzy systems using fuzzy relations
  Application of fuzzy logic in vision, pattern recognition, robotics and linguistics. Approximate reasoning in Experts Systems, Fuzzy sets in approximate reasoning, Fuzzy propositions in approximate reasoning. Transition Modifier rules, Basic principles of approximate reasoning and rules of inference.
- **Genetic Algorithms (GAs) :** Introduction to GAs, Binary encodings of candidate solutions, Schema Theorem and Building Block Hypothesis, Genetic operators – crossover and mutation, parameters for GAs, Reproduction mechanism for producing Offspring, Darwinian Principle in evaluating objective function. Convergence Analysis: Simple GA schemes, Stochastic models: GA approaches to optimization problems.
  Basic Concepts and Principles of Neural Networks (NNs) and Learning Systems.
  Learning with GAs and Artificial NNs (ANNs); Composite use of Fuzzy Logic, ANNs and GAs.
- **Neurocomputing**: Models of Neurocomputing: (a) Perceptron Training, (b) Back propagation learning, (c) Hopfield nets, (d) Adaptive resonance theory I & II, (e) Self-organizing feature map, (f) ADALINE. Applications in pattern classification and image understanding.
- **Chaos Theory**, **Fusion of Neuro**, **Fuzzy**, **GA** & **Chaos theory** & Applications to simple problems.

Books:

1. David E. Goldberg: Genetic Algorithms in Search, Optimization and Machine Learning, Addision Wesley, MA, 1989.
2. S. Haykin: Neural Networks - A Comprehensive Foundation, Macmillan College Publishing Company, New York, 1994.
3. H. J. Zimmermann: Fuzzy set theory and its application, 2nd revised edition, Allied Publishers Ltd.
4. G. J. Klir, B. Yuan: Fuzzy sets and Fuzzy logic: Theory and Applications, PHI, 1995.
5. R. L. Devaney: An Introduction to Chaotic Dynamical Systems, 2nd Ed. Addision Wesley, 1989.
6. An Introduction to Genetic Algorithms – M. Mitchell.
7. Genetic Algorithms – K. F. Man, K. S. Tang and S. Kwong.
8. Genetic Algorithms + Data Structures = Evolution Programs – Z. Michalewicz.
9. Adaptation in Natural and Artificial Systems - J. H. Holland.
10. Genetic Algorithms : for VLSI Design, Layout & Test Automation – P. Mazumder and E. M Rudnick.
11. Neuro- Fuzzy and Soft Computing : A Computational Approach to Learning and Machine Intelligence - J. S. R. Jang C. T. Sun and E. Mizutani.
12. Theory and Practice of Uncertain Programming – B. Liu.
13. Fuzzy Logic for the Applications to Complex Systems – W. Chiang and J. Lee.
14. Fuzzy Logic with Engineering Applications – T. J. Ross.
15. Neural Network and Fuzzy Systems : A Dynamical Systems Approach to Machine Intelligence – B. Kosko.

Subject Code:- CSE 103

Advanced Mathematics

Combinatorics: Multinominal theorem, principle of inclusion; Recurrence relations – classification, summation method, extension to asymptotic solutions for subsequences; Linear homogeneous relations, characteristic root method, general solution for distinct and repeated roots, non-homogeneous relations and examples, generating functions and their application to linear homogeneous recurrence relations, non-linear recurrence relations, exponential generating functions, brief introduction to Polya theory of counting.

Graph Theory: Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Minimum spanning tree, rooted trees and binary trees, planar graphs, Euler's formula, statement of Kuratowskey's theorem, dual of planer graph, independence number and clique number, chromatic number, statement of Four-color theorem, dominating sets and covering sets.

Logic: Propositional Calculus- propositions and consecutives, syntax; Semantics- truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of consecutives; Equivalence and normal forms; Compactness and resolution; Formal reducibility – natural deducation system and axiom system; Soundness and completeness.

Introduction to Predicate Calculus: Syntax of first order language; Semantics- structures and interpretation; Formal deductibility, First Order theory, models of a first order theory (definition only), validity, soundness, completeness, compactness (statement only), outline of resolution principle.

References

J.L. Mott, A. Kandel and T.P. Baker: Discrete Mathematics for Computer Scientists, Reston, Virginia, 1983.
D.F. Stanat and D.E. McAllister: Discrete Mathematics in Computer Science, Prentice Hall, Englewood Cliffs, 1977.
R.A. Brualdi: Introductory Combinatorics, North-Holland, New York, 1977.
Reingold et al.: Combinatorial algorithms: theory and Practice, Prentice Hall, Englewood Cliffs, 1977.
J.A. Bondy and U.S.R. Murthy: Graph Theory with Applications, Macmillan Press, London, 1976.
N. Deo: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall, Englewood Cliffs, 1974.
E. Mendelsohn: Introduction to Mathematical Logic, 2nd Ed. Van-Nostrand, London, 1979.
L. Zhongwan: mathematical Logic for Computer Science, World Scientific, Singapore, 1989.
F.S. Roberts: Applied Combinatorics, Prentice Hall, Englewood Cliffs, 1984.
J.P Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computers.
J.L. Gersting: Mathematical Strcutures for Computer Sciences.
S. Lipschutz: Finite Mathematics.
S. Wiitala: Discrete Mathematics – A Unified Approach.
C. L. Liu : Elements of Discrete Mathematics.
K . D. Joshi : Foundation of Discrete Mathematics.
S. Sahani : Concept of Discrete Mathematics.
L. S. Levy : Discrete Structure in computer Science.
J. H. Varlist and R. M. Wilson: A course in Combinatorics.

Subject Code:- CSE 104

Soft Computing

- **Fuzzy Logic and Approximate Reasoning**:
  1. Conventional and fuzzy sets: Basic concepts of fuzzy logic
  2. Fuzzy expressions: Basic principles of fuzzy logic and fuzzy inference rules, fuzzy relations, fuzzy operators, realization of fuzzy systems using fuzzy relations

3. Application of fuzzy logic in vision, pattern recognition, robotics and linguistics. Approximate reasoning in Experts Systems, Fuzzy sets in approximate reasoning, Fuzzy propositions in approximate reasoning. Transition Modifier rules, Basic principles of approximate reasoning and rules of inference.

- **Genetic Algorithms (GAs) :** Introduction to GAs, Binary encodings of candidate solutions, Schema Theorem and Building Block Hypothesis, Genetic operators – crossover and mutation, parameters for GAs, Reproduction mechanism for producing Offspring, Darwinian Principle in evaluating objective function. Convergence Analysis: Simple GA schemes, Stochastic models: GA approaches to optimization problems. Basic Concepts and Principles of Neural Networks (NNs) and Learning Systems. Learning with GAs and Artificial NNs (ANNs); Composite use of Fuzzy Logic, ANNs and GAs.
- **Neurocomputing**: Models of Neurocomputing: (a) Perceptron Training, (b) Back propagation learning, (c) Hopfield nets, (d) Adaptive resonance theory I & II, (e) Self-organizing feature map, (f) ADALINE. Applications in pattern classification and image understanding.
- **Chaos Theory**, **Fusion of Neuro**, **Fuzzy**, **GA** & **Chaos theory** & Applications to simple problems.

Books:

1. David E. Goldberg: Genetic Algorithms in Search, Optimization and Machine Learning, Addision Wesley, MA, 1989.
2. S. Haykin: Neural Networks - A Comprehensive Foundation, Macmillan College Publishing Company, New York, 1994.
3. H. J. Zimmermann: Fuzzy set theory and its application, 2nd revised edition, Allied Publishers Ltd.
4. G. J. Klir, B. Yuan: Fuzzy sets and Fuzzy logic: Theory and Applications, PHI, 1995.
5. R. L. Devaney: An Introduction to Chaotic Dynamical Systems, 2nd Ed. Addision Wesley, 1989.
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10. Genetic Algorithms : for VLSI Design, Layout & Test Automation – P. Mazumder and E. M Rudnick.
11. Neuro- Fuzzy and Soft Computing : A Computational Approach to Learning and Machine Intelligence - J. S. R. Jang C. T. Sun and E. Mizutani.
12. Theory and Practice of Uncertain Programming – B. Liu.
13. Fuzzy Logic for the Applications to Complex Systems – W. Chiang and J. Lee.
14. Fuzzy Logic with Engineering Applications – T. J. Ross.
15. Neural Network and Fuzzy Systems : A Dynamical Systems Approach to Machine Intelligence – B. Kosko.

Subject Code:- CSE 104

Advanced Computer Architecture

Subject Code:- CSE 105

Design and Analysis of Algorithms

- **Quick Review of basic concepts** - complexity measures, worst-case, average case and amortized complexity functions, model of computation.
- **Algorithm Design Paradigm** - Divide and Conquer, Recursion, Greedy method, Dynamic programming. Role of Data Structures.
- **Sorting and Selection Problems:** Order Statistics, sorting methods, lower bounds.
- **Searching and Selection Problems:** Order Statistics, sorting methods, lower bounds.

- **Searching and Set manipulation:** Searching in Static table - path lengths in Binary trees and applications, optimality of Binary search in worst case and average case, construction of weighted Binary Search tree. Searching in dynamic table - randomly grown binary search trees, AVL trees, (a, b) trees; Union-find problem -tree representation of set, weighted union and path compression, analysis and application.
- **Hashing:** chaining, open addressing, universal hashing function.
- **Graph algorithms:** Review of topological sort, connected and biconnected components, shortest paths, minimum spanning trees. Maximum matching, maximum-flow (Ford-Fulkerson).
- **Arithmetic and Algebraic problems:** Integer multiplication, GCD, Polynomial evaluation, Matrix Multiplication, Lower Bounds. Introductory Stringology. Some geometric algorithms.
- **NP-completeness:** Determinism and non-determinism, P, NP, NP-complete, Cook's theorem, Some NP-complete problems, Approximation algorithms. Notion of Randomization and Parallelism in algorithms.

Books:

1. T. H. Cormen, C. E. Leiserson and R. L. Rivest: Introduction to Algorithms, MIT Press, 1990.
2. U. Manber: Introduction to Algorithms, Addison-Wesley, 1989.
3. G. Brassard and P. Bartley: Algorithmics: Theory and Practice, Prentice Hall International 1996.
4. A. V. Aho, J. E. Hopcroft and J. D. Ullman: Design and Analysis of Algorithms, Addison-Wesley, 1974.

Subject Code:- CSE 201

Advanced Network Security & TCP/IP Programming

- Uniqueness – Number Theory concepts – Primality – Modular Arithmetic – Fermet & Euler Theorem – Euclid Algorithm – RSA – Elliptic Curve Cryptography – Diffie Hellman Key Exchange
- Digests – Requirements – MAC – Hash function – Security of Hash and MAC – Birthday Attack – MD5 – SHA – RIPEMD – Digital Signature Standard – Proof of DSS
- Authentication applications – Kerberos – Kerberos Encryption Techniques – PGP – Radix64 – IP Security Architecture – Payload – Key management – Web security requirements – SSL – TLS – SET
- Resources – Intruders and Intrusion – Viruses and Worms – OS Security – Firewalls – Design Principles – Packet Filtering – Application gateways – Trusted systems – Counter Measures
- Protocols and standards – OSI model – TCP / IP protocol suite – addressing – versions – underlying technologies.
- Classful addressing – other issues – subnetting – supernetting – classless addressing – routing methods – delivery – table and modules – CIDR – ARP package – RARP.
- Datagram – fragmentation – options – checksum – IP package – ICMP – messages, formats – error reporting – query – checksum – ICMP package – IGMP – messages, operation – encapsulation – IGMP package – UDP – datagram – checksum – operation – uses – UDP package.
- Services – flow, congestion and error control – TCP package and operation – state transition diagram – unicast routing protocols – RIP – OSPF – BGP – multicast routing – trees – protocols – MOSPF – CBT – PIM
- Client server model – concurrency – processes – sockets – byte ordering – socket system calls – TCP and UDP client-server programs – BOOTP -DHCP – DNS – name space, resolution – types of records – concept – mode of operation – Rlogin.

TEXT BOOKS

- Behrouz Forouzan, “TCP/IP protocol suite “, 2nd edition, Tata McGrawhill..

REFERENCE BOOKS

- Douglas Comer, “Internetworking with TCP / IP” ,Vol – 1, PHI, 2000.

Subject Code:- CSE 202

Mobile & Wireless Computing

- **Wireless Transmission**-Wired and wireless, Mobility of users and equipments, Electromagnetic Spectrum, Radio and Microwave communication, Infrared and Millimeter waves, Legthwave Transmission.
- **Satellite Network Architecture**-Satellite Orbits-GEO LEO, MEO. Inmarsat, Iridium, Odyssey, Global Star, Archimedes and other Satellite Networks.
- **Spread Spectrum and CDMA**-Direct (pseudo-noise) and Frequency hopped Spread Spectrum. CDMA System.
- **Wireless LANs** -MACA and MACAW protocols. Infrared LAN. Cellular Radio Systems-Paging, Cordless telephones, Analog Cellular telephones AMPS. Digital Cellular Telephone-GSM. Personal Communication service (PCS).
- **CDPD system**.
- **Mobile Data Networks** and their applications.
- Wireless and Mobile access to the Internet.

Books:

1. V. K. Garg & J. E. Wilks: Wireless and Personal Communication Systems: Fundamentals and Applications, IEEE Press and Prentice Hall, 1996.
2. T. S. Rappaport, B. D. Werner and J. H. Reed: Wireless Personal Communications: The Evolution of PCS, Dkyener Academic, 1996.
3. G. I. Stuber: Principles of Mobile Communication, Kluener Academic, 1996.
4. U. Black: Mobile and Wireless Networks, Prentice Hall PTR, 1996.

Subject Code:- CSE 203

Advanced Database Systems

- **Relational Database Management Issues** - Transaction Processing, Concurrency, Recovery, Security and Integrity.
- **Distributed Databases** - Storage structures for distributed data, data fragmentation, Transparency of distributed architecture, Distributed query processing, Transaction management in distributed environment, Recovery and Concurrency control, Locking protocols, Deadlock handling, Dynamic modeling of distributed databases, Client - Server Databases.
- Performance Tuning, Advanced Transaction Processing.
- **Object-oriented Databases** - Objects and Types, Specifying the behavior of objects, Implementing Relationships, Inheritance.
- Sample Systems.
- New **Database Applications**.
- **Multimedia Database** - Multimedia and Object Oriented Databases, Basic features of Multimedia data management, Data Compression Techniques, Integrating conventional DBMSs with IR and Hierarchical Storage Systems, Graph Oriented Data Model, Management of Hypertext Data, Client Server Architectures for Multimedia Databases

Books:

1. H. F. Korth & A. Silverschatz: Database Systems Concepts, McGraw Hill.
2. Bindu R. Rao: Object Oriented Databases, McGraw Hill, 1994.
3. Gray, Kulkarni, and Paton: Object Oriented Databases, Prentice Hall International, 1992.
4. Khoshafian: Object Oriented Databases, John Wiley & Sons, 1993.
5. S. Khoshafian & A. B. Baker, Multimedia and Imaging Databases, Morgan Kaufmann Publishers, 1996.
6. Kemper & Moerkoette: Object-Oriented Database Management, PH, 1994.
7. Alex Berson: Client/Server Architecture, McGraw Hill.

Subject Code:- CSE 301

Remote Sensing GIS, GPS

- Introduction: Sun and atmosphere, Remote Sensing a historical perspective.
- Electromagnetic Radiations: EM radiators, polarization, attenuation.
  Thermal radiations, EM for remote sensing.
  Fundamental of Radiometry.
- Physical Basics of Signatures: Signature OIR, TIR & Microware Region
- Remote Sensor: Classifications of Sensors, Sensor parameters.
  Resolution- Spatial & Spectral
  Optical, Microwave Sensors
- Platform: Principle of Sattelite Motion, Types of orbit, Orbit perturbations.
- GPS – Data Products: Dataformats, data product generation output media
- Date analysis: Visual analysis, Digital Classifications
- Application of Remote Sensing: Agriculture, Forestry, Land Cover Studies
  Water Resource, Earth System Science
- Geographical Interaction System Application.

Subject Code:- Elective I(CS - I)

Parallel Architecture/Processing and Grid Computing

- Parallel computer models: Multiprocessors and Multicomputer – Multivector and SIMD computer PRAM & VLSI models, conditions of parallelism. System interconnect architectures performance. Metrics and Measures.
- Advanced processor technology – Super scalar and vector processors – Memory hierarchy technology, virtual memory technology – cache memory organization – shared – memory organization.
- Linear pipeline processors – Nonlinear pipeline processors – Instruction pipeline design Arithmetic pipeline design – Superscalar pipeline design.
- Multiprocessor system interconnects – Cache coherence, Vector processing principle
  Compound Vector processing, SIMD computer organization, multiprocessor operating system, multiprocessor examples
- Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids
  Desktop Grids : Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.
- The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI)
- Desktop supercomputing – parallel computing – parallel programming paradigms – problems of current parallel programming paradigms – Desktop supercomputing programming paradigms – parallelizing existing applications – Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software applications.

TEXT BOOKS

Kai Hwang, “Advanced Computer Architecture”, Parallelism, Scalability, Programmability, McGraw Hill, 1993.

Ahmar Abbas, “ Grid Computing , A Practical Guide to Technology and Applications”, Firewall media , 2004.

REFERENCE BOOKS

Hwang Briggs, “Computer Architecture and parallel processing”, McGraw hill.
William Stallings, “Computer Organization and Architecture- Designing for Performance”, PHI,2000.

Joshy Joseph , Craig Fellenstein , “Grid Computing”, Pearson Education , 2004.
Foster , “Grid Blue print foe new computing”.

Subject Code:- Elective I(CS - III)

Real Time Systems

- **Real Time Systems**
  - Specification, Analysis, Design.
  - Definition, Types and Evolution;
  - State Diagram, Finite Automata, Timed Petri Net
  - Formal Methods for Analysis & Design.
- **Algorithm Development**
  - Implementation of Real Time Algorithms
  - Debugging and Verification
- **Real Time Distributed Computing**
  - Clock Synchronization, Real Time constraint satisfaction
  - Reliability & Safety.
- Case Studies
  - Computer Control Systems
  - Real Time Simulation Systems
  - Mission Control Systems
  - Safety Critical Systems.

Subject Code:- Elective I(CS - IV)

Pattern Recognition

- Bayes’ Decision Theory, Discriminant functions and decision procedures, Relaxation procedures, Non-separable behavior.
- Parameter estimation and supervised learning, Maximum likelihood estimation, Sufficient statistics, Problems of dimensionality, Nom [Ara, etroc techniques, density estimates, Parzen Windows, k-nearest neighbour estimation, Fisher's linear discriminate.
- Clustering and unsupervised learning, Cluster validity, hierarchical and graph theoretic methods, Sealing.
- Feature Selection-Karhunen Loeve, Stochastic approximation, kernel approximation, divergence measures.
- Syntactic Pattern Recognition, Inductive Learning, Grammatical Inference, Error correcting Parsing, Vapnik - Chorvononkis result.

Books:

1. Tou & Gonzalez: Principles of Pattern Recognition, Addison Wesley.
2. B. D. Ripley: Pattern Recognition & Neural Networks, Cambridge University Press.
3. Tou & Gonzalez: Syntactic Pattern Recognition, Addison Wesley.

Subject Code:- Elective II(IT - II)

Data Warehousing and Data Mining

- Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining,

- Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage.
- Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems,
- Concepts Description: Characterization and Comparison: Data Generalization and Summarization- Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.
- Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.
- Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.
- Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.
- Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER Harcourt India.
2. Data Mining Techniques – ARUN K PUJARI, University Press
3. Building the DataWarehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd..

REFERENCE BOOKS:

1. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
2. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION
3. The Data Warehouse Life cycle Tool kit – RALPH KIMBALL WILEY STUDENT EDITION
4. Data Mining Introductory and advanced topics –MARGARET H DUNHAM, PEARSON EDUCATION

Subject Code:- Elective II(IT - IV)

Advanced Software Engineering

- **System Engineering** - Analysis & Design
- Software **Architecture**s & **Design**.
- Software **Metrics**.
- Software **Testing Strategies**: Analytical models (e. g. Markov Chain Model, Probabilistic Models)
- **Software Reliability**: Analytical Models
- **Formal Methods** in Software Engineering (e. g. Formal Specification Language)
- **Software Re-use**
- **Re-engineering** - reverse engineering.
- Real-time Software Engineering.
- **Client/Server Software Engineering**.
- **CASE tool design & implementation**.

- **Verification** & **Validation**.
- **Object-oriented Software Engineering**: OO-Analysis, OO-Design, OO-Testing, metrics for OO systems.
- **System Modeling and Simulation**.
- Software Engineering **Economics**.

Books:

1. Pressman: Software Engineering, McGraw Hill.
2. Shoeman: Software Engineering, McGraw Hill.

Journals:

1. IEEE Transactions of Software Engineering (IEEE Press).

Subject Code:- Elective II(IT -V)

Data Compression & Error Corrections

Data Compressions

Introduction, Brief history, minimum redundancy codes, Shanon – Fanno code, Huffman code, Adaptive Huffman code, Arithmetic coding, Statistical Modelling, Dictionary based compression, Sliding window compression, Lz78 compression, Speech compression, Lossy Graphics compression.

Error Corrections

Mathematical background, Linear codes, codes for high speed memories,- bit error correcting, byte error correcting. Codes for mass memories. Asymmetric and unidirectional error codes, codes for logic design. Recent development of error correcting codes.

Books:

1. Error control coding for Computer stsystem by T.R.N Rao & E. Fujiwara, PHI Inc.

Subject Code:- Elective IV(CA -I)

Bioinformatics

Machine learning foundations – probabilistic framework, algorithms
Neural Networks and applications
Hidden Markov Models – theory & Applications
Probabilistic Graphical Models & Applications
Phylogenetic trees
Stotastic grammars & linguistics
Microarrays & Gene Expressions
Internet resources & pubic databases
Information theory & statistics in bioinformatics
HMM Techniques
Goussian Process, Kernel Methods and support.

Books:

1. Bioinformatics –the machine learning Approach by Pierre Baldi and Soren Brunk Affiliated – East West Publications

Subject Code:- Elective III(CA -V)

Network Administration

History – TCP/IP, UUCP network, Network through Linux & Maintenance
TCP/IP Networking: interfaces, IP Address, Address resolutions of tcp/ip. Configuring Serial devicses
Configutring Network Hardware
Names services, P-P Protocols, Firewall,IP Accounting, Network Information Systems
IP Masquerade, IPX and NCP file systems, managing UUCP, E-Mail, Senfd Mail, Networks and configurations, E-news

Book:

1. Linux Network Administrators guide by Olaf Kierch & Terry Dawson shroff Publidshers @& Distributores Pbvt. KLtd.