CURRICULUM
&
SYLLABUS

FOR

MASTER OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

MANIPUR UNIVERSITY
CANCHIPUR

Content

Vision of the Institute

Excellence in engineering and technology education with good leadership in Human Resource Development.

Mission of the Institute

1. To produce technically strong, innovative, research oriented, all round developed engineers capable to solve modern challenges by adopting student centric teaching learning methods.
2. To impart engineering and technology education for all round development
3. To produce good engineering professional with social commitment.

About the Department

The Department has several state of the art Computer Laboratories with a host of servers, workstation and a large number of i3 and i5 Desktop Computers connected to the Campus-wide LAN with access to the internet through NKN (National Knowledge Network). The system runs on wide variety of operating systems including Linux Red hat, Windows 7 Professional, Windows 8, High profile Anti-Virus, MySQL, Oracle, Visual Studio, Adobe Premier, Maya (Latest). The laboratories are equipped with up-to-date office automation software, file servers in addition to the various state-of-the-art compilers and programming environment i.e. Hardware Lab., Software Lab., Networking Lab., and Graphic Lab. well equipped with latest Core i3, i5 PC's etc. The network laboratory is equipped with a wireless networking system, LAN trainers and Wi-Fi connection. There is a hardware Lab. equipped with various training kits, experimental setup, analyser equipment etc.

The Department presently offers the following programmes:

1. B.E. in Computer Science & Engineering
2. M. Tech. in Computer Science & Engineering

Vision of the Department

To promote scientific and quality technical education in Computer Science and Engineering and thereby generating competent professionals.

Mission of the Department

1. To impart scientific skills, moral and ethical values to the students
2. To serve the needs of industry, government and society through continuous human resource development.
3. To impart knowledge through quality research in emerging areas in the field of computer science and engineering
4. To fill the gap by undertaking collaborative projects which offer opportunities for long term interaction with academia and industry

Programme Specific Objectives (PSO)

PSO 1: Apply the fundamentals of Computer science and engineering knowledge to solve real world problems.

PSO 2: Apply the appropriate techniques and modern engineering hardware and software tools in Computer Science and engineering to engage in life-long learning and to uccessfully adapt in multi-disciplinary environments.

PSO 3: Apply the contextual knowledge of Computer Science and Engineering to address professional, societal and environmental issues with work ethics and function effectively as a team member.

Programme Educational Objectives (PEOs)

PEO1: To become a successful computer professional in the IT industry and related areas.

PEO2: To enable students to pursue higher education so that they can keep themselves up-to-date research & development.

PEO3: Graduates are prepared to communicate effectively with team members, engage in applying technologies and lead teams in industry.

PEO4: To develop professional skills and ethics in students so that they can prepare themselves for immediate employment and for lifelong learning in computer science and engineering.

PEO5: To demonstrate to the students the tools and techniques of Computer Science and Engineering program so that they can create innovative products for the benefit of society

Programme Outcomes (POs)

PO1: Ability to apply computer science theory in designing of computer systems for the benefit of the society.

PO2: Ability to develop algorithms for real world computational problems and analyze their complexities.

PO3: Ability to maintain computing systems using mathematics, engineering and programme courses.

PO4: Ability to design and implement computer systems with assured quality and efficiency.

PO5: Ability to analyze and design solutions for complex engineering problems which caters to the specified needs.

PO6: Ability to analyze large data samples and discover knowledge to provide solutions to engineering problems.

PO7: Ability to assess security, privacy, quality and cost parameters in developing software systems.

PO8: Ability to communicate effectively the engineering solutions to customers.

PO9: Ability to work with team members using common tools and environment to achieve project objectives.

PO10: Ability to engage in lifelong learning for higher studies.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Curriculum Structure for
M. Tech in Computer Science & Engineering under Manipur University

First Semester

S. No.	Subject Code	Subject	Hours/ Week	Evaluation Scheme					Credits
				Sessional			ESE	Total	
			L-T-P	PA*	CT	Total			
1	PG/CS 111	Core I/Advanced Algorithms	3-1-0	20	10	30	70	100	4
2	PG/CS 112	Core-II/ Advanced Computer Networks	3-1-0	20	10	30	70	100	4
3	PG/CS113	Elective – I	3-1-0	20	10	30	70	100	4
4	PG/CS114	Elective – II	3-1-0	20	10	30	70	100	4
5	PG/CS115	Elective – III	3-1-0	20	10	30	70	100	4
6	PG/CS111P	Practical –I	0-0-3	50	-	50	50	100	2
7	PG/CSXXXP	Practical –II	0-0-3	50	-	50	50	100	2
8	PG/CS116	Seminar	0-0-4	50	-	50	-	50	2
		Total	**15-5-10**	**250**	**50**	**300**	**450**	**750**	**26**

L-Lecture T–Tutorial P–Practical PA–Progressive Assessment CT–Class Test
ESE – End Semester Examination *PA includes 5 marks for attendance.

Second Semester

S. No.	Subject Code	Subject	Hours/ Week	Evaluation Scheme					Credits
				Sessional			ESE	Total	
			L-T-P	PA*	CT	Total			
1	PG/CS121	Core-III/ Software Engineering	3-1-0	20	10	30	70	100	4
2	PG/CS122	Core-IV/ Soft Computing	3-1-0	20	10	30	70	100	4
3	PG/CS123	Elective – IV	3-1-0	20	10	30	70	100	4
4	PG/CS 124	Elective – V	3-1-0	20	10	30	70	100	4
5	PG/CS125	Elective – VI	3-1-0	20	10	30	70	100	4
6	PG/CSXXXP	Practical –III	0-0-3	50	-	50	50	100	2
7	PG/CS126	Term Paper leading to Thesis	2-0-0	50	-	50	-	50	2
8	PG/CS127	Seminar	0-0-4	50	-	50	-	50	2
		Total	**17-5-7**	**250**	**50**	**300**	**400**	**700**	**26**

L-Lecture T–Tutorial P–Practical PA–Progressive Assessment CT–Class Test
ESE – End Semester Examination *PA includes 5 marks for attendance.

Third Semester

S. No.	Subject Code	Subject	Hours/ Week	Evaluation Scheme					Credits
				Sessional			ESE	Total	
			L-T-P	PA*	CT	Total			
1	PG/CS231	Thesis Part I	0-0-20	200	-	200	-	200	15
2	PG/CS232	Seminar	0-0-4	100	-	100	-	100	3
		Total	**0-0-24**	**300**	**-**	**300**	**-**	**300**	**18**

L-Lecture T–Tutorial P–Practical PA–Progressive Assessment CT–Class Test
ESE – End Semester Examination *PA includes 5 marks for attendance.

Fourth Semester

S. No.	Subject Code	Subject	Hours/ Week	Evaluation Scheme					Credits
				Sessional			ESE	Total	
			L-T-P	PA*	CT	Total			
1	PG/CS241	Thesis Part II	0-0-20	200	-	200	100	300	16
2	PG/CS242	Seminar on Thesis	0-0-4	-	-	-	100	100	2
3	PG/CS243	Grand Viva	0-0-4	-	-	-	100	100	2
		Total	**0-0-28**	**200**	**-**	**200**	**300**	**500**	**20**

L-Lecture T–Tutorial P–Practical PA–Progressive Assessment CT–Class Test
ESE – End Semester Examination *PA includes 5 marks for attendance.

M.TECH IN COMPUTER SCIENCE AND ENGINEERING
(Compulsory Subjects)

PG/CS 111: ADVANCED ALGORITHMS

Course Objectives:

1. To discuss about Algorithms used to find solution of a problem and its efficiency using time and space criteria.
2. To discuss about different growth functions in terms of input size and analyze their behaviors and characteristics
3. To discuss about deterministic and non-deterministic algorithms and their analysis
4. To discuss various algorithm design paradigms with their characteristics and behavior
5. To discuss about Computational Models and Complexity
6. To discuss about Approximation Algorithm and Randomized Algorithm for Majority element

Syllabus-

Measuring Algorithm Efficiency: Implementation independent measurement of algorithm efficiency, time and space resources, growth in terms of input size, polynomial vs. exponential growth algorithms, worst and average case efficiency, big Oh notation, algorithm efficiency vs. inherent problem (any algorithm) complexity, deterministic and non-deterministic algorithms, algorithm analysis techniques, amortization, standards and implementation dependent resource measurement. Algorithm Design Paradigms: Characterization of algorithm design paradigms, Utilization of design paradigms for problems across application areas of sorting, selection, computer arithmetic and algebraic computation, graphs and networks, computational geometry. Computation Models and Complexity: NP Complete Problems, NP hard problems, Proving of problem to NP Complete, different NP complete problem. Cook's theorem, Approximation Algorithms, Randomized Algorithms: Some Complexity Classes, Computing π, Primality Testing, Randomize Algorithm for Majority Element.

Course Outcomes:

After studying this Course, students will be able to:

1. Choose a very suitable and efficient algorithm to find the solution of a problem
2. Understand the concepts of time and space resources while developing algorithm
3. Understand about different growth rate functions and their characteristics
4. Understand different design paradigms used and its application across different areas to find solution of problems

References:

1. S. K. Bose, Design Methods and Analysis of algorithms, Prentice Hall of India, 2005.
2. A. Levitin, Introduction to the design & analysis of Algorithms, Pearson, 2003.
3. M. A. Weiss, Data Structures and Algorithm Analysis in Java, Pearson, 2003.
4. T. H. Cormen, C. E. Leiserso, and Ronald L. Rivest, Introduction to Algorithms, Prentice Hall of India, 2005.
5. Baase and Gelder, Computer Algorithms, Introduction to design & Analysis, Pearson, 2000.

PG/CS 112: ADVANCED COMPUTER NETWORKS

Course Objectives:

1. This course focuses on advanced networking concepts for next generation network architecture and design
2. Understand the TCP/IP protocol suite and the working of the Internet.
3. Form an understanding of the principles upon which the global Internet was designed.
4. Understand basic terminology so that students can understand networking research papers.t covers SDN and virtualization for designing next generation networks

Syllabus-

Introduction to computer networks; telephone networks, networking principles; multiple access, multiplexing FDM, TDM, local area networks Ethernet, token ring, FDDI; switching circuit switching, packet switching, multicasting; scheduling performance bounds, naming and addressing, protocol stack, SONET/SDH; ATM networks AAL, virtual circuits, SSCOP; Internet addressing, routing, end point control; Internet protocols IP, TCP, UDP, ICMP, HTTP; traffic management models, classes, scheduling; control of networks QoS, static and dynamic routing, window and rate congestion control, large deviations of a queue and network, open and closed loop flow control, control of ATM networks. Mobile IP, Voice over IP (VoIP), VPNs, Network Security. Congestion Control: Control vs. Avoidance, Overview of Algorithms, Congestion in the Internet.

Course Outcomes:

After completion of the course, the student is able to

Understand advanced concepts and next generation networks

1. Analyze TCP/IP variants, network Algorithm's, Protocols and their functionalities
2. Comprehend features of SDN and its application to next generation systems
3. Analyze the performance of various server implementations

References:

1. J. Walrand and P. Varaya, High Performance Communication Networks, Harcourt Asia (Morgan Kaufmann), 2000.
2. S. Keshav, An Engineering Approach to Computer Networking, Pearson Education, 2004
3. L. Garcia and I. Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, Tata McGraw Hill, 2000.
4. J. F. Kurose and K. W. Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, 2001

PG/CS121: SOFTWARE ENGINEERING

Course Objectives:

1. To discuss the evolution, impact and emergence of software engineering and explain its development and the use of different software life cycle models for real life applications.
2. To discuss about software project management, risk management and configuration management and explain about various requirement elicitation, analysis and specification techniques.
3. To discuss about software design, design best practices and design patterns with case studies
4. To discuss the importance of different Software Testing Techniques along with software reliability metrics and Case tools
5. To discuss about Software maintenance and its importance
6. To discuss the Object Oriented Concepts and Principles, Object Oriented Analysis, Object Oriented Design, its testing and Technical metrics for Object Oriented Systems

Syllabus-

Software Life Cycle Models, Managing software projects, Project management concepts, Software process and Project metrics, Software Project Planning, Risk Analysis and Management, Project scheduling and tracking, Software Quality Assurance, Software Configuration Management. Conventional methods for software engineering, System Engineering, Requirements Analysis and Specifications, Analysis Modeling, Software Design - Design best practices, design patterns, extreme programming, refactoring, design case studies, Software Testing Techniques, Software testing Strategies, Software Reliability, Technical metrics for software, CASE tools, Software Maintenance, Software Reusability. Object Oriented software engineering: Object Oriented Concepts and principles, Object Oriented analysis, Object Oriented Design, and Object Oriented testing, Technical metrics for Object Oriented Systems.

Course Outcomes:

After studying this Course, students will be able to:

1. Choose a proper life cycle model for different real life applications, design software using functional oriented approach
2. with the help of DFDs and object-oriented approach withe the help of UML diagrams.
3. Understand the concepts of computer aided software engineering (CASE) and use different CASE tools in the
4. development, maintenance and reuse of software systems.
5. Understand how how projects have to be managed and the risk factors involved in it.

References:

1. R. S. Pressman, Software Engineering A Practitioner's Approach, McGraw Hill Publications, 2006.
2. R. Mall, Fundamentals of Software Engineering, Prentice Hall of India, 2nd Ed, 2006.
3. I Sommerville, Software Engineering, Pearson Education, Asia, 2006.
4. P. Jalote, An Integrated Approach to Software Engineering, Narosa, 3rd reprint, 2006.
5. A. Behferooz & F. J. Hudson, Software Engineering Fundamentals, Oxford Univ. Press, 2000.
6. Baude, Object Oriented Software Engineering, Wiley, 2006.

PG/CS122: SOFT COMPUTING

Course Objectives:

The Student should be made to:

1. To learn the basic concepts of Soft Computing
2. To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
3. To apply soft computing techniques to solve problems.

Syllabus-

Introduction to Neoro fuzzy and Soft Computing, Fuzzy set theory, Fuzzy Rules, Fuzzy Reasoning, Fuzzy inference System, Neural Networks; Radial basis and recurrent neural networks, Hopfield Networks, Comparision of RBF and MLP Network, Running Algorithms, Neuro Fuzzy Modeling, Applications of Soft Computing to Signal Processing, Image Processing, XOR Problem traveling salesman problem, Image compression using MLPs character retrieval using Hopfield networks, Recent advances in soft computing applications.

Course Outcomes:

Upon completion of this course, the students should be able to

1. Apply suitable soft computing techniques for various applications.
2. Integrate various soft computing techniques for complex problems.

References:

1. V. Kecman, Learning and Soft Computing, Pearson, 1st Ed, 2001.
2. D. E. Goldberg, Genetic Algorithms in Search Optimization and Machine Learning, Addison Wesley, 3rd Ed.
3. B. Kosko, Neural Network and fuzzy systems, Prentice Hall of India, 2006.
4. S. Goonatilake & S. Khebbal, Intelligent Hybrid Systems, Wiley, 1995.

ELECTIVE SUBJECTS:

1. FOUNDATION OF E- COMMERCE:

Course Objectives-

1. Describe e-commerce framework.
2. Explain electronic systems for payment.
3. Describe the use of e-commerce advertising and marketing.
4. Understand business documents and digital library.
5. Understand the usage of multimedia systems for e-commerce

Syllabus-

Introduction: Business/Network Concepts, Technology and business integration. The Hardware of Ecommerce: Introduction to networks, Introduction to the, business server, Electronic Business Structure: Protocols, The WebPages, Portals of Business, Web salesmanship, Introduction to the client machine and OS. Business servers: Mail, Applications, Proxy, Entertainment, ISP, Banking. Advertising on the Network: Web software infrastructure, personalization and tracking, Web Billboards, The 'Hit' Theory, Intellectual property for sale, 'Bots'. Business Netiquette: Dos and Don'ts of Web Pages, Client service, Personnel ,Technical support, Network services ,Accounting and statistics, integration of catalogs and other trading information. Business Security: The Credit card on the Net, Secure transmission , Internal security of telephony, E mail security, auctions and trading mechanisms, safe exchange, payment mechanisms and protocols, searching hyperlink structures, data mining, copy right protection and security. Special topics in E-Commerce.

Course Outcomes-

1. Understand the basic concepts of E-commerce
2. Demonstrate an retailing in E-commerce by using the effectiveness of market research
3. Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra organizational
4. Describe about Consumer Search and Resource Discovery
5. Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other

References:

1. W. Hanson, Principles of Internet Marketing, South Western Publishing, 2004.
2. K. K. Bajaj & D. Nag, E Commerce, Tata McGraw Hill, 2006.
3. R. Kalakola and A. B. Whiston, Frontiers of Electronic Commerce, Addison-Wesley, 1996.
4. Greensein, Feinman, Electronic Commerce Security, Risk management and Control, Tata McGraw Hill, 2000.
5. Green Stein, Electronic Commerce, Tata McGraw Hill, 2007.

2. SOFTWARE PROJECT, PROCESS AND QUALITY MANAGEMENT

Course Objectives

1. To introduce the primary important concepts of project management related to managing software development projects.
2. To familiar with the different activities involved in Software Project Management.
3. To successfully plan and implement a software project management activity.
4. To complete a specific project in time with the available budget.
5. To define software quality metrics
6. To prepare software quality checklists
7. To ensure the highest possible quality products

Syllabus-

Introduction to S/W project management, S/W project management competencies, responsibilities of a software project manager, Software process, S/W process models, project planning, organization of project team, S/W size estimation, estimation of effort & duration, Halstead's software Science, models, dependency &scheduling, staffing, Organizing a software engineering project, S/W configuration management, monitoring &controlling S/W projects, developing requirements, risk management, project tracking & control, communication& negotiating, S/W quality, S/W quality engineering, defining quality requirements, quality standards, practices& conventions, ISO 9000, S/W quality matrices, managerial and organization issues, defectprevention, reviews & audits, SEI capability maturity model, PSP, six sigma.

Course Outcomes:

1. Identify the different project contexts and suggest an appropriate management strategy.
2. Practice the role of professional ethics in successful software development.
3. Identify and describe the key phases of project management.
4. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

References:

1. B. Hughes, M. Cotterell, Software Project Management, McGraw Hill, 4th ed, 2005.
2. R. Walker, Software Project Management, Pearson, 2003.
3. R. H. Thayer, Software Engineering Project management, IEEE CS Press, 2nd Ed, 1988.
4. R. Pressman, Software Engineering A Practitioner's approach, McGraw Hill, 4th Ed, 2005.

3. SOFTWARE TESTING

Course Objectives

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
3. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
4. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
5. To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
6. To understand software test automation problems and solutions.
7. To learn how to write software testing documents, and communicate with engineers in various forms.
8. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Syllabus-

Introduction: Basic concepts, discrete mathematics for testers, Graph theory for testers Black box testing: Boundary value testing, Equivalence class testing, White box testing: statement coverage, Branch coverage, condition coverage, path coverage, McCabe's cyclomatic complexity; Decision Table based testing, Data flow based testing, Integration testing, System testing, Interaction testing, Performance testing, Mutation testing,

Regression testing, error seeding, Object oriented testing: issues in object oriented testing , Test case design by object oriented software, Fault based testing, test cases and class hierarchy, Scenario based Test design, Testing surface structure and deep structure Class testing: Random testing for object oriented classes, Partition testing at the class level Inter class test case design: multiple class testing, tests derived from behaviour models, Test case generation using UML diagrams, GUI testing.

Course Outcome

By the end of the course, Student should:

1. Have an ability to apply software testing knowledge and engineering methods.
2. Have an ability to design and conduct a software test process for a software testing project.
3. Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.
4. Have an ability to understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
5. Have an ability to use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
6. Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems
7. Have an ability to use software testing methods and modern software testing tools for their testing projects.

References:

1. C. J. Paul, Software testing: A craftsmen's approach, CRC Press, 2nd Ed, 2002.
2. R. Gopalswamy, Software testing, Pearson, 2005.
3. G. J. Myers, The art of software testing, Wiley Interscience New York, 2005.
4. R. S. Pressman, Software Engineering A Practitioner's approach, McGraw Hill, 4th Ed, 1982.
5. R. Mall, Fundamentals of Software Engineering, Prentice Hall of India, 2nd Ed, 2003

4. GRAPH THEORY AND NETWORK ALGORITHMS:

Course Objectives:

1. To learn the fundamental theory about graphs (definitions, theorems and their proofs)
2. To study the basic algorithms of graph theory and their modifications
3. To know applications of graph theory

Syllabus-

Introduction: Graphs, Isomorphism, Walks, Paths, Circuits, Trees, Properties of Trees, Cotrees and Fundamental Circuits, Cut Sets, Fundamental Cut Sets and Cut Vertices, Planar and Dual Graphs, Metric Representation of Graphs, Coloring and covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem, Directed graphs, some type of directed graphs, Directed paths, and connectedness, Euler digraphs, trees with directed edges, fundamental circuits in digraph, matrices A, B and C of digraphs adjacency matrix of a digraph,, enumeration, types of enumeration, counting of labelled and unlabeled trees, polya's theorem, graph enumeration with polya's theorem; Graph Algorithms: Elementary Graph Algorithms, Representations of graphs, Breadth-first search, Depth-first search, Topological sort, strongly connected components; Minimum Spanning Trees: Growing a minimum spanning tree, The algorithms of Kruskal and Prim, Single-Source Shortest Paths: Shortest paths and relaxation, Dijkstra's algorithm, Single-source shortest paths in

directed acyclic graphs, Difference constraints and shortest paths, All-Pairs Shortest Paths: Shortest paths and matrix multiplication, The Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, and A general framework for solving path problems in directed graphs; Maximum Flow: Flow networks, The Ford- Fulkerson method, Maximum bipartite matching, Pre flow-push algorithms.

Course Outcomes:

1. Solve problems using basic graph theory
2. Identify induced subgraphs, matchings, covers in graphs
3. Determine whether graphs are Hamiltonian and/or Euclerian
4. Solve problems involving vertex and edge connectivity, planarity
5. Solve problems involving vertex and edge coloring
6. To understand and apply the fundamental concepts in graph theory

References:

1. T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Prentice Hall of India, 3rd ed, 2006.
2. N. Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2004.
3. D. B. West, Introduction to Graph Theory, 2nd Ed, Prentice Hall of India, 2007.
4. R. Diestel, Advanced Graph Theory, Springer Verlag Heidelberg, New York, 2005.
5. M. T. Goodrich and R. Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Wiley, 1st edn, 2001.

5. CRYPTOGRAPHIC FOUNDATIONS:

Course Objectives-

1. To understand the fundamentals of cryptography and its types.
2. To understand network security threats, security services, and their countermeasures.
3. To understand RSA algorithms.
4. To acquire background on well known network security protocols such SSL/TLS.
5. To understand hash functions; authentication; firewalls.

Syllabus-

Introduction to cryptography: Attacks, Services, and Mechanisms, Security Attacks, Security Services, A Model for Inter network Security. Conventional Encryption: Classical and Modern Techniques, Conventional Encryption: Algorithms Triple DES, International Data Encryption Algorithm, RC5, CAST, RC2, Characteristics of Advanced Symmetric Block Ciphers. Confidentiality Using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.; Public Key Cryptography Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication and Hash Functions: Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs. Hash and Mac Algorithms (MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA l), RIPEMD,HMAC), Digital Signatures and Authentication Protocols and Web Security. Special topics in cryptographic foundations.

Course Outcomes-

On the successful completion of the course, students will be able to

1. Understand various Cryptographic Techniques
2. Apply various public key cryptography techniques
3. Implement Hashing and Digital Signature techniques
4. Understand the various Security Applications

References:

1. R. E. Smith, Internet Cryptography, AWL.
2. A. J. Menezes, Handbook of Applied Cryptography, CRC Press.
3. J. Hershey, Cryptography Demystified, McGraw Hill.
4. J. Knudsen, Java Cryptography, O'Reilly

6. AD-HOC AND WIRELESS NETWORKS:

Course Objectives:

1. To understand the basics of Ad-hoc & Sensor Networks.
2. To learn various fundamental and emerging protocols of all layers.
3. To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
4. To understand the nature and applications of Ad-hoc and sensor networks.
5. To understand various security practices and protocols of Ad-hoc and Sensor Networks.

Syllabus-

Ad Hoc Wireless Networks: Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet; MAC Protocols for Ad Hoc Wireless Networks: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols; Routing Protocols for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Power Aware Routing Protocols; Multicast routing in Ad Hoc Wireless Networks: Issues in Designing a Multicast Routing Protocol, Classifications of Multicast Routing Protocols, Energy Efficient Multicasting, Security Protocols for Ad Hoc Wireless Networks: Security in Ad Hoc Wireless Networks. Network Security Requirements. Issues and Challenges in Security Provisioning. Network Security Attacks. Key Management. Secure Routing in Ad Hoc Wireless Networks; Energy Management in AdHoc Wireless Networks: Classification of Energy Management Schemes, Transmission Power Management Schemes, System Power Management Schemes. Special topics in Ad-hoc and wireless networks.

Course Outcomes:

At the end of this course, students will be able to:

1. Identify different issues in wireless ad hoc and sensor networks.
2. To analyze protocols developed for ad hoc and sensor networks.
3. To identify and address the security threats in ad hoc and sensor networks.
4. Establish a Sensor network environment for different type of applications.

References:

1. C S. Ram Murthy, B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall of India, 2nd ed. 2005.
2. R. Hekmat, Ad hoc Networks: Fundamental Properties and Network Topologies, Springer, 1st ed. 2006.
3. B. Tavli and W. Heinzelman, Mobile Ad Hoc Networks: Energy Efficient Real Time Data Communications, Springer, 1st ed. 2006.
4. G. Anastasi, E. Ancillotti, R. Bernasconi, and E. S. Biagioni, Multi Hop Ad Hoc Newtorks from Theory to Reality, Nova Science Publishers, 2008

7. DATABASE ENGINEERING:

Course Objectives-

1. To provide the basic concepts of database systems both in terms of usage and implementation
2. To understand all the requirements and operations that the software system analyst needed to analyze, design, and implement the systems

Syllabus-

Introduction to Database systems: Data Independence, Data Models, levels of abstraction, structure of DBMS, Relational Model, Integrity constraints, Relational Languages, Query Languages: SQL, QUEL, Aggregate operators, Embedded and Dynamic SQL. File Organization: Storage, Buffer management, Record and page formats, File organization techniques, Indexing. Query optimization: Query processing on various operations, Translating SQL queries. Database design: E R Model, Functional dependencies, normalization, multi valued dependencies. Concurrency control and recovery: transaction, Lock based concurrency, Lock management, Concurrency control without locking, Crash recovery log, check pointing. Database Security, Distributed databases design, Object Oriented database design & its implementation, Introduction to recent advances in database technology. Special topics in database engineering.

Course Outcomes-

1. Aware of various database systems and its design issues
2. Design and implement a database for any specified domain according to well-known design principles that balance data retrieval performance with data consistency guarantees
3. Formulate data retrieval queries in SQL and the abstract query languages

References:

1. J. D. Ullman, Principles of Data Base Systems, Galgotia Publisher, New Delhi, 2nd Ed, 2003.
2. Silberschatz, H. F. Korth & A. Sudarshan, Database system Concepts, McGraw Hill,
3. B. Desai, An Introduction to database system, Galgotia, 1997.
4. C. J. Date: An introduction to Data Base Systems, Addison Wesley, 1995.
5. R. Elmasri, S. Navathe, S. B. Navathe, R. Sunderraman, Fundamentals of Database Systems, Addison Wesley, 2nd ed, 2005.
6. R. R. Krishnan, Database Management Systems, McGraw Hill, reprint 2007

8. DATA MINING & DATA WAREHOUSING:

Course Objectives-

1. Be familiar with mathematical foundations of data mining tools..
2. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
3. Master data mining techniques in various applications like social, scientific and environmental context.
4. To study about Data Warehousing and OLTP technology for Data Mining
5. To study about OLAP tools
6. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Syllabus-

Introduction to Data mining: Motivation for Data Mining, its importance, Role Data in Data Mining, Data Mining functionalities, patterns in data mining, Type of patterns, Classification of Data Mining Systems, Major issues in Data Mining; Data Warehousing and OLTP technology for Data Mining, Data Mining Languages, and System Architectures, Mining Association Rules in Large Databases, Classification and Prediction, Cluster Analysis, Mining Complex Data, Applications and Trends in Data Mining, Characteristics of data warehouse, Data Mart, Online Analytical Processing, OLAP tools, Data Warehouse Architecture, Tools for Data warehousing, Performance consideration, Special topics in data mining and data ware housing.

Course Outcomes:

Upon successful completion of this course, you should be able to

1. Understand the functionality of the various data mining and data warehousing component
2. Explain the analyzing techniques of various data.
3. Describe different methodologies used in data mining.
4. Compare different approaches of data warehousing and data mining with various technologies.
5. Evaluate the performance of different data-mining algorithms.
6. Propose data-mining solutions for different applications.

References:

1. J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Ed, 2006.
2. M. J. A. Berry and G. Linoff, Mastering Data Mining: The Art and Science of Customer Relationship Management, Wiley Computer Publishing, 2000.
3. P. Adriaans & D. Zantinge, Data Mining, Addison Wesley, 1996.
4. R. Mattison, Data Warehousing: Strategies, Tools and Techniques, McGraw Hill, 1996.
5. P. Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2001.

9. INTRUSION DETECTION SYSTEMS:

Course Objectives-

1. To monitor the security of an organization and appropriately apply Intrusion Detection tools and techniques in order to improve their security system
2. To identify and describe appropriate situations and scenarios where intrusion detection may be applied to achieve an increased level of situational awareness and information assurance.
3. To enable the knowledges to be applied to built the architecture, configuration, and analysis of specific intrusion detection systems

Syllabus-

Introduction to data and methodologies of computer intrusion detection, statistical & machine approaches to detection of attacks on computers, techniques for studying the Internet & estimating the number & severity of attacks, network based attacks such as probes & denial of service attacks, host based attacks such as buffer overflows and race conditions, malicious codes such as virus and worms, statistical pattern recognition for detection& classification of attacks, techniques for visualizing networked data etc. Special topics in intrusion detection systems.

Course Outcomes-

1. Understand modern concepts related to Intrusion Detection System.
2. Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion
3. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities that all intrusion detection systems share.

References:

1. S. McClure, S. Shah, Shreeraj. Shah, We Hacking, Pearson Press.
2. D. Litchfield, C. Anleyet. al., Database Hacker's handbook, Wiley Publishers.
3. S. McClure, J. Scambray, G. Kurtz, Hacking Exposed, TMH.

10. WIRELESS NETWORK SECURITY:

Course Objectives-

1. To study about Wired and Wireless network and know their differences
2. To study the effect of mobility of nodes in wireless network and their characteristics
3. To study the security issues of information system and its challenges
4. To enable to protect & recover the computer systems & networks from various security threats.

Syllabus-

Wired/wireless networks, effect of mobility on networks & systems, impact on IP stack from MAC layer and up. Ad hoc and sensor networks, wireless broadcasts, IP broadcasts, satellite broadcasts, issues of information capacity, distinction between wired & wireless from information theory, issues of securities in wireless, routing in wireless networks, design of secure protocols, key distribution for access control, source authentication of transmissions and non repudiation, attacks in wireless networks, DOS & DDOS attacks, reaction to attacks, information processing for sensor networks. Special topics in wireless network security.

Course Outcomes-

After the course, students will be able

1. to familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
2. to gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
3. to have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
4. to learn various security issues involved in cloud computing.

References:

1. J. R. Vacca, Guide to Wireless Network Security, Springer Verlag,2006.
2. Tara M. Swaminatha, C. R.Elden, Wireless Security & Privacy, Pearson Press, 2007.

11. WIRELESS SENSOR NETWORKS:

Course Objectives

1. To understand about Wireless Sensor Network and its challenges
2. To understand the protocols and standards used for infrastructures in Wireless Sensor Networks
3. To understand the various routing protocols available in Wireless Sensor Networks
4. To discuss the new applications of Wireless Sensor Networks

Syllabus-

Introduction to wireless sensor network: Application and Motivation, Network Performance objective, Development of Wireless Sensor Network; Canonical Problem Localization and Tracking: Tracking Multiple Objects, State space decomposition, Data association, Sensor Models, Performance Comparison and Metrics; Networking Sensors: The S MAC Protocol, IEEE 802.15.4 Standard and Zig Bee, Routing in sensor network; Infrastructure Establishment: Topology Control, Clustering, Sensor Network Databases: Sensor Database Challenges, Querying The Physical Environment, Query Interfaces, Probabilistic queries, High level Database Organization, In Network Aggregation, Query propagation and aggregation, Query processing scheduling and optimization, Special topics in wireless sensor networks.

Course Outcomes

After studying this Course, students will be able to:

1. understand about Wireless Sensor Networks.
2. understand the characteristics of Wireless Sensor Networks and different issues faced by it
3. understand the protocols and standards used for infrastructures in Wireless Sensor Networks.
4. design and develop Wireless Sensor Networks for different applications

References:

1. F. Zhao and L. Guibas, Wireless Sensor Network: Information Processing Approach, Elsevier.
2. E. H. Callaway, Jr. E. H. Callaway, Wireless Sensor Networks Architecture and Protocols: CRC Press.
3. 3.A. Hac, Wireless Sensor Network Designs, John Wiley & Sons

12. NETWORK SECURITY:

Course Objectives-

1. To know various encryption techniques
2. To understand the public key cryptography like RSA
3. To study about message authentication and hash functions
4. To understand security protocols for protecting data on networks
5. To understand various protocols for network security to protect against the threats in the networks

Syllabus-

Network architecture, attacks, Security at the Application Layer (PGP and S/MIME), email, PGP, S/MIME, MIME, S/MIME. Security at the Transport Layer (SSL and TLS): SSL architecture, Protocols: Handshake, alert, record, SSL Message format, Transport Layer Security. Security at the Network Layer (IP Sec): Modes, Two security protocols, Security association, security policy, Internet key exchange, ISAKMP. Recent trends in network security.

Course Outcomes-

After successful completion of the course, the students would be able to

1. Provide security of the data over the network
2. Do research in the emerging areas of network security
3. Implement various networking protocols
4. Protect any network from the threats in the world
5. Understand and analyze public-key cryptography, RSA and other public-key cryptosystems

References:

1. B. A. Forouzan, Cryptography & Network Security, McGraw Hill, Special Indian Edition, 2007.
2. W. Stallings, Cryptography and Network Security, Pearson Education, 3rd Ed, 2006.
3. N. Krawety, Introduction to Network Security, Thompson, Special India Ed, 2007.

13. ARTIFICIAL INTELLIGENCE:

Course Objective:

The Student should be made to:

1. To understand the various characteristics of Intelligent agents
2. To learn the different search strategies in AI
3. To learn to represent knowledge in solving AI problems

Syllabus-

AI Techniques, Production systems, State space representation and search methods, A * and AO * algorithms, game tree, Knowledge representation: predicate calculus, semantics nets, conceptual dependency, frames and scripts, perception and knowledge acquisition. Introduction to Natural language processing, Expert systems, Non monotonic reasoning, Man Machine interface, Question answering, Simple Case Study. Special topics in artificial intelligence.

Course Outcomes:

Upon completion of the course, the students will be able to:

1. Use appropriate search algorithms for any AI problem
2. Represent a problem using first order and predicate logic
3. Provide the apt agent strategy to solve a given problem

References:

1. E. Rich and K. Knight : Artificial Intelligence , Tata McGraw hill,
2. N.J. Nilsson : Principles of Artificial Intelligence , Narosa,
3. G. F. Luger Wa Stubble field : Artificial Intelligence, Addison Wisley
4. S. L. Tanimotto: The Elements of Artificial Intelligence, Computer Science Press.

14. INFORMATION THEORY AND CODING:

Course Objectives

1. To define and apply the basic concepts of information theory (entropy, channel capacity etc.)
2. To learn the principles and applications of information theory in communication systems
3. To study various data compression methods and describe the most common such methods
4. To understand the theoretical framework upon which error-control codes are built

Syllabus-

Information Theory: Introduction to information Theory, Information and entropy, properties of entropy of a binary memory less source, Measure of Information, Source Coding, Shannon Fano coding, Huffman coding, Lempel Ziv coding, channel coding, Channel capacity, noisy channel coding theorem for DMC. Coding theory Linear block codes: the generator and parity check matrices, Hamming codes. Introduction to finite fields. Cyclic codes, Reed-Solomon codes. Convolutional codes and the Viterbi algorithm. Trellis coded modulation. Turbo codes

Course Outcome

After completion of the course, the student is able to

1. Design the channel performance using Information theory.
2. Comprehend various error control code properties
3. Apply linear block codes for error detection and correction
4. Apply convolution codes for performance analysis & cyclic codes for error detection and correction.
5. Design BCH & RS codes for Channel performance improvement against burst errors.

References:

1. R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill, 2003.
2. F. J. MacWilliams, N. J. A. Sloane, The Theory of Error Correcting Codes, Elsevier, 1977.
3. S. Roman, Coding and Information Theory, Springer, 1992.
4. R. J. McEliece, The Theory of Information and Coding, Cambridge Uinv Press, 2004.
5. T. M. Cover, J. A. Thomas, Elements of Information Theory, Wiley, 1991.

15. DISTRIBUTED OPERATING SYSTEMS:

Course Objectives

1. To provide hardware and software issues in modern distributed systems.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed

Syllabus-

Introduction to parallel Computing, Solving problems in parallel, Structures of parallel computers, Parallel Algorithms, Parallel programming, Operating Systems for parallel computers, Performance Evaluation of parallel computers. Characterization of distributed systems, Design goals, Distributed processing, Distributed operating systems, Client Server Communications, Remote Procedure calls, File Service, Distributed transactions and concurrency control, fault tolerance and security. Synchronization & Coordination, Distributed Algorithms, research issues. Special topics in distributed operating systems.

Course Outcome

1. To provide hardware and software issues in modern distributed systems.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. To know about Shared Memory Techniques.
5. Have Sufficient knowledge about file access. CO6: Have knowledge of Synchronization and Deadlock.

References:

1. G. Coulororis, J. Dollimore & T. Kindberg, Distributed Systems: Concepts and Design, Addison-Wesley, 3rd ed, 2001.
2. M. Singhal & N. G. Shivaratri, Advanced Concepts in Operating Systems, McGraw Hill, 1994.
3. P. K. Sinha, Distributed Operating Systems, IEEE Press, 1997.
4. H. F. Jordan, Fundamentals of Parallel Processing, Pearson, 2004.
5. C. Hughes & T, Hughes, Parallel and Distributed Programming Using C++, Pearson, 1st Ed, 2004.
6. W. Buchanan, Distributed Systems and Networks, Tata McGraw Hill, 2004.
7. P. S. Pacheco, Parallel Programming with MPI, Morgan Kaufmann, 1997.

16. BIOMETRIC SECURITY:

Course Objectives-

To provide students with understanding of biometrics, biometric equipment and standards applied to security.

Syllabus-

Security via biometrics, space domain based biometrics and recognition techniques. Correlation based biometric filters, Design of advanced correlation filters that offer tolerance to expected impairments, methods to implement digital correlation, applications of correlation filters. Special topics in biometric security.

Course Outcomes-

1. Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
2. Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
3. Be able to work effectively in teams and express their work and ideas orally and in writing.
4. Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
5. Understand various Biometric security issues.

References:

1. P. Reid, Biometrics for Network Security, Pearson Press.
2. J. D. Woodward, N.M. Orlans, P.T. Higgins, Biometrics, Dreamtech Publishers.
3. S. Nanavati, M. Thieme, R. Nanavati, Biometrics, Wiley Publishers

17. IMAGE PROCESSING:

Course Objectives

1. The objective of this course is to introduce the students to the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images.
2. Particular emphasis will be placed on covering methods used for image sampling and quantization, image transforms, image enhancement and restoration, image encoding, image analysis and pattern recognition.
3. In addition, the students will learn how to apply the methods to solve real-world problems in several areas including medical, remote sensing and surveillance and develop the insight necessary to use the tools of digital image processing (DIP) to solve any new problem.

Syllabus-

The DFT and Digital Convolution: The DFT and its relationship to other transforms, properties of the DFT, FFT, DIT and DIF FFT algorithms, prime factor FFT algorithms, Analysis and Design of discrete time systems in the frequency domains, Frequency domain characteristics of LTI systems, LTI frequency selective filters, linear filtering method based on DFT, Inverse systems and Deconvolutions, Realisation of discrete systems: Design of digital filters, Quantization effects in Digital Signal Process, Power Spectrum Estimation, Adaptive Filters. Recent advances in signal processing applications.

Course Outcomes

On successful completion of this course students will be able to:

1 Demonstrate a knowledge of a broad range of fundamental image processing and image analysis techniques and concepts (linear and non-linear filtering, denoising, deblurring, edge detection, line finding, detection, morphological operators, compression, shape metrics and feature based recognition)

2 Identify, Demonstrate and apply their knowledge by analysing image processing problems and recognising and employing (or proposing) effective solutions

3 Design and create practical solutions to a range of common image processing problems and to critically assess the results of their solutions, including shortcomings

References:

1. J. G. Proakis and D. G. Manolkis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall of India, 3rd Ed, 1996, reprint 2005.
2. V. Oppenheim & R. W. Schafer, Digital Signal Processing, Prentice Hall of India, 8th Ed, 2002.
3. S. W. Smith, Digital Signal Processing: A Practical Guide for Engineers and Scientists, Newness – Elsevier Science, 1st Ed, 2002.

18. PATTERN RECOGNITION:

Course Objective:

The Student should be made to:

1. To develop the mathematical tools required for the pattern recognition.

Syllabus-

Introduction to pattern recognition, statistical pattern recognition, decision trees, classification using decision trees, missing attribute values, error rates on recall sets, pruning decision trees, obtaining Prules by evolution, Bayes classification, estimation of probabilities, nearest neighbour classification, performance issues of a nearest neighbour classifier, Neural classifier, training of neural classifier, clustering, K means clustering, syntactic pattern recognition. Recent advances in Pattern recognition.

Course Outcomes-

Upon completion of the course, the students will be able to:

1. Summarize the various techniques involved in pattern recognition
2. Categorize the various pattern recognition techniques into supervised and unsupervised.
3. Illustrate the artificial neural network based pattern recognition
4. Discuss the applications of pattern recognition in various applications

References:

1. Rajjan Shighal, Pattern Recognition: Techniques and Applications, Oxford University Press, 1st ed, 2006.
2. Christopher M. Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1st ed, 2003.
3. W. Gibson, Pattern Recognition, Berkley Press, 1st Ed, 2005.
4. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 1st Ed, 2007.
5. D. K. Pradhan, editor, Fault Tolerant Computer System Design, Prentice Hall, 1996. Koren. Fault Tolerant Systems, Morgan Kauffman 2007.
6. L. L. Pullum, Software Fault Tolerance Techniques and Implementation, Artech House Computer Security Series, 2001.
7. M. L. Shooman, Reliability of Computer Systems and Networks Fault Tolerance Analysis and Design, Wiley, 2002

19. ADVANCE NATURAL LANGUAGE PROCESSING

Course Objectives:

At the end of this course you should be able to:

1. Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP).
2. Understand approaches to syntax and semantics in NLP.
3. Understand approaches to discourse, generation, dialogue and summarization within NLP.
4. Understand current methods for statistical approaches to machine translation.
5. Understand semantic analysis and Lexical Analysis in NLP.

Syllabus-

Introduction. WORDS. Regular Expressions and Automata. Morphology and Finite-State Transducers. Computational Phonology and Text-to-Speech. Probabilistic Models of Pronunciation and Spelling. N-grams. HMMs and Speech Recognition. SYNTAX. Word Classes and Part-of-Speech Tagging. Context-Free Grammars for English. Parsing with Context-Free Grammars. Features and Unification. Lexicalized and Probabilistic Parsing. Language and Complexity. SEMANTICS. Representing Meaning. Semantic Analysis. Lexical Semantics. Word Sense Disambiguation and Information Retrieval. PRAGMATICS. Discourse. Dialogue and Conversational Agents. Natural Language Generation. Machine Translation.

Course outcomes:

After the completion of this course, students will be able to:

1. Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
2. Demonstrate understanding of the relationship between NLP and statistics & machine learning.
3. Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
4. Develop systems for various NLP problems with moderate complexity.
5. Evaluate NLP systems, identify shortcomings and suggest solutions for these shortcomings.

References:

1. Daniel Jurafsky & James H. Martin: Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech recognition, Pearson,2008
2. Grasz, Jones & Webber (Ed.): Readings in Natural Language Processing, Morgan Kaufmann, 1986.
3. Gazdar & Mellish: Natural Language Processing in PROLOG, Addision Wesley, 1989.
4. Leonard Bolc. (Ed.): Natural Language Parsing Systems, Springer Verlag, 1987.
5. McDonald &Bolc. (Ed.): Natural Language Generation Systems, Springer Verlag, 1987.
6. W. J. Hutchins: Machine Translation - Past, Present & Future, Ellis Horwood, 1986.
7. Bharati, Chaitanya and Sangal: Natural Language Processing- a Paninian perspective, PHI, 1985.

20. MACHINE LEARNING

Course Objectives:

At the end of this course you should be able to:

1. Understand the basic theory underlying machine learning.
2. Formulate machine learning problems corresponding to different applications.
3. Understand a range of machine learning algorithms along with their strengths and weaknesses.
4. Apply machine learning algorithms to solve problems of moderate complexity.
5. Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Syllabus-

Introduction: Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation. Inductive Classification .The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypotheses. Finding maximally specific hypotheses. Version spaces and the candidate elimination algorithm. Learning conjunctive concepts. The importance of inductive bias. Decision Tree Learning: Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity. Occam'srazor. Overfitting, noisy data, and pruning. Combining Multiple Leraners. Voting. Bagging. Boosting. Stacked Generalization. Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing. Rule Learning: Propositional and First-Order. Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming). Artificial Neural Network Concepts: Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and back propagation. Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. EM algorithm. Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning. Text Classification: Bag of words representation. Vector space model and cosine similarity. Relevance feedback and Rocchio algorithm. Versions of nearest neighbor and Naive Bayes for text. Clustering and Unsupervised Learning Learning from unclassified data. Clustering. Hierarchical Aglomerative Clustering. k-mean spartitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM

using labeled and unlabled data. Language Learning: Classification problems in language: word-sense disambiguation, sequence labeling. Hidden Markov models (HMM's). Veterbi algorithm for determining most-probable state sequences. Forward-backward EM algorithm for training the parameters of HMM's.

Course outcomes:

After completing this course, the student will be able to

1. Appreciate the importance of visualization in the data analytics solution
2. Apply structured thinking to unstructured problems
3. Understand a very broad collection of machine learning algorithms and problems
4. Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory
5. Develop an appreciation for what is involved in learning from data.

References:

1. Michalski, Carbonnel & Michel (Eds.): Machine Learning - An A. I. Approach, Vols I, II & III, Morgan Kaufmann.
2. C. J. Thornton: Techniques in Computational Learning, Chapman & Hall Computing.
3. Ethem Alpaydin. Introduction to Machine Learning, MIT press
4. Tom M. Mitchel .Machine Learning. McgrawHill

21. SHELL PROGRAMMING AND LINUX INTERNALS

Course Objectives:

At the end of this course you should be able to:

1. Provide introduction to UNIX Operating System,Linux environment and its File System
2. Gain an understanding of important aspects related to the SHELL and the process
3. Develop the ability to formulate regular expressions and use them for pattern matching.
4. Provide a comprehensive introduction to SHELL programming, services and utilities.
5. Provide the skills needed to develop and customize Linux shell programs and to make effective use of a wide range of standard Linux programming and development tools.

Syllabus-

Getting started:Operating System Concepts, Introduction To Linux, Linux Terminals & Shell, Different Users and files types, Linux File System, Concept of Process in LinuxLinux Shell Command Set:Navigating File Systems, Handling Files, Regular Expressions, Process Commands, Vim editor. Shell Programming:Types of shell, Bourne shell, Read- Only ShellVariables, Positional Parameters, Control Constructs. Linux Internals: Linux Kernel Structure,inode,System Calls, File Sub-System,Process Sub-System, Linux Signals, Clocks & Timers, Memory Management.

Course outcomes:

At the end of the course, the student will be able to

1. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating Systems.
2. Understand the basic commands of linux operating system and can write shell scripts.
3. Demonstrate UNIX commands for file handling and process control.
4. Write Regular expressions for pattern matching and apply them to various filters for a specific task.
5. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

6. Create shared memory segments, pipes, message queues and can exercise inter process communication.

References:

1. A Practical Guide to Linux Commands, Editors and Shell Programming 3rd Edition Paperback -Mark G. Sobell, PHI.
2. Linux Command Line And Shell Scripting Bible (English) 2nd Edition -Richard Blum, Wiley India.
3. Linux Kernel Development (English) -Robert Love, PHI

22. MULTIMEDIA ENGINEERING AND APPLICATIONS

Course Objectives:

At the end of this course you should be able to

1. Learn and understand technical aspect of Multimedia Systems.
2. learn various multimedia authoring systems.
3. Understand various networking aspects used for multimedia application

Syllabus-

Introduction: Overview of multimedia, various types of multimedia information, characteristics, digital representation, hardware and software, accessories, hypertext and hypermedia Multimedia Technology : Structure - components, platforms, Audio & video technology - basics, digitisation, file format, compression & decompression techniques, image and graphics, storage media, video streaming. Animation: Definition, types, manipulation technique, rendering, file format, animation software Graphics: Devices, display technology, pixel, raster, vector, resolution, transformation, solid modeling, Applications: Virtual reality, e-commerce & courseware engineering.

Course Outcomes:

On completion of the subject:

1. The students will be able to understand and create multimedia projects and comprehend the technologies underlying multimedia applications.
2. List the main ideas of the most recent multimedia technology.
3. Make high-caliber multimedia software programmes.

References :

1. Multimedia - An Introduction : John Villamil - Casanova, Louis Molina - Prentice Hall, India
2. Multimedia Handbook : Jessica Keys, McGraw Hill Inc., 1994
3. Computer Graphics : Hearn D. & Baker M.P., Prentice Hall (EEE)
4. Multimedia Systems : Buford Koegel John F., Addison Wesley (Pearson Education Asia), 2000
5. Multimedia : Computing, Communications & Applications : Steinmetz Ralf &NahrstedtKlara, Pearson Education Asia,2001
6. Video and Image Processing in Multimedia Systems : Borko Furht, Kluwer Academic Publishers
7. Multimedia Systems and Techniques : Borko Furht, Kluwer Academic Publishers
8. Multimedia Systems : John F. Koegel Buford, ACM Press, Addison Wesley
9. Multimedia: Making it Work : Vaughan, Tay (1999), 4th ed. New Delhi, Tata McGraw Hill

23. OBJECT ORIENTED SOFTWARE DESIGN

Course Objectives

1. Describe and provide examples of the essential ideas of object orientation.
2. To introduce fundamental object-oriented analysis and design ideas
3. To examine the primary characteristics of the software development process inside an object-oriented framework.
4. To introduce Visual Object Oriented Modeling languages, in particular UML (Unified Modeling Language)
5. Read, verify, and validate an existing UML specification.

Syllabus-

Object Oriented Modeling – Life Cycle, abstraction, encapsulation, modularity, inheritance, polymorphism, composition, aggregation. Use cases, classification and identification of objects. UML Notation: Class diagram, Object diagram, Sequence diagram, Collaboration diagram, Activity diagram, packages, State Transition diagram, UML model, Meta model Object oriented quality assurance, metrics.

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Understand the fundamentals of computing and object-oriented design.
2. Be familiar with classes and objects.
3. Be familiar with function overloading and parameter passing
4. Be able to understand and analyze UML specifications.

References:

1. Object Oriented Programming: Balaguruswamy, TMH
2. Software Engineering: Pressman, PHI
3. Object Oriented Modeling & Design: Rambaugh et.al. PHI
4. A first course on Database System: Ullman & Widom, PH
5. Inside the Object Model: Papurt, Sigs Book

24. KNOWLEDGE MANAGEMENT

Course Objectives

1. Create Knowledge Management (KM) project efforts in line with company strategy
2. Figure out how to value the above as intangibles so they may be used to generate revenue for smart businesses.
3. To codify the knowledge.
4. To transfer the knowledge to the E-World.

Syllabus-

The Basics – Working smarter, KM myths and lifecycle, implications of KM. Understanding knowledge – definitions, cognition and KM, data, information and knowledge, types of knowledge, expert knowledge, human thinking and learning, implications for KM. Knowledge Management systems lifecycle – Challenges, conventional versus KM system lifecycle, implications for KM. KM Strategy – Economy of plan, economy of change, economy of control.

Knowledge Creation and Capture – knowledge creation and knowledge architecture, Nonaka's model, knowledge architecture, implications, capturing tacit knowledge, knowledge capture, evaluating the expert, developing a relationship with experts, fuzzy reasoning and quality of knowledge, interview as a tool, guide to a successful interview, rapid prototyping, implications. Design of KMs – Economy of scope, economy of effort,

economy in deployment. Other knowledge capturing techniques, onsite observation, brain-storming, protocol analysis, consensus decision making, the repertory grid, NGT, Delphi method, concept mapping, black boarding

Knowledge codification, why codify, modes of knowledge conversion, how to codify knowledge, codification tools and procedures, knowledge developer's skillset, implications, System testing and deployment – quality and assurance, knowledge testing, approaches to logical and user acceptance testing, managing the test phase, KM system deployment, issues, user training and deployment, post-implementation review, implications, knowledge transfer and sharing - as a step in a process, transfer methods, role of internet, implications.

Knowledge transfer in E-World, The E-World, E-Business, implications, KM System tools and portals – Learning from data, data visualization, neural networks as a learning model, Association rules, classification types, implications, Data mining – knowing the unknown, data mining and business intelligence, business and technical drivers, DM virtual cycle and data management, DM in practice, role of DM in customer relationship, implications.

Knowledge Management tools and portals – Portals the basics, Business challenge, Knowledge Portal technologies, implications. Ethical, legal and Managerial issues – Knowledge owners, legal issues, ethical factor, improving the climate, implications.

Course Outcomes

After the completion of the course, students should be able to:

1. Recognize the distinctions between data, information, organisational knowledge, and smart organisations.
2. To identify the knowledge management processes within learning organisations and in relation to their environment.
3. Analyze the resources that affect the development of knowledge management processes in an intelligent organisation using a strategic alignment instrument to demonstrate the generation of value.

Textbooks:

1. Knowledge Management, Elias M. Awad and Hassan Ghaziri, Pearson Publications, 2007
2. Ten Steps to Maturity in Knowledge Management – Lessons in economy, J.K. Suresh and Kavi Mahesh, Chandos Publishing, 2006

Course Objectives:

1. Become familiar with client-server architecture and capable of developing a web application using PHP.
2. Introduce the skills and project-based expertise required to enter professions in web application and development.

Syllabus-

Getting started, Movie review web site - Creating PHP Pages- Using PHP with MySQL. Using Tables to Display Data Form Elements: Letting the User Work with Data. Letting the User Edit the Database. Manipulating and Creating Images with PHP.Validating User Input. Handling and Avoiding Errors. Comic Book Fan Site: Building Databases. Sending E-mail. User Logins, Profiles, and Personalization, Building a Content Management System. Mailing Lists. Online Stores. Creating a Bulletin Board System. Using Log Files to Improve Your Site. Troubleshooting.

Course Outcomes:

At the successful completion of the course, students should be able to:

1. Students are able to construct PHP programmes as a course outcome.
2. Students will be capable of connecting to a DBMS and performing insert, update, and delete operations on a DBMS table.
3. Students will be able to construct a server-side application capable of receiving form data sent from the client, processing it, and storing it in a database.

Textbook

1. Beginning PHP, Apache, and MySQL Web Development, Elizabeth Naramore et. al, Wrox Publications, 2005

25. XML TECHNOLOGIES

Course Objectives:

1. Explain Well-Formed XML.
2. Define XML
3. Identify Definitions for Document Types
4. Enumerate the various sorts of XML Schemas.
5. Apply XML to well-structured documents for Web browser-based technology in enterprise information systems.

Syllabus-

Mark-up languages, XML, Uses of XML. WELL-FORMED XML: Parsing XML, Tags, text, elements, attributes, comments and empty elements. XML Declaration, Processing Instructions, Errors in XML , Need for namespaces, How XML namespaces work, URIs, When to use namespace. Document type definitions (DTD), Sharing vocabularies, Anatomy of DTD, Developing DTDs, DTD Limitations. Benefit of XML schemas, Elements of XML Schema Definition, Creating a Schema from multiple documents. Ways of looking at an XML document, Serialized document, Visualizing XPath, Abbreviated and Unabbreviated syntax, Axes, XPath functions, predicates, Structure of XPath Expressions. XSLT, XSLT processor, Procedural versus declarative programming, Foundational XSLT elements, Influencing the output with the <xsl:output> element, Conditional processing, The <xsl: for each> element, the <xsl:sort> element, XSLT variables and parameter, Named templates and the <xsl:call-templates> element XSLT Functions. Xquery, XQuery tools, Some XQuery examples, The XQuery Data Model, Xquery Expressions, XQuery Functions, Using parameters with XQuery. XML Document Object model, The document Object model at the W3C, Two ways to view DOM Nodes, Overview of the XML DOM, The node object, The document interface. SAX , Simple API for XML: What is SAX and why was it invented? Receiving SAX events, good SAX and bad SAX, Consumer, Producers and filters, other languages, WEB SERVICES, SOAP AND WSDL, RPC protocols, The new RPC protocol, Web services, The web Service Stack. SCALABLE VECTOR GRAPHICS (SVG), The SVG specification.

Course Outcomes:

1. Describe how XML can be used to create well-structured documents for Web browser-based technologies in business information systems.
2. To identify ideas associated with linking resources with links, CSS, DTD, and internationalisation
3. Design and implement XML to develop a markup language for data- and document-centric applications.
4. Develop web browser-based documents that are well-formed using XML
5. Create code to demonstrate awareness of XML-related information

Textbook:

1. Beginning XML, David Hunter et al, 4th Edition, Wrox/John Wiley, 2007