Biju Patnaik University of Technology, Orissa

Course for M.Tech. Syllabus
(Information Technology Engineering)
# M.TECH IN INFORMATION TECHNOLOGY

*With effect from 2009 -2010 Academic Session*

## First Semester

### Theory

<table>
<thead>
<tr>
<th>Professional Core</th>
<th>Contact Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Software Engineering &amp; Development Methodologies</td>
<td>3-1-0</td>
<td>4</td>
</tr>
<tr>
<td>2. Data Ware Housing &amp; Data Mining</td>
<td>3-1-0</td>
<td>4</td>
</tr>
<tr>
<td>3. Information Theory and Coding Techniques</td>
<td>3-1-0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Professional Electives (Any Two) (3 Credits each)**

1. Computational Intelligence
2. Advanced Computer Architecture
3. Advanced Operating System
4. Pattern Recognition
5. Multimedia Communication Systems
6. Real Time System
7. Wireless Sensor Network

### Contact Hours

<table>
<thead>
<tr>
<th>Practicals / Sessionals</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Software Technologies Lab. - I</td>
<td>0-0-4</td>
</tr>
<tr>
<td>2. Pre-thesis work &amp; Seminar</td>
<td>0-0-3</td>
</tr>
</tbody>
</table>

**Total 24 Credits**

## Second Semester

### Theory

<table>
<thead>
<tr>
<th>Professional Core</th>
<th>Contact Hours</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>1. J2EE</td>
<td>3-1-0</td>
<td>4</td>
</tr>
<tr>
<td>2. Enterprise Resource Planning</td>
<td>3-1-0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Professional Electives (Any Three) (3 credits each)**

1. Distributed Database System
2. Compiler Construction
3. Mobile Computing
4. Cryptography
5. Speech Processing
6. VLSI Design
7. Embedded System
8. Non-Linear Optimization Engineering
9. Simulation and Modeling
10. Graph Theory

### Contact Hours

<table>
<thead>
<tr>
<th>Practicals / Sessionals</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Software Technologies Lab - II</td>
<td>0-0-6</td>
</tr>
<tr>
<td>2. Pre-thesis work &amp; Seminar</td>
<td>0-0-3</td>
</tr>
<tr>
<td>3. Comprehensive Viva-voce – I</td>
<td>2</td>
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</tbody>
</table>

**Total 25 Credits**
Third Semester

Theory
Open Elective (Any One)

<table>
<thead>
<tr>
<th>Course</th>
<th>L-T-P</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>1. Digital Image Processing</td>
<td>3-0-0</td>
<td>3</td>
</tr>
<tr>
<td>2. Software Project Management</td>
<td></td>
<td></td>
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<tr>
<td>3. Bio-Informatics</td>
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<tr>
<td>4. Formal Language and Automata</td>
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</table>

THESIS Part –I

Total

14 Credits

17 Credits

Fourth Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis Part - II</td>
<td>20</td>
</tr>
<tr>
<td>Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Comprehensive Viva-Voce-II</td>
<td>2</td>
</tr>
</tbody>
</table>

Total

24 Credits

Grand Total = 90 Credits
Software Engineering & Development Methodologies

UML Diagram: Class Diagram, Object Diagram, Sequence Diagram, Collaboration Diagram, Activity Diagram, State Chart Diagram, Component Diagram, Deployment Diagram
Object Oriented Analysis: Class: Interface Class, Control Class, Entity Class. Developing Use Case: Use case Element, Description, Case Study (i.e ATM), Class Classification Approach, Noun Phase Approach, Classical Approach, Function Point Approach, Structural Approach, CRC Card
Object Oriented Design: Component Level Design, Cohesive, Coupling
Unit Testing: Class Testing, Method Testing

Text Book: Software Engineering by Pressman McGraw Hill

Data Warehousing & Data Mining

Introduction to Data Mining, Measuring Data Mining effectiveness: Accuracy , speed & Cost, Embedding Data Mining into your Business Process, Discovery verses Prediction, Comparing the Technology, Business Score Card, Application Score Card, Algorithm Score card, Decision Tree, CART, CHAID, Growing the Tree, When does the Tree stop growing, Strength & Weakness, Algorithm Score Card, Neural Network, Different types of neural N/W, Kohonen feature maps, Nearest Neighbor and Clustering, Business Score Card Where to use clustering & nearest neighbor prediction, Clustering for clarity, Clustering for out layer analysis, Nearest Neighbor for prediction, Application Score Card

Text Book: Data Warehousing, Data Mining & OLAP by Alex & Stephen, McGraw Hill
Information Theory and Coding Techniques

Introduction to information Theory, Information and entropy, properties of entropy of a binary memory less source, Measure of Information, Source Coding, Shannon-Fano coding, Huffman coding, Lempel ZIV coding, channel coding, Channel capacity, noisy channel coding theorem for DMC. Linear block codes, generator matrices, parity check matrices, encoder syndrome and error detection-minimum distance, error correction and error detection capabilities, cyclic codes, coding and decoding. Coding convolutional codes, encoder, generator matrix, transform domain representation state diagram, distance properties, maximum likelihood decoding, Viterbi decoding, sequential decoding, interleaved convolutional codes.

Text Book:
1. Elements of Information Theory, T.M.Cover, J.A.Thomas, Wiley

Professional Electives (Any TWO)
Computational Intelligence

Fuzzy Inference System: Mamdani fuzzy models, Sugeno Fuzzy Models, Tsukamoto fuzzy models, other considerations.
Least Square Method for system Identification: System Identification, Basic of matrix manipulations and calculus, Least-square estimator, Geometric interpretation of LSE, Recursive least-square estimator, Recursive LSE for time varying systems, Statistical Properties and maximum likelihood estimator, LSE for nonlinear models.
Derivative-based optimization: Descent methods, the method of steepest descent, Newton’s methods, Step size determination, conjugate gradient methods, Analysis of quadratic case, nonlinear least-squares problems, Incorporation of stochastic mechanism.
Derivative-free optimization: Genetic algorithm simulated annealing, random search, Downhill simplex search, Swarm Intelligence, genetic programming.
Adaptive Networks: Architecture, Back propagation for feed forward networks, Extended back propagation for recurrent networks, Hybrid learning rule: combing steepest descent and LSE.
Learning from reinforcement: Failure is the surest path to success, temporal difference learning, the art of dynamic programming, Adaptive heuristic critic, Q-learning, A cost path problem, World modeling, other network configurations, Reinforcement learning by evolutionary computations.
Adaptive Neuro-fuzzy inference systems: ANFIS architecture, Hybrid learning algorithms, Learning methods that cross-fertilize ANFIS and RBNF, ANFIS as universal approximator, Simulation examples, Extensions and advance topics.

Books:
Advanced Computer Architecture


Advanced Operating System


Pattern Recognition

Introduction, Machine perception, Pattern Recognition Systems, Design cycle, Learning & adaptation,(Ch.1) Bayesian Decision Theory in discrete & continuous features(Ch. 2.1 to 2.6, and 2.9) Maximum likelihood and Bayesian parameter estimation (Ch.3.1 to 3.5, 3.10) Nonparametric techniques (Ch. 4.1 to 4.6) Linear discriminant functions (Ch. 5.1 to 5.9), Non-metric method (Ch. 8.1 to 8.3, 8.6 , 8.7)

Text Book: R. O. Duda, P. E. Hart and D. G. Stork, “Pattern Classification” Wiley Publ. 2nd Edition

Multimedia Communication Systems


Book: 1. Multimedia Communications by Buford, Pearson
3. Multimedia Systems by Fred Halsal, Pearson Ch: 1 to 6
4. Multimedia: Computing, Communications & Applications by Ralf & Klara, Pearson Ch: 1 to 9
Real Time Systems

UNIT-1
Introduction: What is real time, Applications of Real-Time systems, A basic model of Real-time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modeling timing constraints

Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA. Issues in using RMA practical situations.

UNIT-2

Scheduling Real-time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

UNIT-3
Commercial Real-time operating systems: Time services, Features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX, A survey of contemporary Real-time operating systems. Benchmarking real-time systems.


UNIT-4
Real-time Communication: Examples of applications requiring real-time communication, Basic concepts, Real-time communication in a LAN. Soft Real-time communication in a LAN. Hard real-time communication in a LAN. Bounded access protocols for LANs. Performance comparison, Real-time communication over packet switched networks. Qos framework, Routing, Resource reservation, Rate control, Qos models.

Book:

Wireless Sensor Network

Unit I
Introduction: the vision, Networked wireless sensor devices, Applications, Key design challenges.

Network deployment: Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

Unit II

Synchronization: Issues & Traditional approaches, Fine-grained clock synchronization, and Coarse-grained data synchronization.
Unit III

Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference.

Medium-access and sleep scheduling: Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques, and Contention-free protocols.

Sleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage, Set K-cover algorithms.

Unit IV

Routing: Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks.

Data-centric networking: Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, The database perspective on sensor networks.

Reliability and congestion control: Basic mechanisms and tunable parameters, Reliability guarantees, Congestion Control, Real-time scheduling.

Books:


Software Technologies Lab. - I

Object-oriented programming concepts and implementation of abstract data types; Implementation of graph algorithms; Linear programming with applications; Basic of OS programming process creation and synchronization, shared memory and semaphore shell programming.