SCHOOL
OF
INFORMATION AND COMMUNICATION TECHNOLOGY

COURSE STURCTURE AND DETAILED SYLLABUS

2 YEARS M. TECH. ICT FOR ENGINEERING GRADUATES

SPECIALIZATION:

INTELLIGENT SYSTEMS AND ROBOTICS

GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2011-2012

2 Year M. Tech. (ICT) for Engineering Graduates **Effective from 2011-2012**

SEMESTER – I

1	CS527	Object-Oriented Analysis and Design	3-1-0	4
2	CS571	Artificial Intelligence	3-1-0	4
3	CS525	Advanced Data Base Management System	3-1-0	4
4		**Elective-1**	3-0-0	3
5	SS101	Human Values & Buddhist Ethics	2-0-0	2
6	CS589	Object-Oriented Analysis and Design Lab	0-0-3	2
7	CS587	Advanced Data Base Management System Lab	0-0-3	2
8	GP521	General Proficiency	------	1
		Total Credits		**22**
		Total Contact Hours	**14-3-6 =**	**23**

Electives - 1		
Sr. No.	Courses Code	Courses
1	CS541 / CS441	Software Project Management
2	CS543 / CS443	Object-Oriented Software Engineering
3	CS545 / CS445	Information Security
4	CS547 / CS447	Multimedia Techniques
5	CS561 / CS449	Soft Computing
6	CS551 / CS451	Natural Language Processing
7	CS557 / CS457	Machine Translation and Learning
8	EC542	Quality of Services in Networks
9	EC447	Digital Image Processing
10	EC555 / EC565	Principles of VLSI Design
11	EC441	Design with Microcontrollers
12	EC564	Wireless Technologies

SEMESTER II

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	MA402	Simulation & Modeling	3-1-0	4
2	CS562	Soft Computing Techniques	3-0-0	3
3	CS564	Artificial Intelligence Programming Languages	3-0-0	3
4		**Elective-2**	3-0-0	3
5		**Elective-3**	3-0-0	3
6	CS584	Artificial Intelligence Programming Lab	0-0-3	2
7	CS592	Major Project	0-0-10	5
8	GP532	General Proficiency	------	1
		Total Credits		**24**
		Total Contact Hours	**15-1-13 =**	**29**

Electives (2 & 3)		
Sr. No.	**Courses Code**	**Courses**
1	CS566 / CS462	Knowledge Engineering
2	CS568 / CS464	Pattern Matching
3	CS570 / CS466	Neural Network
4	CS572 / CS468	Discourse Analysis and Natural Language Generation

SEMESTER III

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	CS661	Expert System	3-0-0	3
2	CS633	Research Techniques in ICT	3-0-0	3
3		**Electives - 4**	3-0-0	3
4		**Electives - 5**	3-0-0	3
5	CS683	Expert System Design Lab	0-0-3	2
6	CS691	Dissertation Part - I	0-0-14	7
7	GP631	General Proficiency	------	1
		Total Credits		**22**
		Total Contact Hours	**12-0-17 =**	**29**

Electives (4 & 5)		
Sr. No.	**Courses Code**	**Courses**
1	CS663 / CS563	Intelligent Information Retrieval
2	CS665 / CS565	Data Mining in Artificial Intelligence
3	CS667 / CS567	Speech Processing
4	CS669 / CS569	Robotics

SEMESTER IV

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	CS690	Dissertation Part - II	------	21
2	GP632	General Proficiency	------	1
		Total Credits		**22**

GRAND TOTAL CREDITS = 90

INTELLIGENT SYSTEM

(SEMESTER - I)

OBJECT-ORIENTED ANALYSIS AND DESIGN			
Course Code:	**CS527**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I OBJECT-ORIENTED DESIGN FUNDAMENTALS

Object model, classes and objects, complexity, classification, notation, process, pragmatics, binary and entity relationship, object types, object state, Object-Oriented Software Development (OOSD) life cycle, foundations of the object-oriented approach, concept of objects, object vs. classes, encapsulation, aggregation, inheritance and polymorphism, de-facto industry standard for general-purpose object-oriented modeling.

UNIT II OBJECT-ORIENTED ANALYSIS

Overview of object analysis: Shater/Mellor, Coad/Yourdon, Rumbaugh, Booch, usecase, conceptual model, behavior, class, analysis patterns, aggregation, advanced principles and strategies for object-oriented analysis and design, encapsulation and connascence, encumbrance and cohesion, type conformance and closed behavior, application of analysis and design patterns.

UNIT III OBJECT-ORIENTED DESIGN METHODS

Unified Modeling Language (UML), diagrams, collaboration, sequence, class, design patterns and frameworks, comparison with other design methods, diagramming and notational techniques within UML, visual nature of UML, CASE tools, structural models in UML, through the use of class diagrams, component diagrams and deployment diagrams, behavioural models in UML, through the use of use-case models, state-chart diagrams and activity diagrams.

UNIT IV OBJECT-ORIENTED DEVELOPMENT METHODOLOGY

Managing analysis and design, evaluation testing, coding, maintenance, metrics, importance of development methodology, object-oriented processes in the context of a development life cycle, Rational Unified Process (RUP), RUP splits project life cycle into four phases: inception, elaboration, construction and transition, workflows and models within each phase.

UNIT V REQUIREMENT, DESIGN AND ANALYSIS MODELLING

Requirements modeling, requirement model principle, use-case models, domain object models, documentation the requirements model, challenges and benefits of requirement modeling, agile requirement modeling, design of foundation class libraries, object-oriented databases, client/server computing, middleware, design modeling, design vs. analysis, persistent objects, design of classes, cohesion and coupling, documenting the design model, analysis modeling, use-case analysis, analysis models.

References Books:

1. Object-Oriented Analysis and Design, John Deacon, Pearson Education, 2009.
2. Object-Oriented Modeling and Design, James Rumbaugh, Michael Blaha,William Premerlani, Prentice Hall, 1991.
3. Object-Oriented Design, Grady Booch, 1991.
4. Applying UML and Patterns, Craig Larman, Addison Wesley, 2000.
5. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Addison-Wesley Longman, 1999.
6. Object Oriented System Development, Ali Bahrami, McGraw Hill International Edition, 1999.
7. Analysis Patterns, Fowler, Addison Wesley, 1996.
8. Design Patterns, Erich Gamma, Addison Wesley, 1994.

9. Object-Oriented Systems Analysis and Design Using UML 2/e , Simon Bennett, Steve McRobb, Ray Farmer McGraw-Hill Education 2002.
10. Requirements Analysis and System Design: Developing Information Systems with UML, Leszek
11. Maciaszek, Addison Wesley, 2007.

ARTIFICIAL INTELLEGENCE			
Course Code:	**CS571**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Basic concept of artificial intelligence (AI), history of AI, AI and consciousness, weak and strong AI, physical symbol system hypothesis, comparison of computer and human skills, practical systems based on AI, development of logic, components of AI.

UNIT II PROBLEM SOLVING THROUGH AI

Defining problem as state space search, analyzing the problem, representing the problems from AI viewpoint, production system, developing production rules, characteristics of production system, algorithm for problem solving using AI technique.

UNIT III SEARCH TECHNIQUES

Use of search in AI problem solution, blind search techniques, heuristic search techniques, concept of heuristic knowledge, designing of the heuristic function, types of heuristic search techniques: generate and test, best first search, problem reduction using AND – OR graph, local search technique, branch and bound search, memory bounded search technique, local beam search, properties of heuristic search techniques, overestimation and underestimation of heuristic function, hill climbing search, simulated annealing search, constraint satisfaction, means ends analysis.

UNIT IV INTRODUCTION TO LOGIC

Introduction, propositional calculus, syntax of propositional calculus, semantics of propositional calculus, well formed formula, properties of statements, inferencing of propositional logic, predicate logic, syntax of predicate logic, semantics of predicate logic, representation of facts First Order Predicate Logic (FOPL), inferencing in predicate logic, concept of resolution, resolution algorithm, skolemization, Types of resolution, unit resolution, binary resolution.

UNIT V PROLOG and LISP

Basic concept of programming languages related to artificial intelligence problems, concept of programming in Logic, basic prolog constructs, atoms, defining the rules, writing small programs in prolog, concept of list processing, basic LISP constructs, writing functions in LISP, some simple programs of LISP.

Reference books:

1. Artificial Intelligence, Elanie Reich: Tata mcgraw Hill publishing house, 2008.
2. Artificial intelligence, Peterson, TataMcGraw Hill, 2008.
3. Artificial intelligence, Russel and Norvig, Pearson Printice Hall Publication, 2006.
4. Artificial Intelligence, Winston, PHI publication, 2006.

ADVANCED DBMS			
Course Code:	**CS525**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I THE EXTENDED ENTITY RELATIONSHIP MODEL AND OBJECT MODEL

ER model revisited, motivation for complex data types, user defined abstract data types and structured types, subclasses , superclasses, inheritance, specialization and generalization, relationship types of degree higher than two, object–oriented concepts, object identity, object structure and type constructors, encapsulation of operations, methods and persistence, type hierarchies and inheritance, type extents and persistent programming languages, OODBMS architecture and storage issues, transactions and concurrency control, examples of ODBMS.

UNIT II OBJECT RELATIONAL AND EXTENDED RELATIONAL DATABASES

Database design for an ORDBMS, nested relations and collections , Storage and access methods, query processing and optimization, overview of SQL3, implementation issues for extended type, Systems comparison of RDBMS, OODBMS, ORDBMS.

UNIT III PARALLEL AND DISTRIBUTED DATABASES AND CLIENT–SERVER ARCHITECTURE

Architectures for parallel databases, parallel query evaluation, parallelizing individual operations, sorting joins, distributed database concepts, data fragmentation, replication and allocation techniques for distributed database design, query processing in distributed databases, concurrency control and recovery in distributed databases, an overview of client–server architecture.

UNIT IV DATABASES ON THE WEB AND SEMI–STRUCTURED DATA

Web interfaces to the web, Overview of XML, structure of XML data, Document Schema, Querying XML data, Storage of XML data, XML applications, semi–structured data model, Implementation issues, Indexes for text data.

UNIT V ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS

Active database concepts, temporal database concepts, spatial databases: concept and architecture, Deductive databases and query processing, mobile databases, Geographic Information Systems (GIS).

Text Books:

1. Elmsari and Navathe, Fundamentals of Database Systems,
2. Ramakrishnan and Gehrke, Database Management Systems,

References Books:

3. Korth, Silberschatz, Sudarshan, Database System Concepts,
4. Rob and Coronel, Database Systems: Design, Implementation and Management,
5. Date and Longman, Introduction to Database Systems,

OBJECT-ORIENTED ANALYSIS AND DESIGN LAB			
Course Code:	**CS589**	**Credits:**	**2**
No. of Practical (Hrs/Week):	**3**		
Total No. of Lab Sessions:	**10**	**End Sem. Exam Hours:**	**2**

Programs/Experiments List:

1. To develop a problem statement with the help of Object-Oriented Analysis and Design Techniques.

2. Develop an IEEE standard SRS document. Also develop risk management and project plan through Gantt chart and Object-Oriented Analysis and Design Techniques.

3. Identify Use Cases and develop the Use Case model.

4. Identify the business activities and develop an UML Activity diagram.

5. Identity the conceptual classes and develop a domain model with UML Class diagram.

6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.

7. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.

8. Implement the Technical services layer, Domain objects layer and User Interface layer.

9. Draw Component and Deployment diagrams.

10. Develop a mini projects in any object- oriented programming language.

ADVANCED DBMS PROGRAMMING LAB			
Course Code:	**CS587**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**3**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**10**		

List of Experiments

1. Introduction to MySQL, Postgre Sql , Microsoft Sql softwares.

2. An exercise of data types in PostGresql & Data Definition Language Commands

2. Exercise on Data Manipulation Language and Transaction Control Commands using PostgreSql.

3. Exercise on Types of Data Constraints using PostgreSql.

4. Exercise on JOINS (Single-Table) Using Normalization

5. Exercise on JOINS (Multiple-Table) Using Normalization

6. Exercise on GROUP BY/ORDER BY Clause and Date Arithmetic using PostgreSql.

7. Exercise on different Functions (Aggregate, Math and String)

8. Exercise on different types of sub queries

9. Introduction to Procedures

10. Introduction to View

11. Introduction to Triggers

INTELLIGENT SYSTEM

(ELECTIVES -1)

SOFTWARE PROJECT MANAGEMENT			
Course Code:	**CS541/CS441**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Scope of project management, project life cycle, software project planning- Step by Step planning, Introduction of project management activities: cost estimation, project scheduling, staffing, software configuration management, quality assurance, project monitoring, risk management, problem with software projects, roles and responsibilities of software project manager.

UNIT II PROJECT EVALUATION AND APPROACHES

Project management and evaluation: Cost benefit analysis, payback period, NPV, ROI, Selection of appropriate project approach: Waterfall model, V-process model, prototyping, spiral model, incremental delivery, iterative process. Capability Maturity Model (CMM).

UNIT III ACTIVITIES PLANNING AND RISK MANAGEMENT

Project scheduling, Project network diagram fundamentals, PERT techniques, Gantt charts, Risk assessment, planning and management, Resource allocation: creating critipaths, scheduling, cost schedules. Monitoring and controlling the projects. Introduction to Microsoft Project.

UNIT IV MONITORING PROJECTS AND CONTRACTS

Monitoring the progress of projects, accessing the risk of slippage, reporting, earned value analysis, control procedures, Managing Contracts: stages needed to acquire software, types of contracts contents of contracts and the evaluation of proposal on the basis of contracts.

UNIT V PROJECT QUALITY AND PEOPLE ISSUES

People: player, team leader, software team, coordination and communication issues; inducting motivating teams, improving efficiency, Software quality and its importance defining, designing and monitoring the software quality.

Reference Books:

1. Software Project Management, Cottrell M. and Hughes B., Tata McGraw Hill, 2006.
2. Software Project Management-A Real-World Guide to Success, Henry J., Addison Wesley, 2009.
3. Effective Software Project Management, Robert K. Wysocki, Wiley India, 2006.
4. Introduction to Software Project Management and Quality Assurance, Ince D., Sharp H. and Woodman M., McGraw Hill, 1993.
5. Project Management, Maylor H., Prentice Hall, 2003.
6. Success in Your Project-A Guide to Student System Development Projects, Weaver P., Prentice Hall, 2004.
7. Managing the Software Process, Humphrey, Watts, Addision-Wesley, 1986.
8. Software Engineering: A Practitioner's Approach, Pressman, Roger, McGraw Hill, 1997.
9. Software Engineering: Software Reliability, Testing and Quality Assurance, Nasib S. Gill, Khanna Book Publishing Co. (P) Ltd., New Delhi, 2002.
10. Fundamental of Software Engineering, Rajib Mall, Prentice Hall of India, 2003.
11. Software Engineering Concepts, Richard E. Fairley, Tata McGraw Hill, 1997.
12. An Integrated Approach to Software Engineering, Pankej Jalote, Narosa Publishing House, New Delhi 1997.
13. Software Engineering, Ian Sommerville, Pearson Education, 2009.

OBJECT-ORIENTED SOFTWARE ENGINEERING			
Course Code:	**CS543/CS443**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I OBJECT-ORIENTED SOFTWARE ENGINEERING

OOSE, object-orientation paradigm, object-oriented analysis, basic concepts, use cases, analysis, stereotypes and objects, analysis patterns, object modeling languages, object-oriented design: basic concepts, design stereotypes and objects, design patterns; object-oriented programming: basic concepts, idioms, object-oriented programming languages, application frameworks, object-oriented case tools, state transition and interaction diagrams, testing of object-oriented programs.

UNIT II ADVANCED OBJECT-ORIENTED ANALYSIS AND DESIGN

Frameworks and design patterns, design for reusability, advanced object-oriented programming techniques, design using object-oriented databases and distributed object architectures, design of software agents, project involving object-oriented analysis, design, and implementation.

UNIT III DESIGNING SOFTWARE USING PATTERNS

Process of design, principles, techniques, software architecture, architectural patterns, abstraction-occurrence pattern, hierarchy pattern, player-role pattern, singleton pattern, observe pattern, delegation pattern, adapter pattern, facade pattern, immutable pattern, read only interface pattern, proxy pattern.

UNIT IV OBJCET-ORIENTED METRICS

Measure, metrics and indicators, software measurement, metrics for object-oriented software development environments, characteristic of object-oriented metrics, Chidamber & Kemerer's metrics suite: Weighted Methods Per Class (WMC), Depth of Inheritance Tree (DIT), Number of Children (NOC), Coupling Between Object Classes (CBO), Response For a Class (RFC), Lack of Cohesion in Methods (LCOM), Lorenz and Kidds' metrics, metrics for object-oriented metrics projects: management process, development process, application size, staffing size, scheduling.

UNIT V DESIGN METRICS AND OBJCET-ORIENTED TESTING

Design metrics overview, method size, method internals, class size, class inheritance, method inheritance, class internals, MOOD (Metrics for Object-Oriented Design): Method Hiding Factor (MHF), Attribute Hiding Factor (AHF), Method Inheritance Factor (MIF), Attribute Inheritance Factor (AIF), Polymorphism Factor (PF), Coupling Factor (CF), object-oriented testing, test case design for object-oriented software, testing methods at class level: random testing of object-oriented class; interclass test case design: multiple class testing, test derived from behavior models.

Reference Books:

1. Object-Oriented Software Engineering, Bernd Bruegge, Allen H. Dutoit, PHI, 2003.
2. Object-Oriented Software Engineering, Timothy C. Lethbridge, Robert Laganiere, TMH, 2008.
3. Object-Oriented Modeling and Design, J. Rumbaugh, M. Blaha, W. Premerlani, PHI, 1991.
4. Object-Oriented Design, Grady Booch, 1991.
5. Software Engineering: Practitioner's Approach, Pressman Roger S., TMH, 2004.
6. Software Engineering: Software Reliability, Testing & Quality Assurance, N. S. Gill, KBP, 2002.
7. Fundamental of Software Engineering, Rajib Mall, Prentice Hall of India, 2003.
8. Software Engineering Concepts, Richard E. Fairley, Tata McGraw Hill, 1997.
9. An Integrated Approach to Software Engineering, Pankej Jalote, Narosa Publishing, 1997.
10. Software Engineering, Ian Sommerville, Pearson Education, 2009.

INFORMATION SECURITY			
Course Code:	**CS545/CS445**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Security problem in computing, threat scenarios, critical infrastructures, security targets and policies, security mechanisms, examples of applications and their different security requirements, multi-lateral security, privacy and data protection, computer misuse legislation, operating system and network security, cyber laws, , hacking , anti hacking solution, case studies of modern antivirus software, Computer Emergency Response Team (CERT) functionality, NIST, Introduce RFC related to security.

UNIT II SECURITY MODELS

Military and Civil Security, vulnerability and threat models, end-end security (COMSEC), link Encryption (TRANSEC), compartments, privacy, authentication, denial of service, no repudiation, private-key and public-key cryptographic algorithms: DES, RSA, SHA, encapsulation, encryption principles, issues in multi-level secure systems, Internet security models: IPv4/IPv6 encapsulation header, digital signature standard,

UNIT III SECURITY POLICIES AND DESIGN GUIDELINES

Policies, policy creation, regularity considerations, and privacy regulations, security: infrastructure and components, design guidelines, authentication: authorization and accounting, physical and logical access control, user authentication: biometric devices. open source software for network security quantum cryptography, Microsoft cryptography toolkit, cryptographic solution using java .

UNIT IV OSI LAYER SECURITY

Secure SNMP, secure routing interoperability: IP Security, virtual networks (DART net/CAIRN), transparent and opaque network services, source masking and hidden channels, techniques for fault detection, isolation and repair, secure network infrastructure services: DNS, NTP, SNMP, privacy Enhanced Mail (PEM), secure binding of multimedia streams, secure RTP, secure RSVP, mobile systems: Address Export and re-use, Secure Session Layer (SSL), Secure Hypertext Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), email security, Firewall platforms, partitioning models and methods,

UNIT V KEY AND CERTIFICATE MANAGEMENT

Secure binding of public and private values: DNS certificates, making and distributing key media: randomization, lifetime issues, key agreement protocols: STS protocol and IETF work orders, key escrow: clipper chip, one-time passwords: schemes based on S/KEY, PKI components and applications, exploiting diversity and redundancy: byzantine generals, time stamping and reliable ordering of events: NTP, consensus and agreement protocols, security in wireless networks, shared secret data authentication: token based/ public key based, session key management: blind key cryptosystems.

Reference Books:

1. Information Security, Principal and practices,Mark Merkow, Jim Breithaupty, Person 2007
2. Cryptography and Network Security: Theory and Practice, Stallings, John Wiley, 2006.
3. Network Security Bible Eric Cole , Ronald L. Krutz,Welley, 2005.
4. Computer Security, Gollmann, D., Wiley Edition, 1999.
5. Cryptography, Theory and Practice, Stinson D., CRC Press, Boca Raton, FA, 1995.
6. Security Engineering: A Guide to Building Dependable Distributed Systems, Anderson R., Wiley, 2nd edition, 2008.
7. Web Security: A Step-by-Step Reference Guide, Stein L., Addison Wesley Longman, Inc., 1998.

MULTIMEDIA TECHNIQUES			
Course Code:	**CS547/CS447**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Introduction to multimedia, multimedia information, multimedia objects, multimedia in business and work, convergence of computer, communication and entertainment products, multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

UNIT II MULTIMEDIA BUILDING BLOCKS

Text, sound MIDI, digital audio, audio file formats, MIDI under windows environment audio & video capture.

UNIT III DATA COMPRESSION

Huffman coding, Shannon Fano algorithm, Huffman algorithms, adaptive Coding, arithmetic coding Higher order modeling, finite context modeling, dictionary based compression, sliding window compression, LZ77, LZW compression, compression, compression ratio loss less & lossy compression.

UNIT IV SPEECH COMPRESSION & SYNTHESIS

Digital Audio concepts, sampling variables, loss less compression of sound, loss compression & silence compression.

UNIT V IMAGES

Multiple monitors, bitmaps, vector drawing, lossy graphic compression, image file formatting animations Images standards, JPEG Compression, Zig Zag coding, multimedia database, content based retrieval for text and images, video: video representation, colors, video compression, MPEG standards, MHEG standard video Streaming on net, video conferencing, multimedia broadcast services, indexing and retrieval of video database, recent development in multimedia.

Reference Books:

1. Tay Vaughan “Multimedia, Making IT Work” Osborne McGraw Hill.
2. Buford “Multimedia Systems” Addison Wesley.
3. Agrawal & Tiwari “Multimedia Systems” Excel.
4. Mark Nelson “Data Compression Book” BPB.
5. David Hillman “Multimedia technology and Applications” Galgotia Publications.
6. Rosch “Multimedia Bible” Sams Publishing.
7. Sleinreitz “Multimedia System” Addison Wesley.
8. James E Skuman “Multimedia in Action” Vikas.

SOFT COMPUTING			
Course Code:	**CS449/CS561**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I FUZZY LOGIC

Introduction to fuzzy logic, classical and fuzzy sets, overview of fuzzy sets, membership function, fuzzy rule generation, operations on fuzzy sets: compliment, intersection, union, combinations on operations, aggregation operation.

UNIT II FUZZY ARITHMETIC

Fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, uncertainty based information, information and uncertainty, no specificity of fuzzy and crisp sets, fuzziness of fuzzy sets.

UNIT III NEURAL NETWORK

Overview of biological neurons, computational neuron, mathematical model of neurons, ANN architecture, single layer and multilayer architectures, activation function, threshold value, self learning and forced learning algorithms, feed forward and feedback architectures.

UNIT IV LEARNING FUNDAMENTALS

Learning paradigms, supervised and unsupervised learning, reinforced learning, ANN
training, algorithms perceptions, training rules, delta, back propagation algorithm, multilayer perception model, Hopfield networks, associative memories, applications of artificial neural networks,

UNIT V GENETIC ALGORITHMS

History of genetic algorithm, terminology of genetic algorithm, biological background, creation of offspring, working principles of genetic algorithms, fitness function, reproduction: Roulette wheel selection, Boltzmann selection, cross over mutation, inversion, deletion, and duplication, generation cycle.

Reference Books:

1. Artificial Neural Networks: An introduction to ANN Theory and Practice, Peteus J. Braspenning, PHI publication, 2005.
2. Fuzzy Logic: A spectrum of Theoretical and Practical issues, Paul P. Wang, pearson publication 2004.
3. Fuzzy Sets, Fuzzy logic, and Fuzzy Systems: Selected Papers- Lotfi Asker Zadeh, George J. Kilr, Bo yuan, 2005.
4. Foundations of Fuzzy logic and Soft Computing: 12th International Fuzzy conference proceeding, 2005.
5. Neural Networks Theory, Particia Melin, Oxford University press, 2003
6. Neural Networks Theory and Application, Oscar Castillo, Wiley Eastern publication 2003.

NATURAL LANGUAGE PROCESSING			
Course Code:	**CS451/CS551**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Fundamental aspects of natural language processing, brief history of natural language processing, significance of natural language processing, some early natural language processing systems like ELIZA, LUNAR, SHRDLU, practical front ends, general NLP system, role of knowledge in language processing, fundamental aspects of English grammar

UNIT II PHASES OF NATURAL LANGUAGE PROCESSING

Various phases of natural language processing: phonological analysis, morphological analysis, lexical analysis, syntactic analysis, semantic analysis, pragmatic and discourse analysis, parsing techniques: top down parsing, bottom up parsing bidirectional parsing, deterministic parsing, non deterministic parsing, comparison of various parsing techniques.

UNIT III APPROACHES TO SYNTACTIC ANALYSIS

Word class and part of speech tagging, rule based part of speech tagging, stochastic part of speech tagging, HMM algorithm of tagging, basic parsing techniques, top down parsing, bottom up parsing, comparison of top down and bottom up parsing, problems of top down and bottom up parser, left recursion, ambiguity, repeated parsing of subtrees, Early algorithm.

UNIT IV APPROACHES TO SEMANTIC ANALYSIS

Syntax driven semantic analysis, lexical semantic approach, use of knowledge for language analysis, representation of knowledge for language analysis, first order predicate calculus, concept of pragmatic and discourse analysis, concept of anaphora, basic types of anaphora, some elementary anaphora resolution approaches.

UNIT V TRANSITION NETWORKS AND GRAMMARS

Concept of transition network, use of transition network for basic language analysis, recursive transition network, augmented transition network, fundamental aspects of grammars, context free grammars, feature and augmented grammars, unification grammar, Fillmore's grammar.

Text Books:

1. Natural language understanding, James Allen: Tata Mc Graw hill publishing house, 2004.
2. Language and speech processing, James Martin: PHI publication, 2003.

References:

1. Natural Language Processing, Gazdar, PHI publication, 2004.
2. Natural Language Processing, Sampson, Narosa publication, 2005.

MACHINE TRANSLATION AND LEARNING			
Course Code:	**CS457/CS557**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I OVERVIEW OF MACHINE TRANSLATION

Definition, fundamental concepts, applications, language similarities and differences, cross language information retrieval, computer aided human translation, sublanguage classification, concept of polysynthetic language, Sapir – Whorf hypothesis, concept of ontology, direct vs. indirect translation, statistical model of machine translation.

UNIT II DIFFERENT MACHINE TRANSLATION MODELS

Graphical models: belief networks, Bayesian networks, Hidden Markov models, incremental learning, reinforcement learning, machine learning applications.

UNIT III MACHINE TRANSLATION METHODOLOGIES

Decision trees, linear discrimination, Neural networks, support vector machines (SVMs), quantifying fluency and faithfulness, usability and system development, direct transfer, quantifying fluency and faithfulness, boosting and bagging, naive Bayes classifiers, gradient-descent, Q-learning.

UNIT IV MACHINE-LEARNING FUNDAMENTALS

Classification, regression and clustering; noisy, noise-free and incomplete data; supervised and unsupervised learning; hypothesis classes, model complexity, model selection, Ockham's razor and bias-variance dilemma, dynamic environments, reinforcement learning and the exploration-exploitation dilemma.

UNIT V BASIC LEARNING METHODS

Unsupervised learning: K-means, vector quantization, self-organizing neural networks. Supervised learning: K nearest neighbor, learning vector quantization, decision tree, supervised neural networks, the transfer metaphor, syntactic transformations, lexical transformations.

Text Books:

1. Machine Translation of Languages, Wilen Sky R. Planning and understanding, Addison Wisely, Reading MA, 2003.
2. Artificial Neural Networks: An Introduction to ANN Theory and Practice by Peteus J. Braspenning, PHI publication, 2005.

References Books:

1. A New Approach to Machine Translation, Russel S, and Norvig P, Pearson education publication, 2003.
2. Evolutionary Language Understanding, Sampson G. Mc. Graw Hill publication, 2002.
3. The Machine Translation perspective, Schank, R.C., PHI publication 2000.

WIRELESS TECHNOLOGIES			
Course Code:	**EC564**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I: INTRODUCTION

Introduction to networking, Reference models , Layering and protocol, OSI and other models, Network types, network media , Network topologies, Connectivity devices, Types and range of wireless communications, Growth of Wireless communication, Wireless technologies, Wireless LAN, Wireless Application Protocol.

UNIT II: WIRELESS TECHNOLOGIES PARAMETERS

Antennas, Narrowband and spread spectrum technology, Accessing channels: spread spectrum and cellular telephony, propagation, frequency and spectrum, signals, personal communication system, Wireless Application protocol, WAP architecture requirements, The WAP model.

UNIT III: BLUETOOTH

Design and principles of operation, transmitter characteristics, baseband characteristics, physical channel, physical links, general format, transmit/Receive timing, channel control, Bluetooth security, Link manager protocol, general operation , data packet format, service discovery protocol, RFcomm.

UNIT IV: CELLULAR TELEPHONY

History of cellular telephony, design and principles of cellular operation, analog cellular telephones, Digital Cellular telephones, digital Network, personal communication systems, third generation.

UNIT V: SATELLITE COMMUNICATIONS AND GPS

History of satellite communication , Communicating with satellite , launching a satellite , escape and orbital velocity, different types of satellites, orbital mechanics, LEO , MEO, GEO, HEO, Design and principles of operation of GPS, satellite segment ,control segment, user segment, Differential GPS.

Text Books:

[1] Gary Rogers, John Edwards, “Introduction to Wireless Technology,” First Edition, 2008.

REFERENCES:

[1] T.S. Rappaport , "Wireless Communication " ,Second Edition, Pearson Education,2002
[2] Simon Haykin; M.Moher , "Modern Wireless Communications " ,Pearson Education,2005
[3] W.C.Y.Lee , "Wireless and Cellular Telecommunications " ,Third Edition, McGraw-hill International Edition,2006

INTELLIGENT SYSTEM

(SEMESTER - II)

SOFT COMPUTING TECHNIQUES			
Course Code:	**CS562**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I FUZZY LOGIC

Introduction to fuzzy logic, classical and fuzzy sets, overview of fuzzy sets, membership function, fuzzy rule generation, operations on fuzzy sets: compliment, intersection, union, combinations on operations, aggregation operation.

UNIT II FUZZY ARITHMETIC

Fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, uncertainty based information, information and uncertainty, no specificity of fuzzy and crisp sets, fuzziness of fuzzy sets.

UNIT III NEURAL NETWORK

Overview of biological neurons, computational neuron, mathematical model of neurons, ANN architecture, single layer and multilayer architectures, activation function, threshold value, self learning and forced learning algorithms, feed forward and feedback architectures.

UNIT IV LEARNING FUNDAMENTALS

Learning paradigms, supervised and unsupervised learning, reinforced learning, ANN training, algorithms perceptions, training rules, delta, back propagation algorithm, multilayer perception model, Hopfield networks, associative memories, applications of artificial neural networks,

UNIT V GENETIC ALGORITHMS

History of genetic algorithm, terminology of genetic algorithm, biological background, creation of offspring, working principles of genetic algorithms, fitness function, reproduction: Roulette wheel selection, Boltzmann selection, cross over mutation, inversion, deletion, and duplication, generation cycle.

UNIT VI CONCEPT OF UNCERTAINTY

Presence of uncertainty in real world problems, handling uncertain knowledge, degree of belief, degree of disbelief, uncertainty and rational decisions, decision theory, utility theory, concept of independent events, Bay's rule, using Bay's rule for combining events.

Text Books:

7. Artificial Neural Networks: An introduction to ANN Theory and Practice, Peteus J. Braspenning, PHI publication, 2005.
8. Fuzzy Logic: A spectrum of Theoretical and Practical issues, Paul P. Wang, pearson publication 2004.

Reference Books:

9. Fuzzy Sets, Fuzzy logic, and Fuzzy Systems: Selected Papers- Lotfi Asker Zadeh, George J. Kilr, Bo yuan, 2005.
10. Foundations of Fuzzy logic and Soft Computing: 12th International Fuzzy conference proceeding, 2005.
11. Neural Networks Theory, Particia Melin, Oxford University press, 2003
12. Neural Networks Theory and Application, Oscar Castillo, Wiley Eastern publication

2 Year M. Tech. (ICT) for Engineering Graduates **Effective from 2011-2012**

ARTIFICIAL INTELLEGENCE PROGRAMMING LANGUAGES			
Course Code:	**CS564**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I PROPOSITIONAL CALCULUS

Syntax and semantics of propositional calculus, Atomic symbol, logical connectives, the semantics of propositional calculus, well formed formula, properties of statements, inferencing in propositional logic, concept of inferencing, modus ponen and modus tollen rules, equivalence, validity, and satisfiability, agent based propositional logic.

UNIT II PREDICATE LOGIC

Syntax of predicate logic, predicate logic symbols, constants, variables, functions, terms, predicates, connectives, quantifiers, semantics of predicate logic, representation of facts using predicate logic, quantifiers, inferencing in predicate logic.

UNIT III RESOLUTION

Concept and process of resolution, concept of theorem proving, disjunctive and conjunctive normal form, conversion of a wff statement into clausal form, Solemnization, resolution algorithm, completes of resolution, types of resolution, unit resolution, binary resolution, linear resolution, unification, unification algorithm, applications of resolution.

UNIT IV LOGIC PROGRAMMING

The order of logic, first order logic, existential and universal quantifier, nested quantifier, The concept of programming, algorithm development for the facts represented in form of logic, techniques of standard program design, writing example programs.

UNIT V PROLOG and LISP LANGUAGE

Syntax of Prolog, basic data types of PROLOG, properties and array list, control structures, input output statements, creating rule base in PROLOG, writing programs in Prolog, Syntax of LISP, properties of LIST, representation and storage of list, function, basic data types of LISP, input output statements, control structure of LISP, writing programs in LISP.

Text Books:

1. Prolog Programming, Russel Norvig, Addison Wisely publication 2006.
2. LISP programming, James Martin, PHI publication, 2002.

Reference Books:

1. Artificial Intelligence, Winston, Addison Wisely publication, 2005.
2. Prolog Programming for Artificial Intelligence , Brakta L, Addison wisely publication, 2006.
3. Programming Expert System in OPS5: An Introduction to Rule Based Programming Browston, 2005.

ARTIFICIAL INTELLEGENCE PROGRAMMING LAB			
Course Code:	**CS584**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**3**		**3**
Total No. of Lab Sessions:	**10**	**End Sem Exam Hours:**	

List of Experiments

1. Logic and AI Programming lab to write a programme in lisp to fined fibroins size up to terms.
2. Write a programme a lips to credit a lips to five notes store and individual data print a aliments of list.
3. Write a programme a lips to read an area print in it rivers order.
4. Write a programme a lips aliment of area in ascending order.
5. Write a in C programme a star a algorithm.
6. Write a programme in C language to implement minimex surch processor.
7. Write a programme in C to implement minimex surch with Alfa Beta cut of.
8. Write a programme in C to implement unification algorithim.

INTELLIGENT SYSTEM

(ELECTIVES - 2 & 3)

KNOWLEDGE ENGINEERING			
Course Code:	**CS566/CS462**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I FUNDAMENTALS OF KNOWLEDGE

Concept of knowledge, types of knowledge, declarative knowledge, procedural knowledge, inheritable knowledge, inferential knowledge, relational knowledge, heuristic knowledge, commonsense knowledge, explicit knowledge, tacit knowledge, uncertain knowledge.

UNIT II KNOWLEDGE REPRESENTATION

The need of knowledge representation, levels of knowledge representation, granularity of knowledge representation, granularity vs. size of knowledgebase, techniques of knowledge representation, frames, reasoning with frames, frame based knowledge representation, semantic network, partitioned semantic nets, conceptual graphs, scripts.

UNIT III KNOWLEDGE STORAGE AND ACQUISITION

Need of knowledge storage, characteristic of good knowledge representation, knowledge acquisition, indexing techniques, fuzzy distance calculation, issues in knowledge acquisition, requirements of knowledge acquisition techniques, issues in knowledge acquisition in organization, knowledge organization and management, consistency of knowledge representation.

UNIT IV KNOWLEDGE ORGANISATION AND MANAGEMENT

Need of organizing the knowledge, techniques of knowledge organization, forward reasoning and backward reasoning, combination of forward and backward chaining, matching, conflict resolution, information retrieval from knowledge base, indexing, matching, RETE matching algorithm.

UNIT V APPLICATIONS OF KNOWLEDGE

Knowledge reuse technique in the designing of expert systems, components of knowledge engineering based problem solution methodology: identification of task, assembly of relevant knowledge, identification of lexicon, encoding general and domain specific knowledge, choosing inference procedure, identifying the bugs, rule based systems, blackboard architectures.

Text Books:

1. Artificial Intelligence and Knowledge Engineering, Winston, PHI publication , 2004.
2. Conceptual Information Processing, R.C Schank, Amsterdum North Holland, 2003.

Reference Books:

1. The basic concepts of knowledge engineering by Shank and J.G. Carbonell, PHI publication, 2003.
2. Principles of Artificial intelligence, Nillson, N.J., Morgan Kaufmann publication, 2004.
   Knowledge Management, by Shelda Debowski, John Wiley & Sons publication,

PATTERN MATCHING			
Course Code:	**CS568/CS464**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION AND BAYESIAN DECISION THEORY

Introduction to pattern recognition, Systems, design cycles, learning and adaptation, Bayesian decision theory, minimum error-rate classification, classifiers, discriminate functions and decisions surfaces.

UNIT II MAXIMUM – LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION

Maximum – Likelihood estimation, Bayesian estimation, Bayesian parameter estimation, Gaussian case and general theory, problems of dimensionality, Hidden Markov models, rules for pattern matching, incremental forward chaining, matching with known facts, data complexity.

UNIT III NONPARAMETRIC TECHNIQUES

Density estimation, parazen windows, Kn – Nearest neighbor estimation, nearest neighbor node metric technique.

UNIT IV LINEAR DISCRIMINATE FUNCTIONS

Linear discriminate functions and decision surfaces, generalized linear discriminate functions, two category uniformly separate case, minimizing the perception criterion function, relaxation procedures, nonseperable behavior, minimum squared-error procedures, Ho–Kashyap Procedures, support vector machines, multicategory generalization.

UNIT V UNSUPERVISED LEARNING

Clustering mixture densities and identifiability, maximum, likelihood estimation, application to normal mixtures, unemperouses, Bayesian learning, Data descriptions and controls, criterion function for clustering, interface, optimization, hierarchical clustering, component analysis, low dimension representation and multidimensional scaling.

Text Books:

1. Pattern Classification Richard O. Duda, Peter E. Hart and David G. Stork," 2nd Edition, John Wiley, 2003.
2. Introduction to the theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.

References:

1. "Learning from Data-Concepts, Theory and Methods, Cherkassky V., F. Kulier, John Wiley, New York, 1998.
2. Neurocomputing: Foundations of Research, MIT Press, Cambridge Anderson J.A., E. Rosenfield, MA, 1988.
3. Self-Organizing Maps, Kohonen T., 2nd Ed., Springer Verlag, Berlin, 1997.
   Pattern Recognition by Devrophi publication, 1996.

NEURAL NETWORK			
Course Code:	**CS570/CS466**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO NEURAL NETWORKS

Biological Neuron, analogy of biological and artificial neuron, architecture classification, neural models, learning paradigm and rule, single unit mapping and the perception.

UNIT II FEED FORWARD NETWORKS

Review of optimization methods, back propagation, variation on back propagation, FFANN mapping capability, activation function of neural networks, network structures, single layer feed forward neural networks (perceptions'), Learning rate of neuron, multilayer feed forward neural network, Kernel function, boosted neural network, support vector machine, virtual support machine, shape matching.

UNIT III MULTILAYER NEURAL NETWORKS

Feed forward operations and classifications, back propagation algorithm, error factors, back propagation as feature & mapping, back propagation, buyer theory and probability, practical techniques for improving back propagation, regularization, complexity adjustment and pruning.

UNIT IV MATHEMATICAL PROPERTIES OF NEURAL NETWORKS

Formulation of mathematical model of FFANN's, Generalization, Bios & variance Dilemma, Radial Basis Function networks, back propagation algorithm, nearest neighbor and instance based learning methods.

UNIT V APPLICATION OF NEURAL NETWORK

PCA, SOM, LVQ, Hopfield networks, associative memories, RBF Networks, applications of Artificial Neural Networks (ANN) to function approximation, regression, classification, blind source separation, time series and forecasting.

Text Books:

1. Neural Networks-A Comprehensive Foundations, Haykin S., Prentice-Hall International, New Jersey, 1999.
2. An Introduction to Neural Networks, Anderson J.A., PHI, 1999.

Reference Books:

1. Introduction to the Theory of Neural Computation, Hertz J, Krogh A, R.G. Palmer, " Addison-Wesley, California, 1991.
2. Introduction to the Theory of Neural Computation, Hertz J, Krogh A, R.G. Palmer, , Addison-Wesley, California, 1991.
3. Neural Networks: Algorithms, Applications and Programming Techniques, Freeman J.A., D.M. Skapura, , Addison-Wesley, Reading, Mass, (1992).

DISCOURSE ANALYSIS AND NATURAL LANGUAGE GENERATION			
Course Code:	**CS572/CS468**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO DISCOURSE

Concept of discourse, characteristics of discourse, difference between normal text and discourse, basic terminology used in analysis of discourse, coherence phenomenon, text analysis, different cohesive relations like anaphoric, cataphoric, endophoric and exophoric, analytical treatment of cohesive relations.

UNIT II BASIC REFERENCE PHENOMENON

Concept of anaphora, types of anaphora, indefinite noun phrase, definite noun phrase, pronoun, syntactic and semantic constraints on co-reference, number agreement, person and case agreement, gender agreement.

UNIT III PERENCES IN PRONOUN INTERPRETATION

Recency, grammatical role, repeated mention, parallelism, verb semantics, Lappin and Leass algorithm for anaphora resolution, tree search algorithm, cantering algorithm, inference based anaphora resolution algorithm,

UNIT IV DIALOGUE AND CONVERSATIOANL AGENTS

Difference between a dialogue and text, turns and utterances, grounding, conversational implicature, dialogue acts, automatic interpretation of dialogue acts, cue based interpretation of dialogue acts, dialogue structure and coherence dialogue managers in conversational agents.

UNIT V INTRODUCTION TO NATURAL LANGUAGE GENERATION

Features of language generation, difference between language analysis and language generation, components of language generation, case study of language generation systems, block diagram of natural language generator, content selection, lexical selection, sentence structure, aggregation, referring expression, discourse structure.

Reference Books:

1. Towards a Computational Theory of Definite Anaphora Comprehension in English discourse, Sidner, Pearson publication 2005.
2. Alternative Grammatical Encoding, Sampson, PHI publication, 2004.
3. Artificial Intelligence, Russel Norvig, PHI publication 2005.
4. Analysis of Syntax Based Pronoun Resolution Methods, Tetreault J.R. Wiley Eastern publication, 2000.
5. Machine Learning and Statistical Modeling Approaches to Image Retrieval, Chen, Li, and Wang, , Kluwer, 2004.

INTELLIGENT SYSTEM

(SEMESTER - III)

EXPERT SYSTEM			
Course Code:	**CS661**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO EXPERT SYSTEM

Block diagram of expert system, features of expert system, characteristics of expert system, components of expert system, applications of expert systems, some standard expert systems.

UNIT II COMPONENTS OF EXPERT SYSTEM

Block diagram of expert system, design issues of expert systems, concept of interface design, issue of knowledgebase design, learning module design, limitations of expert systems, rule based systems.

UNIT III HUMAN INTELLIGENCE VS EXPERT SYSTEM

Comparison of skills of human experts and artificially developed expert systems, characteristics of expert systems, knowledge acquisition in expert system, methods of knowledge acquisition in expert system.

UNIT IV DESIGN CRITERIA OF EXPERT SYSTEM

Elementary concepts about designing of an expert system, the issues involved in designing of knowledgebase, user interface module, inferencing information from knowledge base.

UNIT V KNOWLEDGE MANAGEMENT IN EXPERT SYSTEM

Knowledge management (KM) principles and purposes, dynamic nature of KM system, Knowledge system technologies, KM subsystems, knowledge management system development, selecting the system and / or its relevant components, implementing and maintain the knowledge management systems.

Reference Books:

1. Measuring and Managing Knowledge for Expert System , Mc. Graw- hill Boston, 2001.
2. Dendral: Expert System, Feigenbaum et al, by PHI publication, 1992.
3. Modal Operators in expert systems, Berners Lee, Mc Garw hill publication, 2002.
4. The Frame Based Knowledge Representation in Expert Systems, Mc Carthy and Hays, PHI publication, 2003.
5. Decision Theoretic Expert Systems, Russel, Wiley Eastern publication, 2002.

RESEARCH TECHNIQUES IN ICT			
Course Code:	**CS633/CS503**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO RESEARCH TECHNIQUES

Meaning of research, objectives of research, motivation in research, types of research (Introduction to experimental test bed, algorithmic research, simulation research, mathematical modeling approach), characteristics and prerequisites of research, significance of research, research process, sources of research problem, criteria of identifying the problem, necessity of defining the problem, errors in selecting research problem, technique involved in defining the problem, report and paper writing.

UNIT II DATA ANALYSIS AND STATISTICAL TECHNIQUES

Data and their analyses, quantitative methods and techniques, Measure of central tendency, measures of variation, frequency distribution, analysis of variance, methods, Correlation analysis, regression analysis, time series and forecasting, introduction to discriminant analysis, factor analysis, cluster analysis, conjoint analysis, probability distribution, binomial distribution, poisson distribution, uniform distribution, exponential distribution, and normal distribution, sampling methods, test of hypothesis.

UNIT III MATHEMATICAM MODELING

Steps of modeling, operations research models like queuing theory, stochastic processes, application of models, conceptual framework development and validation techniques, optimization techniques.

UNIT IV ALGORITHMIC RESEARCH

Algorithmic research problems, types of algorithmic research, types of solution procedure, steps of development of algorithm, steps of algorithmic research, design of experiments,

UNIT V SIMULATION AND SOFT COMPUTING TECHNIQUES

Introduction to soft computing, artificial neural network, genetic algorithm, fuzzy logic and their applications, tools of soft computing, need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, output analysis, data simulation packages like MATLAB, NS2, ANSYS, Cadence.

Reference Books:

1. Research Methodologies, R. Panneerselvam, Prentice Hall, 2007.
2. Research in Education, Best John V. and James V Kahn, Wiley eastern, 2005.
3. Elements of Educational Research, Sukhia, S.P., P.V. Mehrotra, and R.N. Mehrotra, PHI publication, 2003.
4. Methodology of Research Education, K. Setia, IEEE publication, 2004.
5. Research methodology, Methods and Techniques, Kothari, C.R., 2000.

INTELLIGENT SYSTEM

(ELECTIVES - 4 & 5)

INTELLIGENT INFORMATION RETRIEVAL			
Course Code:	**CS663/CS563**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INFORMATION RETRIEVAL FUNDAMENTALS

Text based information retrieval, examples of information retrieval, need of maintain the global information base, use of information for planning, reliability of information storage, redundancy in information storage, report on 21st Century Intelligent Systems, role of intelligent systems in e-governance.

UNIT II INFORMATION RETRIEVAL MODELS

Information retrieval using the Boolean model, dictionary and postings, dictionary based approaches of information retrieval, lists, adhoc information retrieval method, Indexing, scoring and term weighting, random vs. sequential search methods, the content based information retrieval system, consistency of retrieved information, accuracy and precision of retrieved information.

UNIT III INTERNET BASED INFORMATION RETRIEVAL METHODS

Vector space retrieval, relevance feedback and query expansion, XML retrieval probabilistic information retrieval, language models for information retrieval, text classification and Naive Bayes, web search basics, web crawling and indexes, evaluating information retrieval methods, concept of precision and recall.

UNIT IV AGENT-BASED INFORMATION RETRIEVAL

Ontology-based web agents, searching for Information in unstructured knowledge domains, intelligent adaptive Information agents, designing of agent for information retrieval, incorporation of AI concepts for design of intelligent agent,

UNIT V INFORMATION RETRIEVAL TECHNIQUES

Intelligent systems for finding Genes in DNA, using Information content to evaluate semantic similarity in information taxonomy.

Text Books:

1. Machine Learning and Statistical Modeling Approaches to Image Retrieval, Chen, Li, and Wang, , Kluwer, 2004.
2. Information Representation and Retrieval in the Digital Age, ASIS, Chu, Heting, , 2003.

Reference Books:

1. The Modern Algebra of Information Retrieval, Dominich, Sandor, Springer 2008.
2. Feldman, R. and Sanger, J. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data. Cambridge U. Press, 2006.
3. The Subject Approach to Information, Foskett, A. C., London, Lib. Assoc. Publ, 1996.

DATA MINING IN ARTIFICIAL ITELLIGENCE			
Course Code:	**CS665/CS565**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Data warehousing, data warehouse vs relational databases, various schemas, architecture, Data mining definition & task, KDD versus data mining, data mining architecture, data mining query languages.

UNIT II ELEMENTARY DATA MINING TECHNIQUES

Clustering techniques, classification and regression rules, characterization and discrimination, outlier analysis, evolution analysis, association rules.

UNIT III MINING ASSOCIATION RULES

The Apriori Algorithm, generating association rules, mining multilevel association rules, mining multidimensional association rules from relational databases, metarule-guided mining of association rules, constraint pushing, mining guided by rule constraints, Incremental mining.

UNIT IV CLUSTERING TECHNIQUES

Cluster analysis, partitioning methods: *k*-Means and *k*-Medoids, hierarchical methods, agglomerative and divisive hierarchical clustering, density- based methods, constraint based clustering.

UNIT V WEB MINING AND DATABASE MINING

Mining complex data objects, spatial databases, multimedia databases, time series and sequence data; mining text databases, web content mining, web structure mining, web usage mining, web mining techniques, role of agents in web mining.

Text Books:

1. Data Warehousing In the Real World, Sam Anahory & Dennis Murray, 1997.
2. Data Mining- Concepts & Techniques, Jiawei Han & Micheline Kamber, 2001, Morgan Kaufmann.

References:

1. Data Mining Techniques, Arun Pujar, University Press, Hyderbad, 2001.
2. Data Mining, Pieter Adriaans & Dolf Zantinge, Pearson,1997.
3. Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, Mc Graw Hill.
4. Data warehousing System; Mallach,Mc Graw Hill, 2000.

SPEECH PROCESSING			
Course Code:	**CS667/CS567**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION AND OVERVIEW

Fundamentals of speech processing, ambiguity and uncertainty in speech processing, representation of speech signal in electrical format, manipulation of speech signal, acquisition of speech signal, storage of speech signal.

UNIT II WAVE SHAPING OF SPEECH SIGNAL

Basic concept of wave shaping, Fourier series, representation of signal using Fourier series, calculation of bandwidth, sending a signal through the limited bandwidth channel, multiplexing and de-multiplexing of a signal.

UNIT III STRING EDIT DISTANCE

Key algorithmic tool: dynamic programming, use of dynamic programming in optimal alignment of sequences, string edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT IV PROBABILITY

Introduction to probability theory, concepts related to modern speech processing, events and counting, joint and conditional probability, marginal's, independence, Bayes rule, combining evidence. application of probability in speech processing, **non-probabilistic methods of speech processing.**

UNIT V INFORMATION THEORY

Concept of information, measurement of information in bits, characteristics of noiseless and noisy channel. Entropy, cross-entropy, information gain, application of information theory to some language phenomenon, probabilistic language modeling and its applications.

Text Books:

1. Introduction to Theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.
2. A New Approach to Speech Processing, Russel S, and Norvig Prentice hall publication, 2003.

References:

1. Evolutionary speech processing by Sampson G, Mc. Graw Hill publication, 2004.
2.The Speech Translation, A New Perspective, Schank, R.C 2003.
3. "Mathematical Methods for Neural Network Analysis and Design", Golden R.M., MIT Press, Cambridge, MA, 1996.
4. Information Retrieval, Salton, Mc Graw Hill 1983.

ROBOTICS			
Course Code:	**CS669/CS569**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I THE KINEMATICS OF ROBOTICS

Forward and inverse kinematics, motion kinematics, low-level and high-level trajectory planning. static force and torque relations, internal sensory devices: position and velocity sensors, external sensory devices: force, tactile and proximity sensors, machine vision, robot programming: multi-level approach, programming techniques, world modeling, off-line programming and simulation.

UNIT II BASIC ROBOT FUNCTIONING

History of robots, types of robots, uses of robots, present status and future trends in robotics, overview of robot subsystems, Issues in designing and controlling robots: resolution, repeatability and accuracy, transmission, Robot configurations and concept of workspace, mechanisms and transmission, motion planning obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.

UNIT III SPATIAL DESCRIPTIONS

Descriptions, postings, orientations, and frames, mappings, operators : translations, rotations, and transformations, transformation arithmetic, transform equations, transformation of free vectors, computational considerations.

UNIT IV ROBOT ANATOMY

End effectors and actuators, Different types of grippers, vacuum and other methods of gripping. pneumatic, hydraulic and electric actuators, Sensors and controllers, internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder, camera, micro-controllers, centralized controllers, real time operating systems.

UNIT V TASK SPECIFICATION OF ROBOT

Point to point and continuous motion specifications for typical applications, joint interpolation, task space interpolation, executing user specified tasks, Robot analysis, position and orientation of rigid bodies, spatial mechanism description, Denavit-Hartenberg notation, homogenous transformation, forward and inverse position analysis, velocity mapping, static force analysis, singularities, acceleration mapping, robot control Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Case studies: Robot in assembly (Puma). Mobile robot (Nataraj)

Reference Books:

1. Introduction to Robotics, Mechanics and control, John J. Craig, Pearson Education publication, 2004.
2. Robotic moments, S Mujtaba and R. Goldman , PHI publication, 2003.
3. An Advance Robotic Programming, A. Gilbert, American Robot corporation 1984.
4. Design of an Interactive Manipulator Programming environment, UMI Research Press, 1985.
5. Mechanical Engineering design, J Shigley, 3rd edition, Mc, Graw hill, New York 1977.