



# **SOLAPUR UNIVERSITY, SOLAPUR**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**COMPUTER SCIENCE AND ENGINEERING**

**Structure for**

**M.E. (Computer Science & Engineering) Part-I**

Choice Based Credit System Syllabus  
(W.e.f. June 2015-16)

## Structure of M. E. (Computer Science & Engineering) Part-II

### Semester – I

Sr. No.	Name of the Subject	Teaching Scheme			Examination Scheme - Credits		
		L	T	P	Paper	T/W	Total
1	Theory of computation	3	1	-	3	1	4
2	Advanced Operating Systems	3	-	2	3	1	4
3	Analysis of Algorithms	3	-	2	3	1	4
4	Research Methodology	3	1	-	3	1	4
5	Elective-I	3		2	3	1	4
6	Seminar-I	-	-	2	-	2	2
	<b>Total</b>	<b>15</b>	<b>2</b>	<b>8</b>	<b>15</b>	<b>7</b>	<b>22</b>

**Elective – I :** 1) Data Mining  
2) Mobile Computing  
3) Artificial Neural Network and Genetic Algorithms  
4) Enterprise Software Development

### Semester – II

Sr. No.	Name of the Subject	Teaching Scheme			Examination Scheme - Credits		
		L	T	P	Paper	T/W	Total
1	Internet Routing Algorithm	3	--	2	3	1	4
2	Advanced Database Concepts	3	--	2	3	1	4
3	Parallel Computer Architectures	3	1	--	3	1	4
4	Elective-II	3	1	--	3	1	4
5	Elective-III	3	--	2	3	1	4
6	Seminar-II	--	--	2	--	2	2
	<b>Total</b>	<b>15</b>	<b>2</b>	<b>8</b>	<b>15</b>	<b>7</b>	<b>22</b>

**Elective – II:** 1) Grid Computing  
2) Real Time Operating System  
3) Natural Language Processing  
4) Infrastructure Management

**Elective – III:** 1) Web Technology  
2) Business Intelligent System  
3) Object Oriented Software Engineering and Design Patterns  
4) Wireless Ad-hoc Network



# **SOLAPUR UNIVERSITY, SOLAPUR**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**COMPUTER SCIENCE AND ENGINEERING**

**Detailed Syllabus for**

**M.E. (Computer Science & Engineering) Part-I**

Choice Based Credit System Syllabus  
(w.e.f. June 2015-16)



## Solapur University , Solapur

### M.E. (Computer Science and Engineering) Part – I ( Semester – I )

#### 1. Theory of Computer Science

##### Teaching Scheme

Lectures: 3 Hrs/week

Tutorials: 1 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1 : Introduction:

(5)

Mathematical notions and terminology of sets, sequences and tuples, functions and relations, graphs, strings and languages. Boolean logic properties and representation. Definition, Theorems and types of proofs, formal proofs, deductive, reduction to definition, proof by construction, contradiction, induction and counter examples.

##### Unit 2 : Turing machine:

(5)

Turing machines, variants of TMs, programming techniques for TMs, TMs and computers.

##### Unit 3 : Decidability:

(8)

Decidable languages, decidable problems concerning Context-free languages. The halting problem – Diagonalization method, halting problem is undecidable.

#### Section II

##### Unit 4 : Reducibility:

(6)

Undecidable problems from language theory, Regular expressions, Turing machines, Reduction, A simple undecidable problem (PCP), mapping reducibility and other undecidable problems.

##### Unit 5 : Computability:

(6)

Primitive recursive functions, more examples, The recursion theorem.

##### Unit 6 : Computational complexity:

(6)

Tractable and Intractable problems, Growth rates of functions, Time complexity of TM , Tractable decision problems, Theory of Optimization.

#### Text Books:

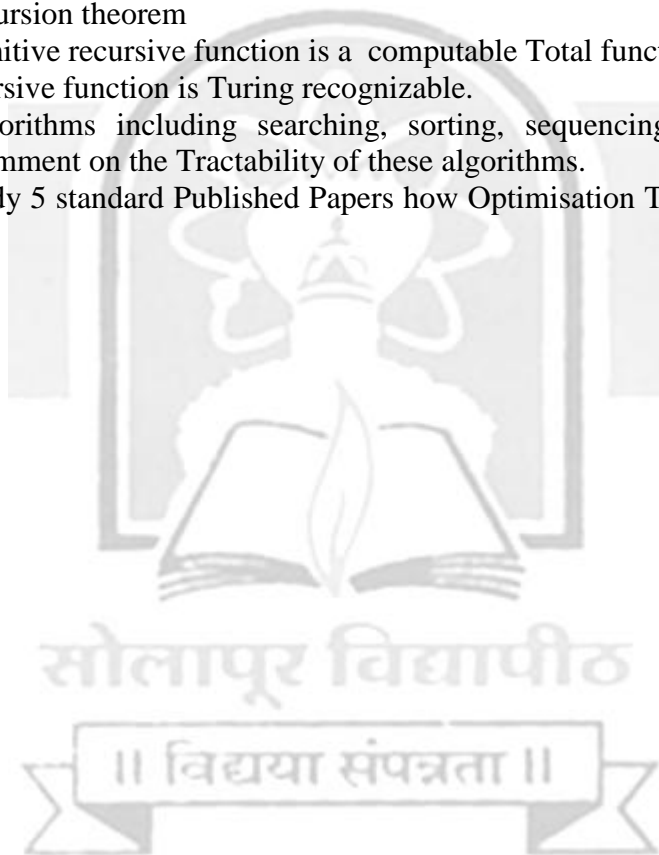
1. Introduction to Theory of Computation - Michael Sipser (Thomson Brooks Cole)
2. Introduction to Automata Theory, Languages and Computation - J. E. Hopcroft, Rajeev Motawani and J.D. Ullman ( Pearson Education Asia) 2nd Edition.
3. Theory of Computer Science – E. V. Krishnamoorthy
4. Introduction to languages & theory of computation -- John C. Martin (MGH)

#### References:

1. Theory of Computation- A Problem Solving Approach - Kavi Mahesh (Wiley India)
2. Theory of Computation - Dr. O.G.Kakde ( University Science Press)
3. Formal Languages & Automata Theory - Basavraj S. Anami, Karibasappa K.G., Wiley Precise Textbook-Wiley India
4. Theory of Computation - Rajesh K Shukla (CENGAGE Learning)

**List of Assignments :**

1. Give illustrations how each of the methods of Proof will be useful
  - a. deductive
  - b. reduction to definition
  - c. Proof by construction
  - d. contradiction
  - e. Induction
  - f. Counter-examples
2. Simulate a Turing Machine to show its basic operations.
3. Design a Turing machine to Perform arithmetic operations.
4. Develop the criteria used for decidability with respect to finite machines, Turing machines, Linear bound automata and Context free Grammars.
5. Under what conditions is Reducibility used. How can undecidable problems be decided using reducibility?
6. Prove using recursion theorem
  - a. Every Primitive recursive function is a computable Total function.
  - b. every recursive function is Turing recognizable.
7. Collect 50 algorithms including searching, sorting, sequencing etc and find their complexity. Comment on the Tractability of these algorithms.
8. Collect and study 5 standard Published Papers how Optimisation Techniques are used to data.





**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – I)**  
**2. Advanced Operating System**

**Teaching Scheme**

**Lectures : 3 Hrs/week**

**Practicals : 2 Hr/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**Section I**

**Unit 1 : Distributed computing systems fundamentals (5)**

Introduction to Distributed computing systems, Models, Popularity. Distributed computing system. Design issues of Distributed operating system. Distributed computing environment.

**Unit 2 : Message Passing (6)**

Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Bullring, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling, Group Communication.

**Unit 3 : Communication in Distributed Systems (5)**

RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. Server Management, Parameter-Passing semantics, call semantics, Communication protocols for RPCs, Client-Server Building, Exception handling, Security RPC in Heterogeneous Environments, Lightweight RPC.

**Unit 4 : Distributed Shared Memory (5)**

General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space. Consistency models, Replacement strategy, Thrashing.

**Section II**

**Unit 5 : Resource Management (5)**

Features of global scheduling algorithm. Task assignment approach, Load-Balancing and Load approach.

**Unit 6 : Process Management (4)**

Introduction, Process Migration, Threads.

**Unit 7 : Case study: Process Management, Memory Management and File Management in Linux (12)**

Process management: Process Descriptor and task structure, Process Creation, Process termination, Process scheduling.

Memory management: Pages, Zones, Kmalloc, Vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping, High memory mapping

File management: File system interface, File Abstraction Layer, VFS, Dentry object, Super block object, Inode object, File object, Data structure associated with File systems.

**Text book:**

1. Distributed Operating Systems concepts and design-P.K.Sinha(PHI).
2. Modern Operating System-Singhal
3. Robert Love, "Linux Kernel Development", Pearson education, 2<sup>nd</sup> edition, 2005.
4. Daniel Bovet: "Understanding the Linux Kernel", O' Really Publications, 2<sup>nd</sup> edition, 2003

**Reference Books:**

1. Distributed Systems concepts and design-G.Coulouris, J.Dollimore & T.Kindberg

**Assignment List to be taken on concepts**

- 1) Message Passing
- 2) Consistency models in Distributed shared memory
- 3) RPC Mechanism and call Semantics
- 4) Global Deadlock detection
- 5) Clock Synchronization
- 6) File caching schemes





**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – I)**  
**3. Analysis of Algorithms**

**Teaching Scheme**

**Lectures : 3 Hrs/week**

**Practical : 2 Hr/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**Section I**

**Unit 1 : Introduction**

(6)

‘O’, ‘ $\Omega$ ’ and ‘ $\Theta$ ’ asymptotic notations, Average, Best and Worst case analysis of algorithm for Time and Space complexity, Amortized Analysis, Solving Recurrence Equations

**Unit 2 : Greedy method and Dynamic Programming**

(7)

General methods, Job sequencing with deadlines, Minimum cost spanning trees, Optimal merge patterns, All pairs shortest paths, Optimal binary search trees, Travelling salesman problem and flow shop scheduling

**Unit 3 : Backtracking and Branch And Bound**

(7)

**Backtracking :** General Strategy, 8 Queen’s problem, Graph Colouring, Hamiltonian Cycles, 0/1 Knapsack.

**Branch and Bound :** General Strategy, 0/1 Knapsack, Traveling Salesperson Problem.

**Section II**

**Unit 4 : NP-Hard and NP-Complete Problems**

(6)

Basic concepts, Cook’s Theorem, NP-Hard Graph problems. NP –Hard Scheduling problems, NP-Hard Code Generation problems.

**Unit 5 : PARAM Algorithm**

(6)

Introduction, Computational model, Fundamental techniques and algorithms, Merging, lower bounds

**Unit 6 : Geometric Algorithm**

(6)

Point location, convex hulls and Voronoi diagrams, Arrangements applications using examples.

**Text Books**

1. Ellis Horowitz, Sartaj Sahni , “Fundamental of Computer Algorithms “, Universities Press ,II Edition
2. Bressard ,Bratley “Fundamental of Algorithms “,PHI,2<sup>nd</sup> Edition
3. Thomas H. Cormen and Chales E.L. Leiserson , “Introduction to Algorithm”,PHI,2<sup>nd</sup> Edition

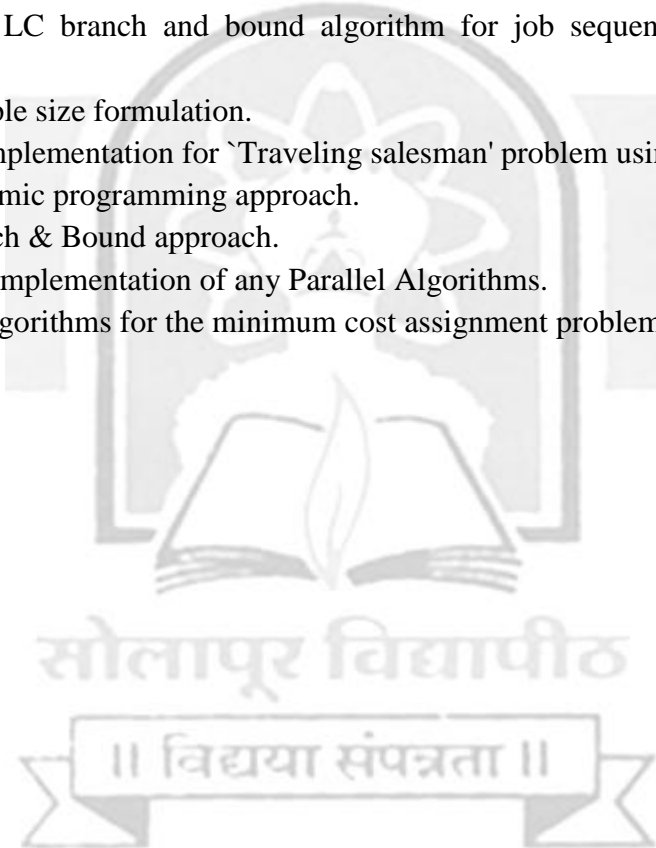
**Reference Books**

1. A.V.Aho and J.D.Ullman ,”Design and Analysis of Algorithms “ , Addition Wesley, 2<sup>nd</sup> Edition



**List of Assignments (Any 5 to 6 from the following list)**

- 1) Recursive and iterative (non-recursive) algorithm for specific problem and there complexity measures(comparison expected).
- 2) Minimal spanning Trees/ Job scheduling as an example of Greedy approach.
- 3) Finding shortest path for multistage graph problem. (single source shortest path and all pairs shortest path.)
- 4) Optimal Binary Search Tree / Flow Shop Scheduling as an example of dynamic programming.
- 5) 0/1 knapsack's problem using Dynamic Programming, Backtracking and Branch & Bound Strategies.
- 6) 8-Queen problem/ Graph coloring problem : general backtracking method
- 7) A complete LC branch and bound algorithm for job sequencing with dead lines problem.
- 8) Use fixed tuple size formulation.
- 9) Algorithm implementation for 'Traveling salesman' problem using -
  - a. Dynamic programming approach.
  - b. Branch & Bound approach.
- 10) Simulation/ Implementation of any Parallel Algorithms.
- 11) Geometric algorithms for the minimum cost assignment problem





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – I)

#### 4. Research Methodology

##### Teaching Scheme

Lectures : 3 Hrs/week

Tutorial : 1 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### SECTION I

##### Unit 1 : Research Methodology: Introduction (10)

Definition of research, Objectives and Motivation of research, Types of Research, Significance of research, Research methods vs Methodology, Research Process, Criteria of good research

**Defining Research problem:** Literature Review, selecting research problem, necessity of defining problem, techniques involved in defining problem

##### Unit 2 : Research Design (5)

Meaning of research design, Features of good design, important concepts to research design, different research design, Basic principles of experimental design

##### Unit 3 : Data collection (5)

Collection of primary data, observation method, Interview method, Collection of data through interviews, Collection of data through schedules, Collection of secondary data.

#### SECTION II

##### Unit 4 : Processing and analysis of data (6)

Processing operations, types of analysis, statistics in research, Hypothesis testing: Basic concepts and procedure

##### Unit 5 : Reading and Publish a Scientific Paper (6)

**Types of technical papers:** Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, when to go for what type of technical paper in the research process,

How to read a scientific paper, How to write scientific paper

**Research ethics and Legal issues:** Intellectual Property rights, Patents, Copyrights, Plagiarism

##### Unit 6 : Report Writing (6)

Significance of report writing, different steps in report writing, layout of research report, types of report, oral presentation, mechanics of writing research report, precautions for writing research reports.

Documentation and presentation tools: LATEX, Microsoft office, PowerPoint and SLIDESHOW, Adobe Flash, Slide Rocket, Zoho Show.

##### Text Books:

1. Research Methodology: Methods and Trends, - by Dr. C. R. Kothari, 2<sup>nd</sup> revised edition, New Age International Limited Publishers
2. Research Methodology – A Step by Step Guide for Beginners by Ranjit Kumar, Sage Publication

**Reference Books:**

1. Research Methodology: An Introduction - by Wayne Goddard and Stuart Melville, 2<sup>nd</sup> Edition, Juta and Co. Ltd
2. Research methodology: an introduction for science & engineering students - by Stuart Melville and Wayne Goddard

**Assignments:** Minimum 5 to 6 assignments based on above topics.





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – I)

#### 5. Elective I – 1) Data Mining

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hr/week

##### Examination Scheme

Theory: 3 credit

Term work: 1 credit

#### Section I

##### Unit 1 : Introduction

(3)

Data Warehousing and Introduction to data mining basic elements of data warehousing, Data warehousing and OLAP.

##### Unit 2 : Data model development for Data Warehousing:

(3)

Business model, selection of the data of interest, creation and maintaining keys, modeling transaction, data warehousing optimization.

##### Unit 3 : Data warehousing methodologies:

(3)

Type and comparisons.

##### Unit 4 : Data Mining techniques

(6)

Data mining algorithms, classification, Decision- Tree based Classifiers clustering, association Association-Rule Mining Information Extraction using Neural Networks.

##### Unit 5 : Knowledge discovery

(3)

KDD environment

#### Section –II

##### Unit 6 : Visualization

(4)

Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, mining class Comparison, Discriminating between classes, mining descriptive statistical measures in large database.

##### Unit 7 : Data mining primitives, languages & system architectures

(4)

Data mining primitives, Query language, designing GUI based on a data mining query language, architectures of data mining systems.

##### Unit 8 : Advanced topics

(3)

Spatial mining, temporal mining.

##### Unit 9 : Web mining

(3)

Web content mining, web structure mining, web usage mining

##### Unit 10 : Application and trends in data mining

(4)

Applications, systems products and research prototypes, multimedia data mining, indexing of multimedia material, compression, space modeling.

##### Text books:

1. Paulraj Ponniah, “Web warehousing fundamentals” – John Wiley.
2. M. H. Dunham, “Data mining introductory and advanced topics” – Pearson education
3. Han, Kamber, “Data mining concepts and techniques”, Morgan Kaufmann

##### Reference Book :

1. Imhoff, Galemme, Geiger, “Mastering data warehouse design”, Wiley DreamTech

**Assignments:** Minimum 5 to 6 assignments based on above topics.



**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – I)**  
**5. Elective I – 2) Mobile Computing**

**Teaching Scheme**

**Lectures : 3 Hrs/week**

**Practical : 2 Hr/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**Section I**

**Unit 1 : Introduction to wireless communication: (5)**

Wireless data technologies, Frequencies for radio signals, antennas and signal propagation, need and types of multiplexing techniques, modulation types, use of spread spectrum, cellular systems.

**Unit 2 : Medium Access Control (5)**

Need for MAC algorithm, medium access methods and comparison of these methods

**Unit 3 : Digital mobile Phone Systems: (10)**

GSM- mobile services, system architecture, radio interference, protocols, localization and calling, hand over, security, new data services, other digital cellular networks, comparison with GSM.

**Section II**

**Unit 4 : Wireless LAN (8)**

Introduction, advantages and design goals for wireless LAN, Infrastructure, ad-hoc networks, IEEE 802.11: system and protocol architecture, physical layer, HIPERLAN protocol architecture and physical layer and MAC, Blue tooth physical and MAC layer, Wireless ad-hoc networks.

**Unit 5 : Protocols for mobile computing (4)**

Mobile network layer, mobile IP, Snooping TCP, Mobile TCP, Fast and selective retransmission and recovery, Transaction oriented TCP.

**Unit 6 : Wireless Application Protocol (3)**

WAP architecture wireless datagram protocol, transport layer security, WML script.

**Unit 7 : Mobile Operating Systems (5)**

Palm OS: Architecture, features of kernel, memory, system managers, Symbian OS: Architecture, hardware interface, memory, management, Android OS: Architecture, features, memory management, Dalvik Virtual Machines

**Text Books**

1. Mobile Communications – Jachen Schiller (Addison- Wesley)
2. Mobile Computing – Asoke K Talukder, Roopa R Yavagal, (TMH Publishing)
3. Mobile Computing - Raj Pandya

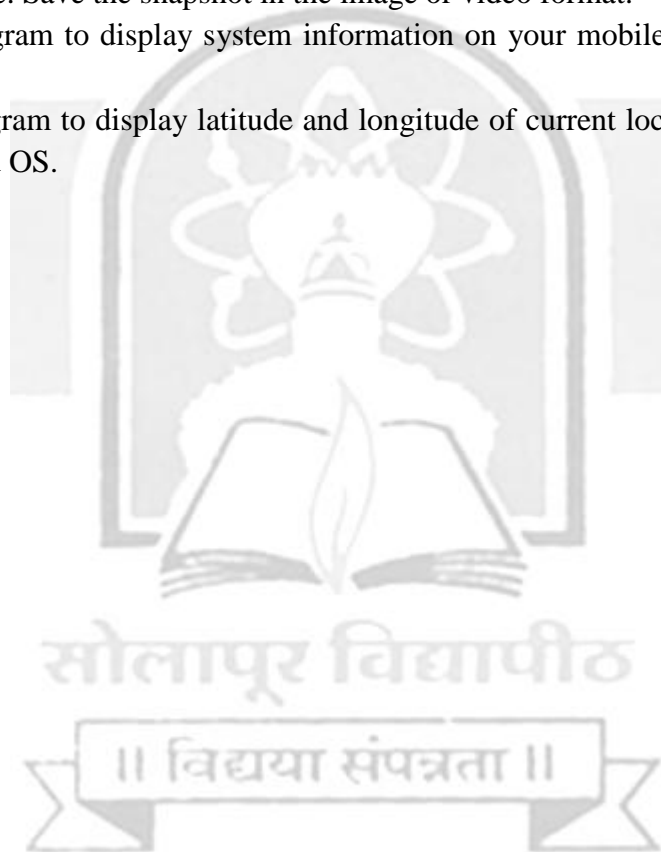
**Reference Books**

1. Mobile Computing: Technology, Applications and Service creation - Asoke K Talukder, Roopa R Yavagal, Tata McGraw Hill 2005

**List of Assignments:**

Minimum four assignments based on the following list:

1. Write a simple program for displaying “Hello, World” on your mobile screen using Android OS. Test output in Emulator and transfer it to mobile or tablet.
2. Write a program for sending SMS to your friend by using your mobile phone. Use Android
3. OS to develop your application. Test it in the Emulator and transfer it to mobile or tablet.
4. Develop a simple calculator for your mobile. Use Android OS to develop your application.
5. Test it in the Emulator and transfer it to mobile or tablet.
6. Write a simple program to take a snapshot by using the Camera in your Android OS based mobile. Save the snapshot in the image or video format.
7. Write a program to display system information on your mobile screen. Use Android OS.
8. Write a program to display latitude and longitude of current location on your mobile. Use Android OS.





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – I)

#### 5. Elective I – 3) Artificial Neural Networks And Genetic Algorithms

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### SECTION-I

##### Unit 1 : Introduction

(6)

Biological Neuron, Macullah Pitts model, Principles of learning, AND/OR gates simulation by TLU. Introduction to Perceptron, Discrete perceptron as a classifier, Decision and discriminant functions, Principle of supervised learning, Linearly non separable patterns, Perceptron training for two class and multiclass dichotomizer.

##### Unit 2 : Multilayer networks and their performance

(6)

Continuous perceptrons, Widrow-Hoff and Delta rule for training , Training algorithms for two category and multi category classifier, Error back propagation algorithm, Performance of feedforward multilayer networks, Accelerating learning process, Design considerations., Adaptive multilayer algorithms.- Merchands, Neural Tree and Tilting algorithms, Multilayer perceptron as a function approximator.

##### Unit 3 : Unsupervised learning:

(6)

Hebbian learning, Hamming net and Maxnet for classification, Competitive learning, K means clustering and LVQ algorithms, Adaptive resonance Theory, ART1 algorithm, Self organizing Kohonen's map

#### SECTION-II

##### Unit 4 : Associative memories

(5)

Autoassociation and hetero association, Hopfield network, Discrete Hopfield for classification, Storage capacity of Hopfield network, Continuous Hopfield network, Gradient Hopfield network for optimization., Brain State in a Box(BOB) network Hetero association – BAM network,

##### Unit 5 : Optimization Techniques

(4)

Hopfield network for optimization, Travelling salesman problem, Iterated gradient descent techniques, Simulated annealing technique, Random search techniques.

##### Unit 6 : Genetic algorithm for optimization problems

(4)

Introduction, A simple Genetic Algorithm, operators, mathematical foundations, objective functions and fitness functions, Computer Implementation of genetic Algorithms.

##### Unit 7 : Application of Artificial Neural Networks and Genetic algorithms

(5)

Character recognition, Speech recognition and Signature verification applications. Human face recognition using neural networks Prediction and scheduling using Genetic Algorithms.

##### Text Books:

1. Introduction to Artificial Neural Systems – Zurada(JAICO)
2. Genetic Algorithms- David E. Goldberg (Addison wesley)
3. Introduction to Artificial neural Networks - B. Yegnanarayana (PHI)

##### References:

- 1) Elements of Artificial Neural Networks – Mehrotra, Mohan, Ranka(PENRAM)
- 2) Artificial Intelligence : Saroj Kaushik (Cengage Learning)



**List of Assignments :**

1. Design and develop a simple Macullah Pitts model.
2. Simulate the working of a Discrete perceptron as a classifier.
3. Simulate a Perceptron training for two class dichotomizer.
4. Simulate the working of a Multilayer perceptron as a function approximator.
5. Design and develop a K means clustering algorithm for a given dataset.
6. Simulate a Competitive learning environment for generating the best student
7. Simulate for restricted data the output of a Travelling salesman problem
8. Design and develop a simple Genetic Algorithm







## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – I)

#### 5. Elective I – 4) Enterprise Software Development

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section - I

##### Unit 1 : Business Process and Enterprise Architecture (5)

Introduction to Business Processes, Business Process Design, Business Process Design Notations, Business Process Execution, Introduction to Enterprise Architecture

##### Unit 2: Enterprise Architecture Integration (7)

Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI, The EAI Process—Methodology or Madness, An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database-Oriented Middleware and EAI, Implementing and Integrating Packaged Applications—The General Idea, XML and EAI, Message Brokers—The Preferred EAI Engine, Process Automation and EAI.

##### Unit 3: Enterprise Architecture Patterns (6)

Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioural Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns.

#### Section - II

##### Unit 4: Software Factories (6)

Context: Monolithic Construction, Gratuitous Generality, One-Off Development, Process Immaturity, Critical Innovations, Systematic Reuse, Development by Assembly, Model-Driven Development, Process Frameworks

Reuse Paradigm: Industrializing Software Development, Economics of Reuse, Economies of Scale and Scope, Systematic Software Reuse, Integrating the Critical Innovations, Software Factory, Software Factory Schema, Software Factory Template, Building a Software Factory, Implications of Software Factories, Development by Assembly, Software Supply Chains, Relationship Management, Domain Specific Assets, Organizational Changes, Mass Customization of Software

##### Unit 5: Reuse and Product Lines (6)

Systematic Reuse : Software Product Families, Software as a Product, How Families Are Formed, Working Within a Family, Solving Problems in Advance, The Role of Architecture, Commonality and Variability, Where Families Are Found, Software Product Lines, Creating Economies of Scope Software Product Lines: Product Line Development, Product Line Analysis, Product Line Design, Product Line Implementation, Product Development, Problem Analysis, Product Specification, Collateral Development, Product Implementation, Product Line Evolution, Product Line Deployment

##### Unit 6: Transformation and Implementations (6)

Mappings and Transformations: Transformations Types of Transformation, Vertical Transformations, Horizontal Transformations, Transformation Problems, Model-to-Model Transformations, Model-to-Code Transformations, Solving the Composition Problem, Solving the Traceability Problem Generating Implementations: Describing Transformations, Mapping Rules Have IF-THEN Parts, Implementing Mapping Rules, Specifying Horizontal

Transformations, Describing Aspect Weaving, Describing Refactoring Rules, Patterns as Sets of Mapping Rules, Transformation Systems, Black-Box and White-Box Transformations, Grey-Box Transformation Systems, Applying Black-Box Transformations

**Text Books :**

1. Patterns of Enterprise Application Architecture, Martin Fowler, Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426
2. Enterprise Integration: An Architecture for Enterprise Application and Systems Integration, Fred A. Cummins, Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103

**Reference Books :**

1. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2003, ISBN-10: 0321200683, ISBN-13: 978-0321200686
2. Essential Business Process Modeling, Michael Havey, O'Reilly Media, Inc., 2005, ISBN-10: 0596008430, ISBN-13: 978-0596008437
3. Business Modeling With UML: Business Patterns at Work, Magnus Penker, Hans-Erik Eriksson, Wiley; 2000, ISBN-10: 0471295515, ISBN-13: 978-0471295518
4. Enterprise Modeling with UML: Designing Successful Software through Business Analysis Chris Marshall, Addison-Wesley Professional, 2000, ISBN-10: 0201433133 ISBN-13: 9780201433135
5. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2004, ISBN-10: 0321200683, ISBN-13: 9780321200686
6. Jack Greenfield, Keith Short, Steve Cook, Stuart Kent, Software Factories: Assembling Applications with Patterns, Models, Frameworks, and Tools, Wiley Publication, ISBN: 978-0-471-20284-4, September 2004

**List of Assignments: Any 4 to 5 out of the following list :**

1. To narrate Requirement Definition Document for the target system with following three areas:
  - Problem Identification
  - Problem Definition
  - Problem Statement
  - To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 std guidelines.
2. To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Specify the behaviour of the target system and map requirements to Use cases. The System Context Diagram depicts the overall System behavioural trace and Requirement Capture diagram depicts the hierarchical Use case Organization. The Use Case diagram should encompass
  - Actors (External Users)
  - Transactions (Use Cases)
  - Event responses related to transactions with external agents.
  - Detection of System boundaries indicating scope of system.

3. To depict the dynamic behaviour of the target system using sequence diagram. The Sequence diagram should be based on the Scenarios generated by the inter-object communication. The model should depict:
  - Discrete, distinguishable entities (class).
  - Events (Individual stimulus from one object to another).
  - Conditional events and relationship representation.
4. To depict the state transition with the life history of objects of a given class model. The model should depict:
  - Possible ways the object can respond to events from other objects.
  - Determine of start, end, and transition states.
5. To prepare Class Collaboration-Responsibility (CRC) cards for the Conceptual classes traced from System analysis phase. To develop logical static structure of target system with Class diagram. The model should depict
  - Relationship between classes: inheritance, Assertion, Aggregation, Instantiation
  - Identification of objects and their purpose.
  - Roles / responsibilities entities that determine system behaviour.
6. To represent physical module that provides occurrence of classes or other logical elements identified during analysis and design of system using Component diagram. The model should depict allocation of classes to modules. To narrate the Program Design Language Constructs for the target system and implement the system according to specification.
7. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Abstract Factory, Composite, Facade and Proxy design patterns. State the complete pattern specification and note the difference between the patterns.
8. Select a complex system and narrate concise specification for the same. Develop architecture specification and use archetypes to recognize the architectural elements.





**Solapur University, Solapur**  
**ME (Computer Science & Engineering) Part – I (Semester I)**  
**6. Seminar-I**

**Teaching Scheme**

**Periods** : 2 Hrs / week / per candidate

**Examination Scheme**

**Term Work** : 2 credits

**Guidelines for Seminar**

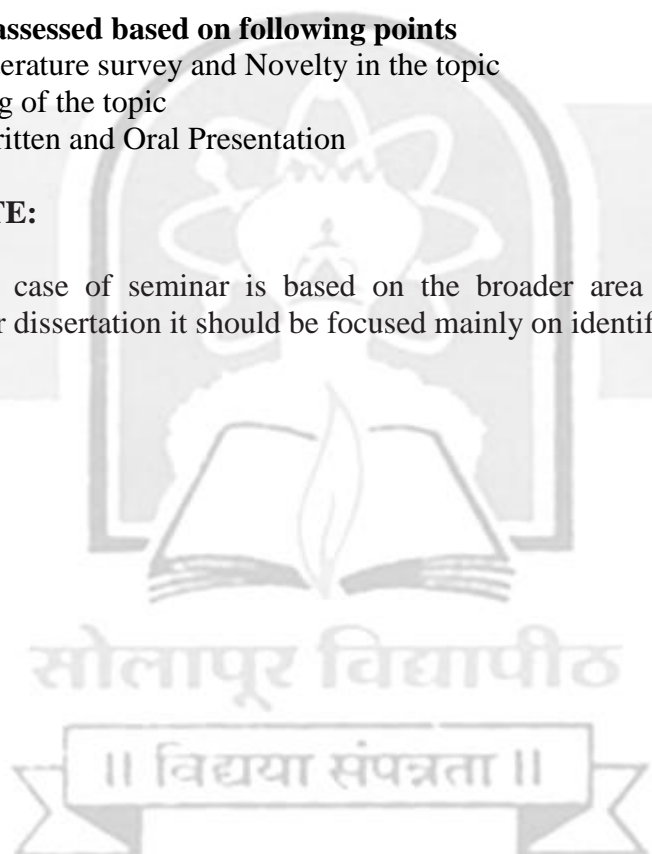
- 1) Seminar should be based on thrust areas in Computer Science & Engineering.
- 2) Students should do literature survey and identify the topic of seminar and finalize in consultation with Guide/Supervisor. Students should use multiple literatures (at least 10 papers from Refereed Journals) and understand the topic and compile the report in standard format and present in front of Internal Panel of Examiners appointed by the Head of the Department/Institute of respective Programme.

**Seminar should be assessed based on following points**

- 1) Quality of Literature survey and Novelty in the topic
- 2) Understanding of the topic
- 3) Quality of Written and Oral Presentation

**IMPORTANT NOTE:**

Literature survey in case of seminar is based on the broader area of interest in recent developments and for dissertation it should be focused mainly on identified problem.





## Solapur University, Solapur

<b>M.E. (Computer Science and Engineering)</b>	<b>Part – I (Semester – II)</b>
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
<b>Lectures : 3 Hrs/week</b>	<b>Theory: 3 credit</b>
<b>Practical : 2 Hr/week</b>	<b>Term work: 1 credit</b>

### 1. Internet Routing Algorithm Section I

#### Unit 1 : Network Basics (7)

OSI Model, Network Hardware, Transmission media, Bridge, Router, Gateways, Network Software Components, MAC, Data Link Protocols, Switching Techniques TCP/IP Protocol suite.

#### Unit 2 : Networking and Network Routing (7)

Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network, Topology, Architecture, Network Management Architecture, Public Switched Telephone Network

#### Unit 3 : Routing Algorithms (6)

Shortest Path and Widest Path: Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Dijkstra-Based Approach, Bellman–Ford-Based Approach,  $k$ -Shortest Paths Algorithm.

OSPF and Integrated IS-IS : OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison

BGP : Features, Operations, Configuration Initialization, phases, Message Format. IP Routing and Distance Vector Protocol Family :RIPv1 and RIPv2

### Section II

#### Unit 4 : Routing Protocols: Framework and Principles (6)

Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing, Protocol, Link Cost.

#### Unit 5 : . Internet Routing and Router Architectures (6)

Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability.

Router Architectures: Functions, Types, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures

#### Unit 6 : Analysis of Network Algorithms (6)

Network Bottleneck, Network Algorithmics, Strawman solutions, Thinking Algorithmically, Refining the Algorithm, Cleaning up, Characteristics of Network Algorithms.

IP Address Lookup Algorithms : Impact, Address Aggregation, Longest Prefix Matching, Naïve Algorithms, Binary, Multibit and Compressing Multibit Tries, Search by Length Algorithms, Search by Value Approaches, Hardware Algorithms, Comparing Different Approaches IP Packet Filtering and Classification : Classification, Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for  $d$  Dimensions,

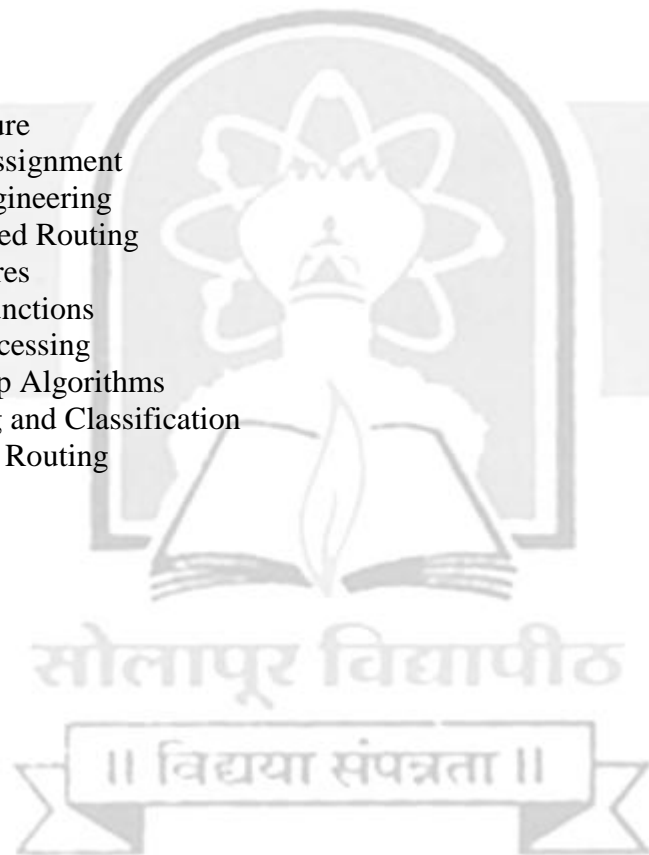
#### Text Books :

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking)
2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking)



**List of Assignment** (Any 4 to 5 assignments from following topics) :

1. Network Routing – An Introduction through Implementation
  - a. To setup Intranet : Installation and Configuration of Peer to Peer and Client Server models, Web server, E-mail, Proxy, Firewall and DNS Configurations
  - b. Conversion of a simple machine into a router.
2. Routing Algorithms
  - a. Bellman–Ford Algorithm and the Distance Vector Approach
  - b. Comparison of the Bellman–Ford Algorithm and Dijkstra’s Algorithm
  - c. Shortest and Widest Path Computations
3. Routing Protocols
  - a. Distance Vector Routing
  - b. Link State Routing
4. Routing in IP networks
  - a. RIP
  - b. OSPF
  - c. BGP
5. Internet Architecture
  - a. Address Assignment
  - b. Traffic Engineering
  - c. Policy-Based Routing
6. Router Architectures
  - a. Routing Functions
  - b. Packet Processing
7. IP Address Lookup Algorithms
8. IP Packet Filtering and Classification
9. Quality of Service Routing





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 2. Advanced Database Concepts

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hr/week

##### Examination Scheme

Theory: 3 credit

Term work: 1 credit

#### Section I

##### Unit 1 : Distributed database management system (8)

Features of DDS, Distribution transparency, DDB design, Query translation, Optimization

##### Unit 2 : Distributed Transaction (6)

Management of distributed transaction, concurrency control, reliability.

##### Unit 3 : Parallel Databases (5)

I/O parallelism, Interquery and Intra query parallelism, Intra operation and Interoperation parallelism

#### Section II

##### Unit 4 : Object database management system (7)

Overview, Complex Data types, Structured data types, Encapsulation Inheritance, Arrays and Multiset types in SQL, Object OIDs and reference types, ORDBMS, Object Query Language

##### Unit 5 : Multimedia database system (6)

Multimedia database management system, image and text database techniques, Audio and Video Database Techniques Physical Storage and Retrieval. Data structure, Operation, indexing, segmentation.

##### Unit 6 : Spatial and Temporal Database: (6)

Types of spatial data and queries, spatial indices: Space filling curves grid files, R-Trees, Introduction to temporal data, Time in databases.

#### Text Books

1. Database management system - Ramakrishna Gherkin (McGraw Hill)
2. Distributed Database Principals and systems - Stephan ceri, Giuseppe Pelagatti. (McGraw Hill)
3. Database system concepts - Silberschatz, Korth, Sudershan, McGraw Hill International

#### Reference Books

1. Principals of distributed Database system (2nd edition) - M. Tamer Ozsu. Patrick valduriez (Pearson)
2. Object Oriented Interface and Databases - Rajesh Narang, Prentic Hall of India.
3. Modern Information Retrieval - Ricardo Baeza-Yates and Berthier Ribeiro- Neto - Pearson Education (Low Price Edition)

**Assignment List:**

Minimum 5 assignments based on the following concepts

1. Implementation of Distributed database.  
Fragmentation, Execution of local and global transaction based on different transparency level, concurrency control.
2. Implementation of Parallel databases for  
Inter query and Intra query parallelism, Intra operation and Inter operation parallelism.
3. Implementation of object relational databases using structured and complex data types.
4. Blob data type implementation for multimedia data.
5. Implementation of multimedia information retrieval system.
6. Implementation of spatial indices.
7. Presentations on current trends/special issues/important topics from research papers in DBMS.







**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – II)**  
**3. Parallel Computer Architectures**

**Teaching Scheme**  
**Lectures: 3 Hrs/week**  
**Tutorials: 1 Hr/week**

**Examination Scheme**  
**Theory: 3 credits**  
**Term work: 1 credit**

**Section I**

**Unit 1 : Instruction level parallel processors (4)**

Evolution and overview of ILP processors, Dependencies between instructions, Instruction scheduling, Preserving sequential consistency, Speed up potential of ILP processing

**Unit 2 : Pipelined processors (6)**

Concepts, Design space of pipelines, Pipelined instruction processing, Pipelined execution of integers and Boolean instructions, Pipelined processing of load and stores

**Unit 3: VLIW architectures (4)**

Basic principles, VLIW architectures, Case study- Trace 200 family

**Unit 4 : Superscalar Architecture I (6)**

Introduction, Parallel decoding, Superscalar instruction issue, Shelving, Register naming, Parallel execution, Preserving the sequential consistency of instruction execution and exception processing, Implementation of super scalar CISC processor using a superscalar RISC core

**Section – II**

**Unit 5 : Superscalar Architecture II (7)**

Processing of control transfer instructions: Introduction, basic approaches to branch handling and delayed branching

**Unit 6 : Case studies (6)**

R10000, power PC 620 and Pentium Pro

**Unit 7 : Introduction to multiprocessors (7)**

Chip multiprocessors: why CMP (Moore's law, wire delay); shared L2 vs. tiled CMP; core complexity; power/performance; snoopy coherence: invalidate vs. update, MSI, MESI, MOESI, MOSI, memory consistency models: SC; chip multiprocessor case studies: Intel Montecito and dual core Pentium 4, IBM power4, Sun Niagara.

**Text Books:**

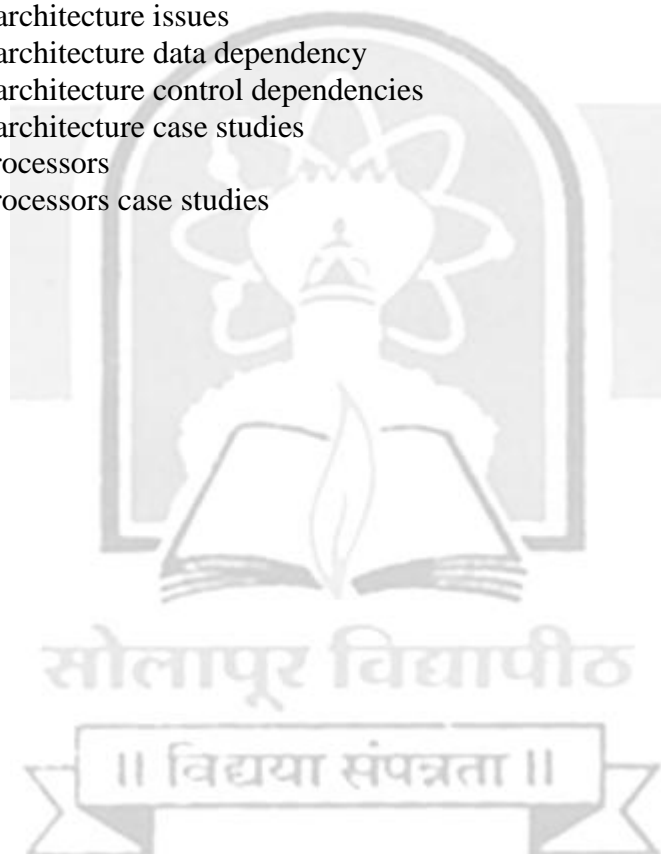
1. Advanced Computer Architecture a design space approach. - Sima, Fauntain, Kscucle, Pearson Edition
2. Computer Architecture A Quantitative Approach – John L. Hennessy and David A. Patterson

**Reference Books:**

1. Parallel Computer Architecture – David Culler and J. Palsingh, Morgan Kaufmann Pub.
2. Introduction to parallel Algorithms - Joseph J.A. , Addison Wesley
3. Parallel programming - Barry Wilkinson, C.Michael Allen

**List of Assignments:** Minimum eight assignments based on the following topics:

1. ILP Processors
2. Dependencies in ILP Architectures
3. Pipelined architectures
4. Numerical problems on pipelined architectures
5. VLIW architectures
6. Superscalar architecture issues
7. Superscalar architecture data dependency
8. Superscalar architecture control dependencies
9. Superscalar architecture case studies
10. Chip multiprocessors
11. Chip multiprocessors case studies





**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – II)**  
**4. Elective-II : 1) Grid Computing**

**Teaching Scheme**

**Lectures: 3 Hrs/week**

**Tutorials: 1 Hr/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**SECTION- I**

**Unit 1: Overview**

**(6)**

Definitions of Grid Computing, The GRID, Grid Computing Business Value Analysis, Key risk factors and vulnerabilities of Grid Computing deployments, Cloud Computing and Grid Computing Comparison, Worldwide Large Hadron Collider Computing Grid (WLCG) - Grid Computing, The Tier Sites, Components- Middleware, Fabric, Management, Disk & Tape, Data Transfer, Network transfer architecture, Data Processing, Using the Worldwide LHC Computing Grid and Job load.

**Unit 2 : The Anatomy of Grid**

**(4)**

Introduction, The emergence of virtual organizations, The nature of Grid architecture, Grid architecture description, Grid architecture in practice, 'On the Grid': the need for intergrid protocols, Relationships with other technologies, Other perspectives on Grids

**Unit 3 : The Physiology of the Grid**

**(4)**

Introduction, The need for Grid technologies, Background, An Open Grid Services Architecture, Application example, Technical details, Network protocol bindings, Higher-level services, Related work

**Unit 4: The Semantic Grid: A Future e-Science Infrastructure**

**(4)**

Introduction, A semantic Grid scenario, A service-oriented view, The knowledge layer

**SECTION- II**

**Unit 5 : Grids and The Virtual Observatory**

**(4)**

The virtual observatory, What is a Grid?, Image computing, Database computing, A semantic Web of astronomical data

**Unit 6 : The New Biology and Grid**

**(4)**

Introduction, Bioinformatics Grid applications today, The challenges of the Grid from the perspective of bioinformatics researchers

**Unit 7 : Combinatorial Chemistry and Grid**

**(5)**

Introduction, What is combinatorial chemistry?, 'Split & mix' approach to combinatorial chemistry, Chemical markup language (cML), Statistics & design of experiments, Statistical models, The multimedia nature of chemistry information, The pervasive Grid and metadata, Virtual data, Multimedia collaboration, A Grid or intra-Grids, e-Science and e-Business

**Unit 8 : "GARUDA" Indian National Grid Initiative**

**(5)**

Garuda Overview, Garuda Architecture, Garuda Usage Framework

**Text Books :**

1. "GRID COMPUTING: Making The Global Infrastructure A Reality" Edited by Fran Berman, Geoffrey C. Fox, Anthony J. G. Hey, ISBN: 978-81-265-2722-9, Published by WILEY INDIA Edition

2. “GRID COMPUTING: A Practical Guide to Technology and Applications” by AHMAR ABBAS, ISBN: 81-7008-626-4, Published by FIREWALL MEDIA, (An Imprint of Laxmi Publications Pvt. Ltd), New Delhi-11002.

#### References :

1. WLCG-Flyer-Update2011-v0.pdf and web site <http://lcg-archive.web.cern.ch/lcg-archive/public/overview.htm>
2. garuda\_brochure\_2012.pdf, web site <http://www.garudaindia.in> and GarudaUserManual.pdf
3. “GridCafe The place for everybody to learn about grid computing” <http://www.gridcafe.org>

#### List of Assignments

At least one separate tutorial by each student on the technical topic in the prescribed syllabus or on new technical topic in the Grid Computing domain area. Tutorial in the form of writing assignments/seminar on any one (at least) paper published by IEEE/ACM/International Journal or Conference on the Grid Computing or installation/demo/execution of computing job on any open source Grid Computing environment or on The India’s National Computing Grid Infrastructure viz. GARUDA GRID

Nature & number of tutorial assignments left to the decision of faculty teaching Grid Computing Subject. Objective should be consolidating theoretical understanding of a technical topic from the syllabus or new/recent technical topic from the Grid Computing domain area.

Confining learning/teaching to a syllabus will not be sufficient for making good carrier in CSE/IT. There should be quest for learning/teaching new technical topics and applying whatsoever learnt. Tutorial assignments can be one good mode for learning new technical topic beyond the syllabus.





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 4. Elective-II : 2) Real Time Operating System

##### Teaching Scheme

Lectures: 3 Hrs/week

Tutorials: 1 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1 : Basic Real Time Concepts

(4)

Terminology ,Real time design issues, Example Real-time systems, Brief history, Language issues : Language features, Commonly used programming languages, Software life cycle : Phases of the software life cycle ,non temporal transition in the software life cycle , spiral model .

##### Unit 2 : Real time specification and design techniques

(4)

Natural languages, Mathematical specification , flow chart, structure chart ,pseudo code, programming designing languages, finite state automata , data flow diagrams, petrinets, warnier-orr notations, state charts, Sunity in using graphical techniques

##### Unit 3 Real time kernels

(4)

Polled loop system, phase state driven code , co routine interrupt driven systems, foreground/background systems, full feature real time operating system

##### Unit 4 : Inter-Task Communication and Synchronization

(4)

Buffering Data, Mailboxes, Critical Regions, Semaphores, Event flags and signals, Deadlock.

##### Unit 5 : Real time Memory Management

(3)

Process Stack Management, Dynamic Allocation, Static Schemes.

#### Section II

##### Unit 6 : System performance Analysis and optimization

(4)

Response Time calculation, Interrupt Latency, Time- Loading and its Measurement, Scheduling is NP-Complete, Reducing Response Times and Time-loading, Analysis of memory Requirements, Reducing Memory loading I/O performance.

##### Unit 7 : Queueing Models

(4)

Probability functions, discrete, Basic Buffer size calculation, Classical Queueing theory, Little's law, Erlang's Formula.

##### Unit 8 : Reliability, Testing and Fault tolerance

(3)

Faults, Failures, Bugs and effects, Reliability, testing fault tolerance.

##### Unit 9 : Hardware, Software Integration

(4)

Goals of real time system integration tools, Methodology, The software Heisenberg Uncertainty Principle.

##### Unit 10 : Real time Applications

(4)

Real time systems as complex system, first Real time application, Real time databases Real time Image processing, Real time Unix Building Real time Applications with real time programming languages.

**Text Book:**

1. Real Time Systems Design and Analysis : An Engineer's Handbook Phillip A. Laplante (2nd Edition PHI)

**Reference Books:**

1. Real Time system Design – Levi Shem Tov and Ashok K. Agrawala (New York McGraw Hill)
2. Proceedings of IEEE Special Issue on Real Time Systems (Jan 1994)
3. Real Time Systems and their Programming Language Burns, Alan and Andy Wellings (New York, Addison Wesley)
4. The design of Real time Applications : M. Blackman (New York John Wiley & Sons).
5. Real time systems : C.M. Krishna, K.G. Shin (TMGh)

**Assignments:**

Implement minimum 5-6 assignments based on the above topics.







## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 4. Elective-II : 3) Natural Language Processing

##### Teaching Scheme

Lectures: 3 Hrs/week

Tutorials: 1 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1 : Introduction to NLP :

(6)

Introduction, sentence analysis phases, Grammars and Parsers, Bottom up and Top down Parsing, Link Parser, Chart Parser, Simple Transition Networks, Recursive Transition Networks, Augmented Transition Networks, Definite Clause grammar, Construction of a Parse structure, Semantic analysis, Semantic Grammars, DCG formalism, case Grammars, Case Frame, Conceptual Parsing, Universal Networking language Some Example Applications of NLP, Achievements and Brief History of NLP, Open Problems, Major Goal of NLP.

##### Unit 2 : Languages Structure and Language Analyzer :

(6)

Introduction to Language Structure, Overview of Language Analyzer, Morphological Analyzer, Local Word Grouping (LWG), Core Parser, Requirements of Computational Grammars, Computational Aspects, System Aspects, Large System Aspects, Introduction to Words and Their Analyzer, Why Morphological Analysis, Morphological Generation Using Paradigms, Morphological Analysis Using Paradigms, Speeding Up Morphological Analysis by Compilation, Introduction to Local Word Grouping, Verb Groups, Kriya Rupa Charts, Noun Group, Strategy for Grammar Development, Semantics in Stages, Some Open Problems, Conclusions.

##### Unit 3 : Paninian Grammar and its Parser

(6)

Introduction, The Semantic Model, Free Word Order and Vibhakti, Paninian Theory, Karaka Relations, Active Passive, Control, Karaka to Vibhakti Mapping, Karaka Sharing, Introduction to Paninian Parser, Core Parser, Constraints, Constraint Parser Using Integer Programming, Constraint Parser Matching and Assignment, Reduction to Bipartite Graph Matching, Reduction to Assignment Problem, Preferences over Parses, Lakshan Charts for Sense Disambiguation, Summary.

#### Section - II

##### Unit 4 : Machine Translation :

(6)

Survey, Introduction, Problems of Machine Translation, Is MT Possible?, Brief History, Possible Approaches, Current Status, Anusaraka or Language Accessor, Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusaraka Output, Language Bridge, Summary.

##### Unit 5 : Lexical Functional Grammar

(6)

Introduction, Active-Passive and Dative Constructions, Wh-movement in Questions, Overview of LFG, LFG Formalism, Well-formedness Conditions, Handling Wh-movement in Questions, Computational Aspects, Features and Feature Structures, Unification, Other Constraints, Conclusions, LFG and Indian Languages, Functional Specification.

##### Unit 6 : Tree Adjoining Grammar and Government & Binding Theories

(6)

Lexicalized Grammars and Locality, Lexicalized Tree Substitution Grammar, Lexicalized Tree Adjoining Grammar, Feature Structures, Some Mathematical Aspects. Similarities

Between TAG and PG Difference between TAG and PG, Optional Arguments, Sentential or Verbal Arguments, Some Important Phenomena, Discussion, Introduction to Government and Binding, The GB Modules, X-bar theory, Theta theory, Government, Case theory, Bounding theory, Empty Category Principle (ECP), Binding theory, Constraints on movement, How can GB help in Parsing?, Conclusion, Comparing GB with PG.

**Text Books :**

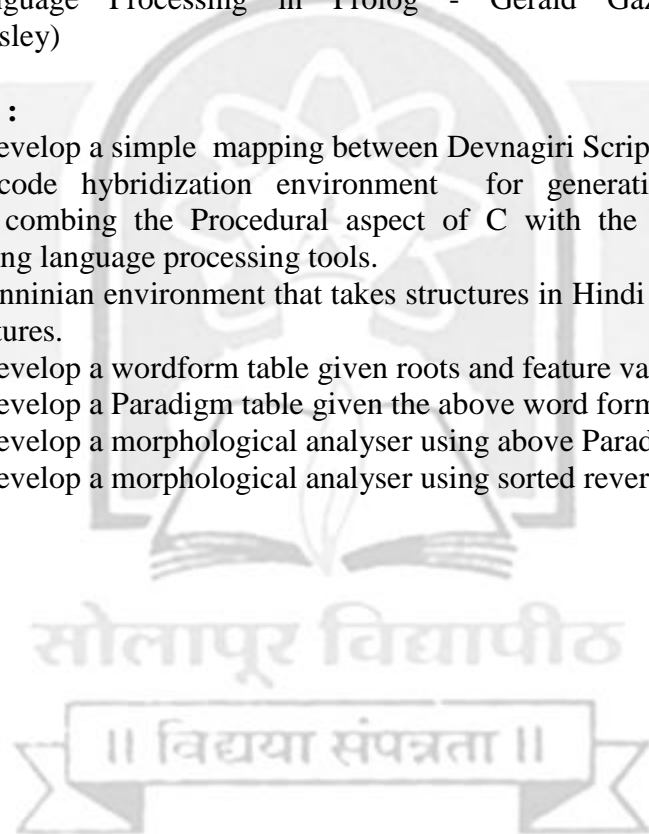
1. Artificial Intelligence : Saroj Kaushik (Cengage Learning)
2. Natural Language Processing : A Paninian Perspective - Akshar Bharti, Vineet Chaitanya, Rajeev Sangal (PHI)

**References :**

- 1) Natural Language Understanding - James Allen  
(The Benjamin / Cummings Publishing Company)
- 2) Natural Language Processing in Prolog - Gerald Gazdar, Chris Mellish  
(Addison Wesley)

**List of Assignments :**

1. Design and develop a simple mapping between Devnagiri Script and Roman script.
2. Develop a code hybridization environment for generating a simple LogiC environment combining the Procedural aspect of C with the declarative aspect of PROLOG using language processing tools.
3. Develop a Panninian environment that takes structures in Hindi as input and produces modifier structures.
4. Design and develop a wordform table given roots and feature values.
5. Design and develop a Paradigm table given the above word form table.
6. Design and develop a morphological analyser using above Paradigm Tables.
7. Design and develop a morphological analyser using sorted reverse suffix table.







## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 4. Elective-II : 4) Infrastructure Management

##### Teaching Scheme

Lectures: 3 Hrs/week

Tutorials: 1 Hr/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1: Infrastructure Management Overview (6)

Definitions, Infrastructure management activities, Evolutions of Systems from Mainframes - to-New age systems and their management, growth of internet, current business demands and IT systems issues, Complexity of today's computing environment, cost estimation of complexity issues, Importance of Systems management for enterprises.

##### Unit 2: Preparing for Infrastructure Management (7)

IT infrastructure design factors and considerations, Determining customer's Requirements, Identifying System Components to manage- processes, data and applications. Tools and their integration, Patterns for IT systems management, Introduction to the design process for information systems, Models, Information Technology Infrastructure Library (ITIL)

##### Unit 3: Service Delivery Processes (7)

Service level management, financial management and costing, IT services continuity management, Capacity management, Availability management.

#### Section II

##### Unit 4: Service Support and Management Processes (7)

Configuration Management, Service desk, Incident management, Problem management, Change management, Release management.

##### Unit 5: Storage and Security Management (6)

Introduction to storage, Backup & Restore, Archive & Retrieve, Space management, SAN & NAS, Disaster Recovery, Database & Application protection, Data retention, Introduction Security, Identity management, Single sign-on, Access Management, Basics of network security, Firewalls.

##### Unit 6: Issues in Infrastructure management (7)

Regulatory issues in infrastructure management, Environmental policies, Urban governance Rural IT infrastructure management, Technology change management in infrastructure sectors

#### Text Books:

1. Foundation of IT Service Management: base on ITIL, by Jan Van Bon, Van Haren publishing, 2nd edition 2005.
2. High Availability: Design, Techniques, and processe, by Floyd Piedad, MachaelHawkins, Prentice Hall, 2000

#### Reference Books:

1. IT Oraganization: Building a Worldclass Infrastructure, by Harris Kern, Stuart Galup, Guy Nemiro, Publisher: Prentice Hall, 2000
2. IT Systems Management: Designing, Implimenting, and managing World – class Infrastructures Rich Schiesser, Prentice Hall PTR; 2001
3. Grigg, Nail, "Infrastructure Engineering and management", John Wiley, 1998.

**List of Assignments:**

Minimum Six assignments based on the following topics:

1. Infrastructure Management activities and importance in Enterprises.
2. Design factors in IT infrastructure management.
3. Information Technology Infrastructure Library (ITIL)
4. Service Delivery Processes
5. Service Support Processes
6. Storage management in IT infrastructure management
7. Security management in IT infrastructure management
8. Current trends and issues in IT infrastructure management





**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – II)**  
**5. Elective-III : 1) Web Technology**

**Teaching Scheme**

**Lectures : 3 Hrs/week**

**Practical : 2 Hrs/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**Section I**

**Unit 1 : Introduction**

**4**

History of the Internet and World Wide Web – HTML 4 protocols – HTTP, SMTP, POP3, MIME, IMAP. Introduction to JAVA Scripts – Object Based Scripting for the web. Structures – Functions, Arrays–Objects.

**Unit 2 : Dynamic HTML**

**5**

Introduction – Object refers, Collectors all and Children. Dynamic style, Dynamic position, frames, navigator, Event Model – On check – On load – Onenter – Mouse rel – Form process – Event Bubblers – Filters – Transport with the Filter – Creating Images – Adding shadows – Creating Gradients – Creating Motion with Blur – Data Binding – Simple Data Binding – Moving with a record set – Sorting table data – Binding of an Image and table.

**Unit 3 : Multimedia**

**5**

Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E- Marketing – Online Payments and Security – Web Servers – HTTP request types – System Architecture – Client Side Scripting and Server side Scripting – Accessing Web servers – IIS – Apache web server.

**Unit 4 : DATABASE- ASP – XML**

**5**

Database, Relational Database model – Overview, SQL – ASP – Working of ASP – Objects – File System Objects – Session tracking and cookies – ADO – Access a Database from ASP – Server side Active-X Components – Web Resources – XML – Structure in Data – Namespaces – DTD–Vocabularies–DOM methods.

**Section – II**

**Unit 5 : Servlets and JSP**

**5**

Introduction – Servlet Overview Architecture – Handling HTTP Request – Get and post request – redirecting request – multi-tier applications – JSP – Overview – Objects – scripting – Standard Actions–Directives.

**Unit 6 : Web Architectures**

**5**

Web architectures, web analysis, web restructuring methodologies, Web 2.0, Web 3.0 concepts and implementation strategies.

**Unit 7 : Web security**

**4**

Web insecurity Security strategies, General security, Listing of server-side risks, Language specific security

**Unit 8 : Web Applications**

**4**

Accessible Blogs, RSS, Widgets, Mashups , wiki, Podcasting

**Text Book :**

1. Deitel & Deitel, Goldberg, “Internet and world wide web – How to Program”, Pearson Education Asia, 2001.

**References :**

1. Eric Ladd, Jim O’ Donnel, “Using HTML 4, XML and JAVA”, Prentice Hall of India - QUE, 1999.
2. Aferganatel, “ Web Programming: Desktop Management”, PHI, 2004.
3. Rajkamal, “Web Technology”, Tata McGraw-Hill, 2001.

**Url resources**

1. <http://ocw.uc3m.es/ingenieria-telematica/web-technologies-1>
2. <http://ad4dcss.wikispaces.com/>

**Assignments:** Minimum 5 to 6 assignments based on above topics.





**Solapur University, Solapur**  
**M.E. (Computer Science and Engineering) Part – I (Semester – II)**  
**5. Elective-III : 2) Business Intelligent System**

**Teaching Scheme**

**Lectures : 3 Hrs/week**

**Practical : 2 Hrs/week**

**Examination Scheme**

**Theory: 3 credits**

**Term work: 1 credit**

**SECTION-I**

**Unit 1: Introduction to Business Intelligence: (8)**

Framework, Architecture, benefits, Tools and techniques.

**Unit 2: Business Performance Management: (8)**

Methodologies (balanced scorecard, dashboards), BPM & BI.

**Unit 3: Text mining for Business Intelligence: (8)**

Concepts and definitions, Extractive and Abstractive methods, Applications & Tools, Marketing, Security & Biomedical Applications.

**SECTION-II**

**Unit 4: Forecasting Time Series: (6)**

Introduction, Explanatory versus Predictive Modeling, Popular Forecasting Methods in Business, Combining Methods & Time Series Components.

**Unit 5: Business Intelligence Implementation: Emerging Trends (10)**

Implementing BI, Implementations Factors, BI and Integration Implementation, Connecting BI Systems to Databases and Other Enterprise Systems, On-Demand BI, Key Characteristics and Benefits, Legal Issues, Privacy, Ethics in Decision Making and Support.

**Unit 6: The Future of Business Intelligence (8)**

Social Networks and BI, Collaborative Decision Making, RFID and New BI Application Opportunities, Reality Mining,

**Text Books :**

1. Business Intelligence, 2/E; Efraim Turban, Ramesh Sharda, Dursun Delen, David King; pearson Education
2. Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with Xlminer; 2nd edition, Galit Shmueli, Nitin R. Patel and Peter C. Bruce; John Wiley
3. Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management, 3<sup>rd</sup> edition; Berry, Gordon S. Linoff, John Wiley & Sons Inc.

**References:**

1. Data Mining: Building Competitive Advantage; Robert Groth, , Prentice Hall, 2000.
2. Introduction to Data Mining; P. N. Tan, M. Steinbach, Vipin Kumar, Pearson Education
3. Data Mining and Data Warehousing and OLAP; Alex Berson and Smith, Mc Graw Hill Publication.
4. Decision Support and Data Warehouse Systems; E. G. Mallach, Tata Mc Graw Hill.
5. Mastering Data Mining- Art & science of CRM; Michael Berry and Gordon Linoff, Wiley Student Edition
6. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, 3rd edition, Morgan Kaufmann

**List of Assignments**

1. Use of spreadsheets, reporting tools, OLAP and Datamining tools for a Business
2. Use of Data Visualisation Tools.
3. Study and implementation using Pentaho BI(open source).
4. Study of IBM Analytics.
5. Case study of quadbase a dashboard design tool
6. Case study Financial Forecasting using Datamining Techniques
7. Design and develop an Extractive method for Text summarisation
8. Design and develop an Abstractive method for text summarisation







## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 5. Elective-III: 3) Object Oriented Software Engineering and Design Patterns

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hrs/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1 : Domain Model Engineering (6)

Crunching Knowledge, Communication and the Use of Language, Binding Model and Implementation, Isolating the Domain, Model Expressed in Software, Life Cycle of a Domain Object, Making Implicit Concepts Explicit, Maintaining Model Integrity, Distillation, Large-Scale Structure.

##### Unit 2 :Introduction to Primitive Workflows (6)

Unified Process: What is UML?, What is the Unified Process?, The requirements workflow, Use case modeling., Advanced use case modeling., The analysis workflow., Objects and classes, Finding analysis classes, Relationships, Inheritance and polymorphism, Analysis packages, Use case realization. Advanced use case realization, Activity diagrams, Advanced activity diagrams.

Design-driven Workflows: The design workflow. Design classes, Refining analysis relationships. Interfaces and components, Use case realization-design. State machines, Advanced state machines, The implementation workflow, Deployment, Introduction to OC, Model Driven Development.

##### Unit 3 : Introduction to Software Architecture (6)

Software Architecture, Relationships to Other Disciplines, Multi-Disciplinary Overview, Foundations of Software Architecture, Software architecture in the context of the overall software life cycle, Architectural Styles, CASE study of Architectures

#### Section - II

##### Unit 4 : Software Architecture Design (6)

Designing, Describing, and Using Software Architecture, IS2000: The Advanced Imaging Solution, Global Analysis, Conceptual Architecture View, Module Architecture View, Styles of the Module Viewtype, Execution Architecture View, Code Architecture View. Component-and-Connector Viewtype, Styles of Component-and-Connector Viewtype, Allocation Viewtype and Styles, Documenting Software Interfaces, Documenting Behavior, Choosing the Views, Building the Documentation Package

##### Unit 5 : Archetype Patterns (6)

Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. , Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern

##### Unit 6 : Design Patterns and Patterns Types (6)

Design Patterns: Creational Patterns, Patterns for Organization of Work, Access Control Patterns, Service Variation Patterns, Service Extension Patterns Pattern Types: Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns for Interactive Systems , Adaptable Systems, Frameworks and Patterns, Analysis Patterns

### **Text Books**

1. Christine Hofmeister, Robert Nord, Deli Soni, Addison-Wesley Professional; 1<sup>st</sup> edition Applied Software Architecture , (November 4, 1999) ,ISBN-10: 0201325713, ISBN-13: 978-0201325713
2. Ian Gorton Springer; 1 edition (2006) Essential Software Architecture, ISBN-10: 3540287132 ISBN-13: 978-3540287131

### **Reference Books :**

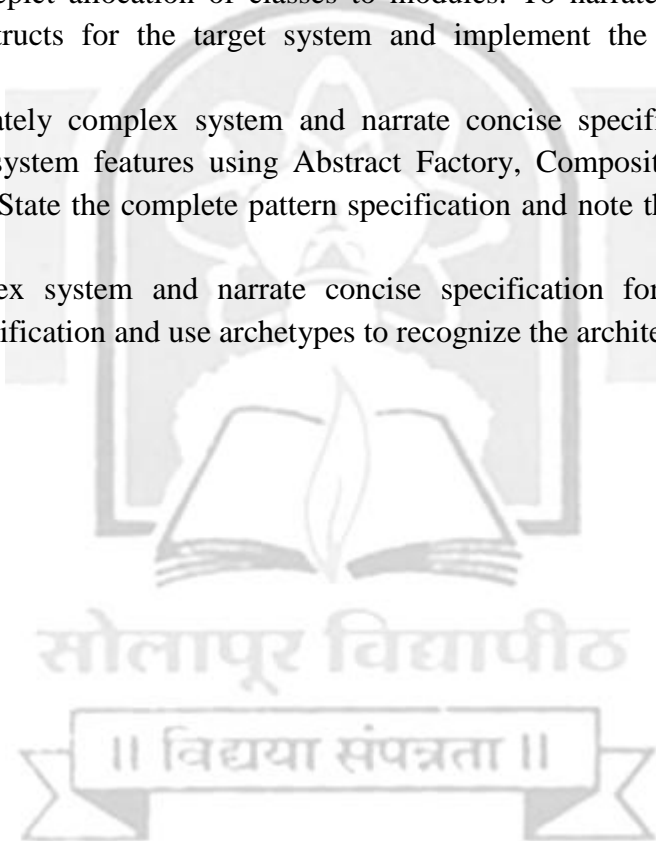
1. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt, Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5 by Publisher: Wiley; 1 edition (August 8, 1996-2004) ISBN-10: 0471958697 ISBN-13: 978-0471958697
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides Publisher: Addison-Wesley Professional; 1st edition Design Patterns: Elements of Reusable Object-Oriented Software (Addison-Wesley Professional Computing Series) (January 15, 1995) ISBN-10: 0201633612 ISBN-13: 978-0201633610
3. Thomas Stahl, Markus Voelter, Krzysztof Czarnecki, Wiley ,Model-Driven Software Development: Technology, Engineering, Management, ISBN-10: 0470025700, ISBN-13: 978-0470025703 2006,
4. Eric Evans, Addison-Wesley Professional, Domain-Driven Design: Tackling Complexity in the Heart of Software, 2004, ISBN-10: 0321125215, ISBN-13: 9780321125217
5. Jim Arlow, Ila Neustadt, Addison-Wesley Professional, UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2/E, , ISBN-10: 0321321278, ISBN-13: 9780321321275, 2005

### **List of Assignments :**

- 1 A) To narrate Requirement Definition Document for the target system with following three areas:
  - Problem Identification
  - Problem Definition
  - Problem Statement
- B) To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 std guidelines.
- 2) To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Specify the behavior of the target system and map requirements to Use cases. The System Context Diagram depicts the overall System behavioral trace and Requirement Capture diagram depicts the hierarchical Use case Organization. The Use Case diagram should encompass
  - a. Actors (External Users)
  - b. Transactions (Use Cases)
  - c. Event responses related to transactions with external agents.
  - d. Detection of System boundaries indicating scope of system.
- 3) To depict the dynamic behavior of the target system using sequence diagram. The Sequence diagram should be based on the Scenarios generated by the inter-object communication. The model should depict:
  - a. Discrete, distinguishable entities (class).
  - b. Events (Individual stimulus from one object to another).
  - c. Conditional events and relationship representation.



- 4) To depict the state transition with the life history of objects of a given class model. The model should depict:
  - a. Possible ways the object can respond to events from other objects.
  - b. Determine of start, end, and transition states.
- 5) To prepare Class Collaboration-Responsibility (CRC) cards for the Conceptual classes traced from System analysis phase. To develop logical static structure of target system with Class diagram. The model should depict
  - a. Relationship between classes: inheritance, Assertion, Aggregation, Instantiation
  - b. Identification of objects and their purpose.
  - c. Roles / responsibilities entities that determine system behavior.
- 6) To represent physical module that provides occurrence of classes or other logical elements identified during analysis and design of system using Component diagram. The model should depict allocation of classes to modules. To narrate the Program Design Language Constructs for the target system and implement the system according to specification.
- 7) Select a moderately complex system and narrate concise specification for the same. Implement the system features using Abstract Factory, Composite, Facade and Proxy design patterns. State the complete pattern specification and note the difference between the patterns.
- 8) Select a complex system and narrate concise specification for the same. Develop architecture specification and use archetypes to recognize the architectural elements.





## Solapur University, Solapur

### M.E. (Computer Science and Engineering) Part – I (Semester – II)

#### 5. Elective-III : 4) Wireless Ad-hoc Network

##### Teaching Scheme

Lectures : 3 Hrs/week

Practical : 2 Hrs/week

##### Examination Scheme

Theory: 3 credits

Term work: 1 credit

#### Section I

##### Unit 1 : Introduction

(6)

Introduction, Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, IEEE 802.11a Standard

##### Unit 2 : Overview of Ad-hoc Networks

(6)

Origin of Ad hoc: Packet Radio Networks, Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Ad hoc Wireless Networks, Heterogeneity in Mobile Devices, Wireless Sensor Networks, Traffic Profiles, Types of Ad hoc Mobile Communications, Challenges Facing Ad Hoc Mobile Networks, Ad hoc wireless Internet

##### Unit 3 : Ad Hoc Routing Protocols

(6)

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table-Driven Routing Protocols - Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV), On-Demand Approaches - Ad Hoc On-Demand Distance Vector Routing (AODV), Zone Routing Protocol (ZRP)

#### Section II

##### Unit 4 : Multicast routing In Ad Hoc Networks

(6)

Introduction - Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols - Tree-Based Multicast Routing Protocols, Mesh-Based Multicast Routing Protocols, Summary of Tree-and Mesh-Based Protocol

##### Unit 5 : Transport Layer Protocols

(6)

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks

##### Unit 6 : Security

(6)

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks

#### Text Books :

1. C. Siva Ram Murthy and B.S. Manoj “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR, 2004
2. C.K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 2001

#### References Books :

1. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000

**List of Assignments :**

- 1: Simulation of Ad-hoc network.
- 2: Install and configure Network- Simulator 2(NS-2) for Ad-hoc network.
- 3: Create different scenario for wired and wireless nodes using NS-2.
- 4: Compare packet delivery ratio of following protocol using NS-2.
  - a) Dynamic Source Routing
  - b) Destination Sequenced Distance Vector
  - c) Ad-hoc On demand Distance Vector Routing





**Solapur University, Solapur**  
**ME (Computer Science & Engineering) Part – I (Semester II)**  
**6. Seminar-II**

**Teaching Scheme**

**Periods : 2 Hrs / week / per candidate**

**Examination Scheme**

**Term Work : 2 credits**

**Guidelines for Seminar**

- 1) Seminar should be based on thrust areas in Computer Science & Engineering.
- 2) Students should do literature survey and identify the topic of seminar and finalize in consultation with Guide/Supervisor. Students should use multiple literatures (at least 10 papers from Refereed Journals) and understand the topic and compile the report in standard format and present in front of Internal Panel of Examiners appointed by the Head of the Department/Institute of respective Programme.

**Seminar should be assessed based on following points**

- 1) Quality of Literature survey and Novelty in the topic
- 2) Understanding of the topic
- 3) Quality of Written and Oral Presentation

**IMPORTANT NOTE:**

Literature survey in case of seminar is based on the broader area of interest in recent developments and for dissertation it should be focused mainly on identified problem.

