BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

MCA

Semester – V

MCC501	Artificial Intelligence and Expert system	3-1-0	4
MCC502	Object Oriented Analysis and Design with UML	3-0-0	3
MCC503	Internet Technology and enterprise Java	3-1-0	4
MCC504	Quantitative Techniques-II (Modeling & Simulation)	3-0-0	3
	ELECTIVE –I	3-0-0	3
	ELECTIVE –II	3-0-0	3
Elective-I			
MCE505	Distributed Systems		
MCE506	Parallel Computing		
MCE507	Image Processing		
MCE508	Web Engineering		
Elective-II			
MCE509	Computer Security		
MCE510	Software Design		
MCE511	Bioinformatics		
MCE512	Soft Computing		
MCL513	Software Design Using UML Lab	0-0-3	2
MCL514	Lab – X (Enterprise Web Computing Java Lab.)	0-0-6	4
MCV515	Comprehensive Viva-voce		4
	Total	**30**	

Semester –VI

MCP601	Project work for 16 weeks**	20

* There will be atleast 10 weekly assignments to be submitted by students on the subject
"object oriented Analysis and design with UML". Weekly evaluation will be done by a group of teachers of the department of 10 marks each taking personal viva of the students for a total of 100 marks.

** There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert and teachers of the department.

5th Semester

MCC 501: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (3-1-0)

Module-1 (15 hours)

Artificial Intelligence: Introduction, Intelligent Agents: Agents & Environments, Concept of Rationality, Nature & Structure of Agents; Problem Solving: Solving Problems by Searching, Classical Search, Adversarial Search, Constraint Satisfaction Problems. Knowledge, Reasoning and Planning: Logical agents, First order logic, Inference in First order logic.

Module-2 (13 hours)

Classical planning, Knowledge Representation; Uncertain Knowledge and Reasoning: Probabilistic Reasoning, Learning from Examples, Knowledge in Learning; Natural Language Processing: Language models, Text Classification, information retrieval, information extraction

Module-3 (12 hrs)

Natural Language for Communication: Phrase structure Grammars, Syntactic Analysis, Augmented grammars and semantic interpretation, Machine translation, Speech recognition; Perception; Expert Systems: Introduction, Design of Expert systems.

Text Books:

1. Stuart **Russell** and Peter **Norvig**, "*Artificial Intelligence: A Modern Approach*", Third Edition, 2010, Pearson Education, New Delhi.
   Chapters: 1, 2, 3, 4 (4.1, 4.2), 5 (5.1, 5.2, 5.3), 6, 7, 8, 9, 10 (10.1, 10.2, 10.3, 10.5), 12, 14 (14.1-14.6), 18 (18.1- 18.7), 19 (19.1, 19.2, 19.3), 22, 23, 24 (24.1-24.3, 24.5).
2. Joseph **Giarratano** and Gary **Riley**, "*Expert Systems: Principles and Programming*", Fourth Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
   Chapters: 1 and 6.

Reference Books:

1. Elaine A. **Rich** and Kevin **Knight**, "*Artificial Intelligence***"**, 3rd Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Nills J. **Nilsson**, "*Artificial Intelligence: A New Synthesis*", 2nd Edition, 2000, Elsevier India Publications, New Delhi.
3. Michael **Negnevitsky**, "*Artificial Intelligence: A Guide to Intelligent Systems*", Second Edition, 2005, Pearson Education, Inc. New Delhi.
4. Dan W. **Patterson**, "*Introduction to Artificial Intelligence and Expert Systems*", 1st Edition, 1996, PHI Learning Pvt. Ltd., New Delhi.
5. Ben **Coppin**, "*Artificial Intelligence Illuminated*", 2005, Narosa Publication, New Delhi. ISBN: 978-81-7319-671-3

MCC 502: OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML (3-0-0)

Module-I (15 hours)

Introduction: Object orientation & Object oriented development, Modeling Concepts: Modeling as a design technique, Class Modeling, advanced class modeling, State Modeling, advanced State Modeling, Interaction Modeling, advanced Interaction Modeling.

Module-II (13 hours)

Analysis and Design: Process overview, system Conception, Domain Analysis, System Design, Class design.

Module-III (12 hours)

Implementation: Implementation Modeling, Object Oriented (OO) Languages, Databases, Programming Style.

Text Books:

1. Michael R. **Blaha** and James R **Rambaugh**, "*Object-Oriented Modeling and Design with UML*", Second Edition, 2005, Pearson Education, Inc. New Delhi.
   Chapters: 1 to 8, 10, 11, 12, 14, 15, 17, 18, 19, 20.
2. Mark **Priestley**, "*Practical Object-Oriented Design with UML*", Second Edition, 2006, McGraw-Hill Education, India. New Delhi.

Reference Books:

1. Grady **Booch**, "*Object-Oriented Analysis and Design with Applications*", Third Edition, 2007, Pearson Education, Inc. New Delhi.
2. Craig **Larman**, "*Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*", Third Edition, 2005, Pearson Education, Inc. New Delhi.
3. Mike **O'Docherty**, "*Object Oriented Analysis and Design: Understanding System Development with UML 2.0*", 2005, Wiley India Pvt. Ltd., New Delhi.
4. John W. **Satzinger**, Robert B. **Jackson**, Stephen D. **Burd**, "*Object-Oriented Analysis and Design with the Unified Process*", 2006, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. James **Rumbaugh**, Grady Booch, Ivar Jacobson, "*The Unified Modeling Language Reference Manual*", 2nd Edition, 2004, Pearson Education, Inc. New Delhi.

MCC 503: INTERNET TECHNOLOGY AND ENERPRISE JAVA (3-1-0)

Module-I (15 hours)

Internet and Web Technology: ntroduction and overview, Internetworking concept and architectural model, classful internet addresses, classless and subnet address extensions (CIDR), Protocol Layering, , Mobile IP, Client Server model, World wide web, Voice and Video over IP.

Web Programming:- Web 2.0, Web Browsers, Web Servers, URLs, URN, URI, Basics of HTML & XHTML Programming: Syntax, Document structures, images, hyperlinks, List, Tables, Forms, Frames, CSS, Basic JavaScript Programming: DOM, Loops, function and arrays. XML: Document structure, DTD, Namespaces, XML Schema, and Parsing XML documents.

Module-II (15 hours)

Enterprise Java Programming: Overview, Java EE 6 API, Web Applications, Java Servlet Technology: - Lifecycle of a Servelet, Servelet API, Servlet Packages, Types of servlets, Database Access, Stateless and Stateful protocols, Session Tracking. JSP Technology: - Architecture & Anatomy of JSP Page, JSP life cycle, JSP with MVC Architecture, Dynamic webpage Creation, Scripting Elements, Session Tracking, Database access, JSTL, JavaServer Faces (JSF) Technology, Facelets, Ajax.

Module-III (10 hours)

Web Services: Building Web services with JAX-WS, Enterprise JavaBeans Technology: EJB Component Architecture, Role of EJB & its life cycle, Types of Beans, Stateless and stateful beans, Security features of EJB, Contexts and Dependency Injection for the Java EE Platform; Java Persistence API, Security in Java EE, Java EE Supporting Technologies: Introduction, Transactions and Resource Connections.

Recommended Books:

1. Douglas E. **Comer**, "*Internetworking with TCP/IP, Volume 1: Principles, Protocols and Architecture*", Fifth Edition, 2006, PHI Learning Pvt. Ltd., New Delhi.
   Chapters: 1, 3, 4, 9, 10, 18, 20, 27, 28.
2. Ralph **Moseley**, "*Developing Web Applications*", 2008, Wiley India, New Delhi.
3. Eric **Jendrock**, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, "*The Java EE6 Tutorial*", Volume-1, Fourth Edition, 2010, Pearson India, New Delhi.
   Chapters: 1, 3, 4, 5, 7, 9 to 12, 14 to 16, 17, 19, 23, 26, 27, 28.

References:

1. Joe **Wigglesworth**, Paula **McMillan**, "*Java Programming: Advanced Topics*", 3rd Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. William **Stallings**, "*Computer Networking with Internet Protocols and Technology*", 2004, Pearson education, New Delhi.
3. **Kongent S.**, "*Java Server Programming (JEE 6) Black Book, Platinum Edition*", 2008, Dreamtech / Wiley India Pvt. Ltd.
4. David **Geary**, Cay S. **Horstmann**, "*Core JavaServer Faces*", Second Edition, 2007, Pearson Education, Inc. New Delhi.
5. Adrian **Farrel**, "*The Internet and its Protocols: A Comparative Approach*", 2005, Elsevier India Pvt. Ltd., New Delhi.

MCC 504: Quantitative Techniques-II (3-0-0)

Module-1 (12 hours)

Markov Chain: Stochastic Processes, Markov chains, Chapman-Kolmogorov equations, States of a Markov chain, Properties of Markov chains, Continuous time Markov chains.
Markov Decision Process: Model for Markov decision Process, Linear programming and optimal policies, Policy improvement algorithm, Discounted cost criterion

Module-2 (12 hours)

Random numbers, Psedo random number generation, Using random numbers to evaluate integrals, Generation of discrete random variables: Inverse transform method, generating Poisson and Binomial random variables, the acceptance – rejection technique
Generating continuous random variable : The inverse transform algorithm, the rejection method, the polar method for generating normal random variables, generating Poisson process.
Discrete event simulation approach: Simulation via discrete event, the single server queuing system, Queuing system with two servers in series and with two parallel servers, Inventory model.

Module-3 (12 hrs)

Variance reduction technique: Use of antithetic variable, use of control variates, variance reduction by conditioning, stratifies sampling, Importance sampling.
Statistical validation techniques: Goodness of fit tests, Chi-square goodness of fit test for discrete data, Kolmogorov- Smirnov test for continuous data, Goodness of fit test when some parameters are unspecified, two sample problem.

Text Books

1. Frederick S. **Hiller**, Gerald J. **Lieberman**, "*Introduction to Operations Research*", McGraw Hill Education India Pvt. Ltd, Eighth edition, 2008, New Delhi.

2. Sheldon M. **Ross**, " *Simulation*", Academic Press(an imprint of Elsevier), Fourth edition

Reference Books:

1. Hamdy A.Taha,"*Operations research*", Pearson Education India, New Delhi
2. Jerry **Banks**, John S. **Carson II**, Barry L. **Nelson**, David M. **Nico**l, "*Discrete Event System Simulation*", 5th Edition, 2010, Pearson education Inc. New Delhi.
3. Andrew **Seila**, Vlatko **Ceric**, Pandu **Tadikamalla**, "*Applied Simulation Modeling*", 1st Edition, 2009, Cengage Learning pvt. Ltd. New Delhi.
4. Manuel D. **Rossetti**, "*Simulation, Modeling and Arena*", First Edition, 2009, Wiley India Pvt. Ltd. New Delhi.
5. Bernard P. **Zeigler**, Herbert **Praehofer**, Tag Gon **Kim**, "*Theory of Modeling and Simulation*", 2nd Edition, 2000, Academic Press/ Elsevier India Pvt. Ltd, New Delhi.

MCE 505: **DISTRIBUTED SYSTEMS** (3-0-0)

Module-I (12 hours)
Distributed systems: Definition, goals, types of Distributed Systems, Architectures, Key characteristics-resource sharing openness, concurrency, scalability, fault tolerance, transparency; Design issues, naming, communication, software structure, workload allocation, consistency maintenance; User requirement, functionality, Quality of service, reconfigurability; Interprocess communication, building blocks, client server communication; CORBA's Common Data Representation (CDR); Java object serialization; Extensible markup language (XML); Remote object references; Inter-process communication in UNIX; Remote procedure calling; Design issues, interface definition language exception handling; Implementation - interface processing, communication handling; Binding, Case study: sun RPC Vs. Java RMI.

Module-II (12 hours)
Distributed Operating systems: kernel, processes and threads, Naming and protection - Communication and Invocation, virtual memory, Distributed file services - design issues, interfaces, implementation techniques, Case study sun NFS, Name services: Name spaces; Name resolution, Domain Name System, SNS and DNS, Peer-to-Peer Systems. Coordination and Agreement: Time and Global States, Time and co-ordination, Synchronizing physical clocks- logical time and logical clocks, Distributed co-ordination, distributed mutual exclusion, elections, Replication, basic architectural model, consistency and request ordering.

Module-III (12 hours)
Distributed Transactions, Recovery and fault tolerances: Transaction recovery, logging - shadow versions, fault model for transaction; Fault tolerance: characteristics; Hierarchical and group masking of faults; Security, authentication and key distribution, logic of authentication, digital signatures; Web Services: SOAP, XML, CORBA, Distributed object based systems, Distributed file systems, Distributed web- based systems, Distributed co-ordination based systems.

Text Books:

1. George **Coulouris**, Jean **Dollimore** and Tim **Kindberg**, "*Distributed Systems: Concepts and Design*", Fourth Edition, 2006, Pearson Education, Inc. New Delhi.
2. Andrew S. **Tanenbaum**, Maarten **van Steen**, "*Distributed Systems: Principles and Paradigms*", 2nd Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.

Reference Texts:

1. Hagit **Attiya**, Jennifer **Welch**, "*Distributed Computing: Fundamentals, Simulations, and Advanced Topics*", 2nd Edition, 2005, Wiley India Pvt. Ltd., New Delhi.
2. Mordechai **Ben-Ari**, "*Principles of Concurrent and Distributed Programming*", 2nd Edition, 2006, Pearson Education, Inc. New Delhi.
3. Mei-Ling **Liu**, "*Distributed Computing: Principles and Applications*", 2004, Pearson Education, Inc. New Delhi.
4. Gerard **Tel**, "*Introduction to Distributed Algorithms*", Second edition, 2002, Cambridge University Press / Foundation Books India, New Delhi.
5. Ajay D. **Kshemkalyani**, Mukesh **Singhal**, "*Distributed Computing: Principles, Algorithms, and Systems*", 2008, Cambridge University Press / Foundation Books India, New Delhi.

MCE 506: **PARALLEL COMPUTING** (3-0-0)

Module-I (12 hours)

Introduction to Parallel Computing; Motivating Parallelism, Scope of Parallel Computing; Parallel Programming; Platforms : Implicit parallelism, Limitation of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs of Parallel Machines, Routing Mechanism for Interconnection Networks, Impact of Process-processor Mapping and Mapping Techniques.

Module-II (12 hours)

Principles of Parallel Algorithm Design : Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing interaction Overheads, parallel Algorithm Models. Analytical Modelling of Parallel Programs : Sources of Overhead in Parallel Programs, Performance metrics for parallel systems, the effect of Granularity on Performance, Scalability of Parallel Systems, minimum Executuion time and minimum cost-optional Execution Time, Asymptotic Analysis of Parallel Programs, other Scalability Metrics.

Module-III (12 hours)

Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, Scatter and Gather, All-to-All Personalized Communication, Circular Shift.
Introduction to MPI Principles of Message - Passing Programming, The Building Blocks (Send and Receive Operations), MPI (the Message Passing Interface), Collective Communication and Computation Operations, Examples of Matrix - Matrix multiplication, One dimensional Matrix Vector Multiplication using MPI.

Text Books:

1. Ananth **Grama**, George **Karypis**, Vipin **Kumar**, Anshul **Gupta**, "*Introduction to Parallel Computing*", 2nd Edition, 2004, Pearson Education, Inc. New Delhi.
2. Michael J. **Quinn**, "*Parallel Computing: Theory and Practice*", 1994, McGraw-Hill Education (India), New Delhi.

Reference Books:

1. Calvin **Lin**, Larry **Snyder**, "*Principles of Parallel Programming*", 1st Edition, 2009, Pearson Education, Inc. New Delhi.
2. Michael J. **Quinn**, "*Parallel Programming in C with MPI and OpenMP*", 2004, McGraw-Hill Education (India), New Delhi.
3. Barry **Wilkinson**, "*Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers*", 2nd Edition, 2005, Pearson Education, Inc. New Delhi.
4. Yves **Robert**, Henri **Casanova**, Armand **Legrand**, "*Parallel Algorithms*", 1st Edition, 2009, CRC Press. ISBN-13:9781584889458.
5. Harry F. **Jordan**, Gita **Alagband**, "*Fundamentals of Parallel Processing*", first Edition, 2003, PHI Learning Pvt. Ltd. New Delhi.

MCE 507: **IMAGE PROCESSING** (3-0-0)

Module-I (12 hours)

Introduction: The digitized image and its properties: Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Module-II (12 hours)

Image preprocessing: Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing- image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local preprocessing and adaptive neighborhood pre processing; image restoration.
Image Segmentation: Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation-edge image thresholding, edge relaxation, border tracing, border detection.

Module-III (12 hours)

Mathematical Morphology: Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particles segmentation.
Image textures: Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications.
Image representation and description: Representation, boundary descriptors, regional descriptors

Text Books:

1. Rafael C. **Gonzalez**, Richard E. **Woods**, "*Digital Image Processing*", 3rd Edition, 2008, Pearson Education, Inc. New Delhi.
2. Milan **Sonka**, Vaclav **Hlavac**, Roger **Boyle**, "*Image Processing, Analysis, and Machine Vision*", 3rd Edition, 2008, CENGAGE Learning, New Delhi.

Reference Book:

1. William K. **Pratt**, "*Digital Image Processing: PIKS Scientific Inside*", 4th Edition, 2008, Wiley India Pvt. Ltd., New Delhi.
2. Bernd **Jähne**, "*Digital Image Processing*", 6th Revised and Extended Edition, 2006, Springer Science. ISBN 978-3-540-24035-8.
3. Anil K. **Jain**, "*Fundamentals of Digital Image Processing*", 1989, PHI Learning Pvt. Ltd. New Delhi.
4. Kenneth R. **Castleman**, "*Digital Image Processing*", 1996, Pearson Education, Inc.
5. Bhabatosh **Chanda** & Dwijesh **Dutta** Majumder, "*Digital Image Processing and Analysis*", First Edition, 2000, PHI Learning Pvt. Ltd., New Delhi.

MCE 508: **WEB ENGINEERING** (3-0-0)

Module-I (12 hours)

Web-based Systems, Web Engineering, A Web Engineering Process, Communication, Planning.

Module-II (12 hours)

Modeling Activity, Analysis Modeling For Web Applications, Web Application Design, Interaction Design, and Information Design.

Module-III (12 hours)

Functional Design, Construction and Deployment, Design Patterns, Technologies and Tools, Web Applications Testing, Change and Content Management, Future Directions.

Text Books:

1. Roger S **Pressman**, David **Lowe**, "*Web Engineering: A Practioner's Approach*", 1st Edition, 2008, McGraw Hill Education (India), New Delhi.
2. Emilia **Mendes**, Nile **Mosley**, "*Web Engineering*", 2006, Springer India Pvt. Ltd. New Delhi.

Reference Books:

1. Gustavo **Rossi**, Oscar **Pastor**, Daniel **Schwabe** and Luis **Olsina**, "*Web Engineering: Modeling and Implementing Web Applications*", 2007, Springer India Pvt. Ltd. New Delhi. ISBN: 978-1-84628-922-4.
2. Woojong **Suh**, "*Web Engineering: Principles and Techniques*", IGI Global, 2006, ISBN-13: 978-1591404330
3. Gerti **Kappe**l, Birgit Prýýll, Siegfried Reich, Werner Retschitzegger, "*Web Engineering: The Discipline of Systematic Development of Web Applications*", 2007, John Wiley & Sons Inc. / Wiley India Pvt. Ltd., New Delhi. ISBN-13: 978-0470015544
4. Daniel M. **Brandon**, "*Software Engineering for Modern Web Applications: Methodologies and Technologies*", IGI Global, 2009, ISBN-13: 978-1599044927.

(Elective-II)

MCE 509: COMPUTER SECURITY (3-0-0)

Module-I (12 hours)

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense; Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms, Private-Key Cryptosystems, The Data Encryption Standard, The AES Encryption Algorithm, Public-Key Cryptosystems, Public Key Encryptions, Uses of Encryption, Pseudo-randomness, and Hashing.

Module-II (12 hours)

Program Security : Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection memory and address protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security polices, models of security, trusted O.S. design, Assurance in trusted OS, Implementation examples.
Digital Signatures, Authentication, Secret Sharing, Group-oriented cryptography, Identification.

Module-III (12 hours)

Data base & Network Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security; Security in Network; Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security; The Economics of Cyber security; Privacy in Computing; Legal and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Case studies of Ethics.

Textbooks:

1. Charles P. **Pfleeger** & Shari Lawrence **Pfleeger**, "*Security in Computing*", Fourth Edition, 2007, Pearson Education, Inc. New Delhi.
2. Josef **Pieprzyk**, Thomas **Hardjono**, Jennifer **Seberry**, "*Fundamentals of Computer Security*", 2003, Springer & Universities Press India, New Delhi.

Reference Books:

1. Dieter **Gollmann**, "*Computer Security*", Second Edition, 2006, Wiley India Pvt. Ltd., New Delhi.
2. William **Stallings** & Lawrie **Brown**, "*Computer Security: Principles and Practice*", First Edition, 2008, Pearson Education, Inc. New Delhi.
3. Charlie **Kaufman**, Radia **Perlman** & Mike **Speciner**, "*Network Security: Private Communication in a Public World*", 2nd Edition, 2003, PHI Learning. New Delhi.
4. Chuck **Easttom**, "*Computer Security Fundamentals*", First Edition, 2006, Pearson Education, Inc. New Delhi.
5. Alfred **Baasta**, "*Computer Security*", First edition, 2008, CENGAGE Learning.

MCE 510: **SOFTWARE DESIGN** (3-0-0)

Module-I (12 hours)

Software Architecture: Introduction, Architectural Styles, Shared Information Systems, Architectural Design Guidance, Formal Models and Specifications, Linguistic Issues.
Role of Software Design: Nature of the Design Process, Software Design Process, Design in the Software Development Process, Design Qualities.

Module-II (12 hours)

Transferring Design Knowledge: Describing a Design Solution, Transferring Design Knowledge, Design Representations, and Rationale for Method, Design Processes and Design Strategies, Design Patterns.

Module-III (12 hours)

Design Principles: Correctness and Robustness, Flexibility, Reusability, and Efficiency.
Design Practices: Stepwise Refinement, Incremental Design, Structured Systems Analysis and Structured Design, Jackson Structured Programming, Jackson System Development, Designing with Objects, Component-Based Design, Formal Approach to Design.

Text Books:

1. Mary **Shaw**, David **Garlan**, "*Software Architecture: Perspectives on an Emerging Discipline*", 2005, PHI Learning Pvt. Ltd, New Delhi.
2. David **Budgen**, "*Software Design*", 2nd Edition, 2004, Pearson Education Inc. New Delhi.

Reference Books:

1. Eric J. **Braude**, "*Software Design: From Programming to Architecture*", 2004, Wiley India Pvt. Ltd., New Delhi.
2. Nick **Rozanski**, Eóin **Woods**, "*Software Systems Architecture: Working With Stakeholders Using Viewpoints and Perspectives*", 2006, Pearson Education, Inc. New Delhi.
3. Len **Bass**, Paul **Clements**, Rick **Kazman**, "*Software Architecture in Practice*", 2nd Edition, 2004, Pearson Education, Inc. New Delhi.
4. Hong **Zhu**, "*Software Design Methodology: From Principles to Architectural Styles*", 2006, Butterworth-Heinemann / Elsevier India Pvt. Ltd., New Delhi.
5. Richard N. **Taylor**, Nenad **Medvidovic**, Eric **Dashofy**, "*Software Architecture: Foundations, Theory, and Practice*", 2009, Wiley India Pvt. Ltd., New Delhi.

MCE 511: BIOINFORMATICS (3-0-0)

Module-I (12 hours)

Molecular Biology and Biological Chemistry: The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, *Data Searches and Pairwise Alignments*: Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments, *Substitution Patterns*: Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles.

Module-II (12 hours)

Distance based methods of Phylogenetics: History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments, *Character Based methods of Phylogenetics*: Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

Module-III (12 hours)

Genomics and Gene Recognition: Prokaryotic genomes, Prokaryotic gene structure, GC-content Prokaryotic genomes, Prokaryotic gene density, Eukaryotic genomes, Eukaryotic gene structure, Open reading frames, GC-content Eukaryotic genomes, Gene expression, Transposition, Repetitive elements, Eukaryotic gene density, *Protein and RNA structure prediction*: Amino acids, Polypeptide composition, Secondary structure, Tertiary and quaternary structure, Algorithms for Modeling Protein Folding, Structure prediction, Predicting RNA secondary structures, *Proteomics*: from Genomes to Proteomes, Protein classification, Experimental techniques, Inhibitors and drug design, Ligand screening, X-ray crystal structures, NMR structures, Empirical methods and prediction techniques, Postranslational modification prediction.

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Text Books:

1. Dan E. **Krane**, Michael L. **Raymer**, "*Fundamental Concepts of Bioinformatics*", First Edition, 2003, Pearson Education, Inc. New Delhi.
2. Teresa **Attwood**, David **Parry-Smith**, "*Introduction to Bioinformatics*", 1999, Pearson Education, Inc. New Delhi.

Reference Books:

1. Shuba **Gopal**, A. **Haake**, R. P. **Jones**, P. **Tymann**, "*Bioinformatics: A Computing Perspective*", First Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Yi-Ping P. **Chen**, "*Bioinformatics Technologies*", 2006, Springer India Pvt. Ltd., New Delhi.
3. Arthur **Lesk**, "*Introduction to Bioinformatics*", 2009, Oxford University Press, ISBN-13: 978-0199208043.
4. Bryan **Bergeron**, "*Bioinformatics Computing*", 2003, PHI Learning. New Delhi.
5. Zoe Lacroix, Terence Critchlow, "*Bioinformatics: Managing Scientific data*", 2009, Elsevier India Pvt. Ltd., New Delhi.

MCE 512: **SOFT COMPUTING** (3-0-0)

Module-I (10 hours)

Introduction to intelligent systems and soft computing: Introduction, Intelligent systems, Knowledge-based systems, Knowledge representation and processing, soft computing.
Fundamentals of fuzzy logic systems: Introduction, background, fuzzy sets, generalized fuzzy operations, implication, definitions, fuzziness and fuzzy resolution, fuzzy relations, composition and inference, considerations of fuzzy decision making.

Module-II (10 hours)

Fundamentals of artificial neural networks: introduction, learning and acquisition of knowledge, features of artificial neural networks, fundamentals of connectionist modeling. Classes of neural networks: introduction, multilayer perceptron, radial basis function networks, Kohonen's self-organizing network, Hopfield network, industrial and commercial applications of ANN.

Module-III (10 hours)

Neuro-fuzzy systems: introduction, background, architectures of neuro-fuzzy systems, construction of Neuro-fuzzy systems. Evolutionary computing: introduction, overview, genetic algorithms and optimization, the schema theorem, genetic algorithm operators, integration of genetic algorithms with neural networks, integration of genetic algorithms with fuzzy logic, known issues in GAs, population-based incremental learning, evolutionary strategies, ES applications.

Text Books:

1. Fakhreddine O. **Karray**, Clarence **De Silva**, "*Soft Computing and Intelligent Systems Design: Theory, Tools and Applications*", Pearson Education, New Delhi.
   Chapters: 1, 2, 4, 5, 7 and 8.
2. Jyh-Shing Roger **Jang**, Chuen-Tsai **Sun**, Eiji **Mizutani**, "*Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence*", 1996, PHI Learning Pvt. Ltd. New Delhi.

Reference Books:

1. S. N. **Sivanadam**, S. N. **Deepa**, "*Principles of Soft Computing*", First Edition, 2008, Wiley India Pvt. Ltd. New Delhi.
2. Frank **Hoffmann,** M. **Köppen,** F. **Klawonn,** R. **Roy**, "*Soft Computing: Methodologies and Applications*", 2006, Springer, New Delhi.
3. D. K. **Prathihar**, "*Soft Computing*", 2007, Narosa Publication, New Delhi.
4. A. K. **Srivastava**, "*Soft Computing*", 2009, Morgan & Claypool / Narosa, New Delhi.
5. N. K. **Sinha**, "*Soft Computing and Intelligent Systems: Theory and Applications*", 2009, Elsevier India Pvt. Ltd, New Delhi.

CL 513: **SOFTWARE DESIGN USING UML LAB** (0-0-3)

Prerequisite: software engineering and Object Oriented Analysis & Design with UML.
Designing Tools: Rational rose/ Open Source NetBean**.**

The students are advised to design the different case studies correlating to their Theory paper.

	Topic
01.	Developing the Building blocks of UML: things, relationships and diagrams.
02.	Generating the Following through UML: a) Class diagram b) Object diagram c) Use case diagram d) Sequence diagram e) Collaboration diagram f) Activity diagram g) Statechart diagram h) Component diagram i) Deployment diagram
03.	Design the following systems through UML: a) OnlineBookShop Management System b) Bank Management System c) Library Management System d) University Management System e) Railway Information System

MCL 514: **ENTERPRISE WEB COMPUTING WITH JAVA LAB** (0-0-6)

	Topics
01.	HTML & XHTML Programming: basic tags, text formatting tags, creating hyperlinks.
02.	HTML & XHTML Programming: tables, lists, frames, forms, maps, Creating CSS.
03.	JavaScript Programming: Data types, loops, functions.
04.	JavaScript Programming: DOM, arrays, forms, frame, GUI design.
05.	XML Programming: page creation, making a DTD, Parsing XML files.
06.	Creating, installation and running a web server (e.g. Apache Tomcat/ GlassFish).
07.	Creating, Compiling and Running a Servlet. Program (both http & generic servlet).
08.	Implementing session tracking mechanisms in servlets.
09.	Generating Dynamic web content using Servlet basing upon request response model.
10.	DHTML programming: GUI designs.
11.	Creating a JSF program showing framework based application development.
12.	Creating, Compiling and Running a JSP Program.
13.	Implementing Session tracking through JSP Program.
14.	Access to a database using Servlet/JSP program.
15.	Creating a simple Java Bean Application programs using BDK. Tools.
16.	Deploying of beans, implementing entity beans and session beans of EJB.
17.	Creating manifest file, jar file and Deploying a web application.
18.	Designing a simple Program using JDBC, beans and JSP implementing MVC Model.
19.	Creating a RMI Program showing Marshalling and Unmarshalling Processes.
20.	A Web based Capstone project university management system using JSP and Database..

6th Semester

MCP 601: Project Work (for 16 weeks) Credit 20

There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert, internal supervisor and teachers of the department.

Each student must have an internal supervisor who is a faculty of the department/ Institution. Each student must submit the abstract of the project which will be approved by the department on the recommendation of the internal supervisor. .

Guidelines: SUMMARY/ABSTRACT

All students must submit a summary/abstract of the project to be undertaken to the internal supervisor for approval, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up should include the followings-

1. Name / Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. Testing Technologies used
8. What contribution would the project make?

After the approval, the student is allowed to carry out the project in any organization/ Institution. He/She must immediately inform the internal supervisor about the name and contact details of the external supervisor in the organization/Institution. Moreover he must report to the internal supervisor about the progress of his/her work periodically. After the end of 16 weeks, the student is required to submit the project report in the department after getting approved by the internal and external supervisors.

Guidelines for preparation of the final project report

Good quality white executive bond paper of A4 size should be used for typing and duplication with the following specification

Left margin	: 3.0cm
Right margin	: 2.0cm
Top margin	: 2.5cm
Bottom margin	: 2.5cm

Page numbers: All text pages as well s the Program source code should be numbered in the bottom center of the pages.

Font size of the normal Text	:12pt Times New Roman
Font size of Paragraph Heading	:14pt Times New Roman
Font Size of chapter Heading	:18pt Times New Roman
Font size of Code	:10pt Courier New

Format of the Project report

Cover page
Certificate of the internal supervisor
Certificate of the external supervisor
Self certificate
Acknowledgement
List of abbreviations, figures, Tables
Synopsis of the project (3-4 pages)
Main Report
- Objective and scope of the project
- Theoretical background
- Definition of the problem
- System Analysis and design
- System planning
- Methodology adopted
- System implementation
- System maintenance and Evaluation
- Cost benefit Analysis
- Detail life cycle of the project

Test reports (print out of the reports)
Print out of the code
References
Every student has to submit the followings

(a) One hard copy of the Project report
(b) Soft copy of the project on CD(to be submitted to the Universiy) on a cover mentioning the name of the project, name of the student, Regd No. , name of the college, Year
(c) Five copies of the synopsis of the project report

Evaluation of the Project

Evaluation of the project will be done by a jury of experts including one external expert, Head of the Department, internal supervisor, two teachers of the department. The evaluation will be done on the basis of the followings

Presentation : 30 Percentile
Viva-Voce : 20 Percentile
Project report : 50 Percentile

Number of students in a project should not be more than one. In some cases if the project completion needs more than 16 weeks, then two students may be allowed on the recommendation of the supervisors. However, they should handle different modules of the project.

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