

ANNA UNIVERSITY TIRUCHIRAPPALLI**Tiruchirappalli – 620 024****Regulations 2007****Curriculum****M.E. SOFTWARE ENGINEERING****SEMESTER I**

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	MA5132	Applied Probability and Operations Research	3	1	0	100
2	SE5101	Computer Networks Engineering and Management	3	0	0	100
3	SE5102	Object Oriented Systems	3	0	0	100
4	SE5103	Software Documentation	3	0	0	100
5	SE5104	Formal Methods and Requirements Engineering	3	1	0	100
Practical						
6	SE5105	Networks Laboratory	0	0	3	100
7	SE5106	Case Tools Laboratory	0	0	3	100

SEMESTER II

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	SE 5151	Software Design	3	0	0	100
2	CS 5019	Software Project Management	3	0	0	100
3	SE 5152	Software Testing	3	0	0	100
4	SE 5153	User Interface Design	3	0	0	100
5	SE 5154	Security in Computing	3	0	0	100
6	E1***	Elective I	3	0	0	100
Practical						
7	SE 5155	Software Testing Laboratory	0	0	3	100
8	SE 5156	Software Development Laboratory	0	0	3	100

SEMESTER III

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	E2***	Elective II	3	0	0	100
2	E3***	Elective III	3	0	0	100
3	E4***	Elective IV	3	0	0	100
Practical						
4	SE5251	Project Work Phase I	0	0	12	-

SEMESTER IV

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	SE5251	Project Work Phase II	0	0	24	600

LIST OF ELECTIVES

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	SE5001	Software Reuse	3	0	0	100
2	SE5002	Software Agents	3	0	0	100
3	SE5003	Design Patterns	3	0	0	100
4	SE5004	Personal Software Process and Team Software Process	3	0	0	100
5	SE5005	Software Reliability and Metrics	3	0	0	100
6	SE5006	Language Technologies	3	0	0	100
7	CS5003	Mobile Computing	3	0	0	100
8	CS5006	XML and Web Services	3	0	0	100
9	CS5007	Bio informatics	3	0	0	100
10	CS5010	Embedded Systems	3	0	0	100
11	CS 5012	Software Quality Assurance	3	0	0	100
12	CS5013	Ad hoc Networks	3	0	0	100
13	CS 5014	Data Warehousing and Data Mining	3	0	0	100
14	CS5018	Advanced Databases	3	0	0	100
15	CS5020	Component Based Technology	3	0	0	100

ANNA UNIVERSITY TIRUCHIRAPPALLI

Tiruchirappalli - 620 024

Regulations 2007

Syllabus

M.E. SOFTWARE ENGINEERING

SEMESTER I

MA5132 – APPLIED PROBABILITY AND OPERATIONS RESEARCH

L T P
3 1 0

UNIT I PROBABILITY AND RANDOM VARIABLES 9

Probability Concepts – Random Variables – Moment Generating Function – Standard Distributions Binomial – Poisson – Rectangular or Uniform – Normal – Exponential Distributions – Functions of Random Variables – Two Dimensional Random Variables.

UNIT II STOCHASTIC PROCESSES 9

Classification – Stationary and Random Process – Markov Process – Markov Chains – Transition Probability – Classification of Markov Chain – Limiting Distribution – First Passage Time – Poisson Process – Birth and Death Process.

UNIT III QUEUE MODELS 9

Single and Multi – Server Markovian Queuing Models – Customer Impatience – M/G/1 Queuing System – Queuing Applications.

UNIT IV SIMULATION AND APPLICATIONS 9

Types of Simulation – Limitations of Simulation Techniques – Phases of Simulation Study – Generation of Random Numbers – Monte Carlo Simulation – Applications to Queuing Problems.

UNIT V CLASSICAL OPTIMIZATION THEORY 9

Unconstrained External Problem – Newton Raphson Method – Equality Constraints – Lagrangian Method – Kuhn Tucker Conditions.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. T.Veerarajan in ASCENT Series, “Probability Statistics and Random processes”, Tata McGraw Hill Publishing company Ltd, 2003.
2. Sharma S.D., “Operations Research”, 12th Edition, Kedar Nath, Ramnath & Co - 1998.

REFERENCES

1. S.C Gupta and V.K.Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, 2001.
2. Bhat U.N., “Elements Applied Stochastic processes”, 2nd Edition, John Wiley and Sons, 1984.
3. Taha H.A., “Operations Research -An introduction”, 6th Edition, Prentice hall of India Ltd,1987.

SE5101 – COMPUTER NETWORKS ENGINEERING AND MANAGEMENT

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3 0 0

UNIT I FUNDAMENTALS 9

Network Architecture – Topologies – Error Detection – Reliable Transmission Technique – IEEE Standards 802.3 – 802.5 – 802.11 – Bridges.

UNIT II SWITCHING AND ADDRESSING 9

Switching & Forwarding – Cell Switching – Simple Internetworking – Routing – Subnetting & Supernetting – IPV6.

UNIT III TRANSPORT LAYER 9

UDP – TCP – Retransmission – Timeout – Congestion Control & Avoidance – Quality of Service – Compression.

UNIT IV APPLICATION LAYER 9

DNS – FTP – Email – HTTP – Telnet – RTP – RTSP – Socket Programming.

UNIT V NETWORK MANAGEMENT 9

SNMP V1 Network Management – Organization and Information Models – Communication and Functional Models – SNMP v2 Management.

Total: 45

TEXT BOOKS

1. Peterson Davie, “Computer Networks - A System Approach”, 3rd Edition, Harcourt Asia Pvt. Ltd., 2003.
2. Mani Subramanian, “Network Management Principle and Practice”, 1st Edition, Pearson Education, 2004.

REFERENCES

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw Hill, 2004.
2. William Stallings, “Data and Computer Communication”, 6th Edition, Pearson Education, 2000.
3. Douglas E. Comer, “Internetworking with TCP/IP Volume I”, PHI, 1997.

SE5102 – OBJECT ORIENTED SYSTEMS

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UNIT I OBJECT ORIENTED DESIGN FUNDAMENTALS 9

The Object Model – Classes and Objects – Complexity – Classifications – Notation – Process – Pragmatics – Object types – Object State – OOSD Life Cycle.

UNIT II OBJECT ORIENTED ANALYSIS 9

Overview of Object Analysis – Shaller /Mellor – Coad/Yourdon – Rumbaugh – Booch –Object Analysis Classification – Noun Phrase approach – Common Class Patterns Approach – Use Case Driven Approach – Classes – Responsibilities and Collaborators.

UNIT III OBJECT ORIENTED DESIGN METHODS 9

UML – Class Diagram – Use case Diagram – Dynamic Modeling – Extensibility –Comparison with other Design Methods.

UNIT IV OBJECT ORIENTED DEVELOPMENT 9

OO Design Process and Axioms – Designing Classes – Access Layer – View Layer –Testing.

UNIT V CASE STUDIES IN OBJECT ORIENTED DEVELOPMENT 9

Total: 45

TEXT BOOKS

1. Ali Bahrami, “Object Oriented Systems Development”, McGraw Hill International Edition, 1999.
2. Craig Larman, “Applying UML and patterns”, Addison Wesley, 2000.

REFERENCES

1. Booch Grady, “Object Oriented Analysis and Design”, 5th Edition, Addison Wesley, 1997.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley Longman, 1999.
3. Fowler, “Analysis Patterns”, Addison Wesley, 1996.
4. Shlaer S., Mellor S., “Object Lifecycles Modeling the World in States”, Prentice Hall, 1992.
5. Coad P., Yourdon E., “Object -Oriented Analysis”, Yourdon Press, Prentice Hall, 1990.
6. Graham - I, “Object Oriented Methods”, Addison Wesley, 1993.

SE5103 – SOFTWARE DOCUMENTATION

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UNIT I FUNDAMENTALS 9

Need for Software Documentation – Understanding Task Orientation – Analysing Users – Writing User Scenarios – User Informational Needs – Document Goals – User Work Motivations – User Analysis Checklist – Constructing a Task List – Categorization – Writing Steps as Actions – Task Analysis.

UNIT II DOCUMENTATION PLANNING 9

Planning and Writing Documents – Task List and Schedule – Guidelines – Documentation Process – Documentation Plan – Document Review Form – Review Plan – Schedule – Checklist.

UNIT III DOCUMENTATION TESTING 9

Usability Tests – Advantages of Field Testing – Editing and Fine Tuning – Problems – Designing for Task Orientation – Page Showing Elements of Document Design – Screen Showing Elements for Online Help Design – Solutions to the Design Problem for Printed and Online Documentation.

UNIT IV DOCUMENTATION LAYOUTS 9

Laying Out Pages and Screens – Elements of Page and Screen Design – Designing Type – Effective Writing Style – Using Graphical that Support Decision Making – Functions of Graphics – Type and Elements of Graphics.

UNIT V DOCUMENTATION GUIDELINES 9

Writing to Guide – Procedures – Guidelines – Writing to Support – Reference – Structural – Reference Entry – Checklist – Designing Index – User Oriented Index – Case Studies.

Total: 45

TEXT BOOK

1. Thomas T. Barker, “Writing S/W Documentation - A Task Oriented Approach”, Allyn & Bacon Series of Technical Communication, 1998.

REFERENCE

1. Edmond H. Weiss, “How To Write Usable User Documentation”, Second Edition, Oryx Press, 1991.

SE5104 – FORMAL METHODS AND REQUIREMENTS ENGINEERING

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UNIT I FUNDAMENTALS 9

Need for Modeling Systems – Challenges in Software Development – Modeling Computing Systems – Verification – Formal Specification – Advantages and Disadvantages – Approaches to Formal Specification – Formal Specification Languages – Software Tools Supporting Formal Specification

UNIT II FORMAL SPECIFICATION 10

Deficiencies of Less Formal Approaches – Mathematics in Software Development – Formal Methods Concept – Z-Specification – Mathematical Preliminaries – First Order Logic – Sets – Logic-Sequences – Applying Mathematical Notation for Formal Specification

UNIT III FORMAL PROOF 9

Methods for Reasoning – Formal Proof – Rigorous Proof – Immanent Reasoning – Reification and Decomposition – Floyd Hoare Logic – Case Studies – The Bill of Materials Problem – A Route Planner – Wing’s Library Problem

UNIT IV REQUIREMENTS ENGINEERING 9

The Requirements Problem – Introduction to Requirements Management – Analyzing the Problem – Five Steps in Problem Analysis – Business Modeling – Understanding User Needs – The Challenge of Requirements Elicitation – Brainstorming and Idea Reduction – Applying Use Cases – Prototyping

UNIT V ADVANCED REQUIREMENTS ENGINEERING 8

Defining the System – Managing Scope – Refining – Software Requirements – Refining Use Cases – On Ambiguity and Specificity – Building the Right System – From Requirements to Implementation – Using Traceability to Support Verification – Validating System

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Antoni Diller Z., “An Introduction to Formal Methods”, 2nd edition, John Wiley & Sons Ltd, 1994.
2. Dean Leffingwell & Don Widrig, “Managing Software Requirements A Unified Approach”, Addison-Wesley, 5th Printing, November, 2000.

REFERENCES

1. Roger S. Pressman, “Software Engineering, A Practitioner’s approach”, 6th Edition, McGraw-Hill International, 2005.

SE5105 – NETWORKS LABORATORY

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1. Simulation of Sliding window Protocol
2. Simulation of ARP / RARP
3. Simulation of Routing Protocol
4. Client server application using TCP– UDP
5. Client server application using RPC
6. Study of NS2 or GLOMOSIM
7. Simulation of Dynamic Routing using NS2 or GLOMOSIM

SE5106 – CASE TOOLS LABORATORY

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Develop software for an application using typical Case Tool – Following Software Engineering methodology as given below.

1. **Problem Statement**
Thorough study of the problem – Identify project scope – Objectives and infrastructure.
2. **Business modeling and requirements specification – the specification language**
Unified Modeling Language (UML) will be used.
3. **UML**
Use work products – Data dictionary – Use case diagrams and activity diagrams – Build and test – Class diagrams – Sequence diagrams – Collaboration diagrams and add interface to class diagrams.
4. **Software Implementation – Coding – Use tools for automatic code generation from system specifications.**
5. **Change Management – Program – Data and Documentation management**
6. **Software Testing**
Prepare test plan – Perform validation testing – Coverage analysis – Memory leaks– Develop test case hierarchy – Site check and site monitor.
7. **Software Documentation and Reverse Engineering**
Apply Reverse Engineering approach and compare with the forward engineering approach.
Prepare documents and reports

SEMESTER II

SE5151 – SOFTWARE DESIGN

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UNIT I GENERAL DESIGN FUNDAMENTALS 9

The Nature of Design Process – Objectives – Building Models – Constructs – Design Qualities – Assessing the Design – Design Viewpoints for Software – The Object Model – Classes and Objects – Complexity – Classification – Notation – Process – Pragmatics

UNIT II STRUCTURED SYSTEM ANALYSIS AND DESIGN 9

Structured Design – Design Principles – Problem Partitioning and Hierarchy – Abstraction – Modularity – Top-Down and Bottom-Up Strategies – Transformation of a DFD to a Structure Chart – Transform Analysis – Transaction Analysis – Coupling – Cohesion – Multiple Types of Cohesion in a Module – Data Design – Normalization – De-Normalization – Procedural Design

UNIT III OBJECT ORIENTED ANALYSIS AND DESIGN 9

Overview of Object Oriented Analysis – Shaler/Mellor – Coad/ Yourdon – Rumbaugh – Booch – Uml – Use Case – Conceptual Model – Behaviour – Class Analysis Patterns – Overview – Diagrams – Aggregation – UML – Diagrams – Collaboration – Sequence – Class – Design Patterns and Frameworks – Comparison with other Design Methods – Managing Analysis and Design – Evaluation Testing – Coding – Maintenance – Metrics

UNIT IV DESIGN METHODS 9

The Architecture Concepts – Design Methods – Design Patterns – Rationale for Methods – Design Processes and Strategies – Design by Template – Designing with Patterns – Stepwise Refinement – Incremental Design – Prototyping – DSDM – Structured Systems Analysis and Structured Design – JSP – JSD.

UNIT V CASE STUDIES 9

Domain Name System – Email – World Wide Web (HTTP) – Simple Network Management Protocol – File Transfer Protocol – Security – Multimedia Applications.

Total: 45

TEXT BOOK

1. David Budgen, “Software Design”, 2nd Edition, Pearson Education, 2004.

REFERENCES

1. Roger S. Pressman, “Software Engineering”, 6th Edition, McGraw Hill Inc., 2005.
2. Steve McConnell, “Code Complete”, Word Power Publishers, 2001.
3. Ed Downs, Peter Clare, Jan Coe, “Structured System Analysis and Design Methods Application and Context “, Prentice Hall, 1998.
4. A. G. Sutcliffe, “Human Computer Interface Design”, 2nd Edition Macmillan, 1995.

CS5019 – SOFTWARE PROJECT MANAGEMENT

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UNIT I FUNDAMENTALS 9

Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management.

UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9

Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process.

UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9

Iterative Process Planning – Organisation and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process.

UNIT IV MANAGED AND OPTIMIZED PROCESS 9

Data Gathering and Analysis – Principles of Data Gathering – Data Gathering Process – Software Measures – Data Analysis – Managing Software Quality – Defect Prevention.

UNIT V CASE STUDIES 9

COCOMO Cost Estimation Model – Change Metrics – CCPDS–R.

Total: 45

TEXT BOOKS

1. Walker Royce, “Software Project Management - A Unified Framework”, Pearson Education, 2004.
2. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989

REFERENCES

1. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989.
2. Ramesh Gopaldaswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
3. Bob Hughes and Mike Cotterell, “Software Project Management”, 3rd Edition, Tata McGraw Hill, 2004.

SE5153 – USER INTERFACE DESIGN

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UNIT I FUNDAMENTALS

8

Human – Computer Interface – Characteristics of Graphics Interface – Direct Manipulation Graphical System – Web User Interface – Popularity – Characteristic & Principles.

UNIT II HUMAN COMPUTER INTERACTION

10

User Interface Design Process – Obstacles – Usability – Human Characteristics in Design – Human Interaction Speed – Business Functions – Requirement Analysis – Direct – Indirect Methods – Basic Business Functions – Design Standards – System Timings – Human Consideration in Screen Design – Structures of Menus – Functions of Menus – Contents of Menu – Formatting – Phrasing the Menu – Selecting Menu Choice – Navigating Menus – Graphical Menus.

UNIT III WINDOWS

9

Characteristics – Components – Presentation Styles – Types – Managements – Organizations – Operations – Web Systems – Device – Based Controls Characteristics – Screen – Based Controls – Operate Control – Text Boxes – Selection Control – Combination Control – Custom Control – Presentation Control.

UNIT IV MULTIMEDIA

9

Text for Web Pages – Effective Feedback – Guidance and Assistance – Internationalization – Accessibility – Icons – Image – Multimedia – Colouring.

UNIT V WINDOWS LAYOUT– TEST

9

Prototypes – Kinds of Tests – Retest – Information Search – Visualization – Hypermedia – WWW – Software Tools.

Total: 45

TEXT BOOK

1. Wilbent. O. Galitz, “The Essential Guide to User Interface Design”, John Wiley& Sons, 2001.

REFERENCES

1. Ben Sheiderman, “Design the User Interface”, Pearson Education, 1998.
2. Alan Cooper, “The Essential of User Interface Design”, Wiley - Dream Tech Ltd., 2002.

SE5154 – SECURITY IN COMPUTING

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UNIT I FUNDAMENTALS 10

Security Problem in Computing – Elementary Cryptography – DES – AES – Public Key Encryption – Uses of Encryption.

UNIT II PROGRAM SECURITY 8

Security Programs – Non Malicious Program Errors – Virus and Other Malicious Code – Targeted Malicious Code – Control against Program Threats.

UNIT III SECURITY IN OPERATING SYSTEM 9

Protected Objects and Methods of Protection – Memory and Address Protection – Control of Access Generated Objects – File Protection Mechanisms – User Authentication – Trusted Operating Systems – Models of Security – Trusted Operating System – Assurance in Trusted Operating Systems.

UNIT IV DATABASE and NETWORK SECURITY 11

Database Security Requirements – Reliability and Integrity – Sensitive Data – Inference – Multilevel Databases and Multilevel Security – Threats in Networks – Network Security Controls – Firewalls – Intrusion Detection System – Security – E-mail.

UNIT V ADMINISTERING SECURITY AND ETHICAL ISSUES 7

Security Planning – Risk Analysis – Organization Security Policies – Physical Security – Protection Programs and Data – Information and the Law – Software Failures – Computer Crime – Privacy – Ethical Issues.

Total: 45

TEXT BOOK

1. Charles B. Pfleeger and Shari Lawrence Pfleeger, “Security in computing”, 3rd Edition, Pearson Education, 2003.

REFERENCES

1. Matt Bishop, “Computer Security - Art and Science”, 1st Edition, Pearson Education, 2003.
2. William Stallings, “Cryptography and Network Security - Principles and Practices”, 3rd Edition, Prentice Hall of India, 2003.
3. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill, 2003.

SE5155 – SOFTWARE TESTING LABORATORY

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- I. Do the following testing for a chosen software implementation using any commercial or freeware tools
 1. Path-testing
 2. Transaction-flow testing
 3. Data-flow testing

- II. Do the following measurements on a chosen software implementation
 1. Halstead's Metrics
 2. McCabe's Metrics

- III. Simulate a test driver
Develop a simple software testing tool implementing any testing technique of your choice.

SE5156 – SOFTWARE DEVELOPMENT LABORATORY

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Take up a software development project of your choice and systematically carry-out all the phases of SDLC. Do the necessary documentation at each stage. Use appropriate case tools.

The project to be carried out may be in domains such as

1. Online stock trading
2. Airport management
3. Bio-informatics
4. Hospital management
5. Internet-based multi-user online games
6. Programmer's editor with syntax-based coloring
7. Library of computer security related algorithms

ELECTIVES

SE5001 – SOFTWARE REUSE

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UNIT I FUNDAMENTALS

9

Organizing Reuse – Introduction – Motivation for Reuse – Reuse Driven Organizations – Managing a Reuse Project – The Characteristics of Reuse of Project – Roles in Reuse Projects – Adopting a Project to Reuse – Reuse Tools

UNIT II REUSE METRICS

9

Managing a Repository – The REBOOT Component Model – Classification – Configuration Management of the Repository – Managing the Repository – Computer Supported Cooperative Working – Process Metrics for Reuse – Product Metrics – Cost Estimation – Forming a Reuse Strategy – Assessing Reuse Maturity

UNIT III REUSABLE COMPONENTS

9

Practicing Reuse – Generic Reuse Development Processes – Develop for Reuse – Develop with Reuse – Testing Reusable Components – Object Oriented Components – Techniques and Life Cycles – Object Oriented Development for Reuse – Detailed Design for Reuse – Implementation for Reuse – Verification – Test and Validation

UNIT IV REUSE PHASES

9

Development with Reuse – With Reuse Specific Activities – Common Reuse Processes – Phases of Development with Reuse – Impact of Reuse on Development Cycle

UNIT V CLEAN ROOM SOFTWARE ENGINEERING

9

Re-engineering for Reuse – Methodology – Retrieving Objects in Non-Object Oriented Code-Measurements – Tools Support for Re-engineering – Overview of Clean Room Software Engineering – Phases in Clean Room Method – Box Structures Algorithms – Adapting the Box Structures

Total: 45

TEXT BOOK

1. Even-Andre Karisson, “Software Reuse A Holistic Approach”, John Wiley and Sons, 1996.

REFERENCE

1. Karma McClure, “Software Reuse Techniques Additional reuse to the Systems development process”, Prentice Hall, 1997.

SE5002 – SOFTWARE AGENTS

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UNIT I AGENTS – OVERVIEW 9

Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents – Agent Frameworks – Agent Reasoning

UNIT II JAVA AGENTS 9

Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets – RPCs – Distributed Computing – Aglets Programming – Jini Architecture – Actors and Agents – Typed and Proactive Messages

UNIT III MULTIAGENT SYSTEMS 9

Interaction between Agents – Reactive Agents – Cognitive Agents – Interaction Protocols – Agent Coordination – Agent negotiation – Agent Cooperation – Agent Organization – Self-Interested Agents in Electronic Commerce Applications

UNIT IV INTELLIGENT SOFTWARE AGENTS 9

Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications

UNIT V AGENTS AND SECURITY 9

Agent Security Issues – Mobile Agents Security – Protecting Agents against Malicious Hosts – Un-trusted Agent – Black Box Security – Authentication for Agents – Security Issues for Aglets

Total: 45

TEXTBOOKS

1. Bigus & Bigus, “Constructing Intelligent agents with Java”, Wiley, 1997.
2. Bradshaw, “Software Agents”, MIT Press, 2000.

REFERENCES

1. Russel & Norvig, “Artificial Intelligence a modern approach”, Prentice Hall, 1994.
2. Richard Murch and Tony Johnson, “Intelligent Software Agents”, Prentice Hall, 2000.
3. Michael Wooldridge, “An Introduction to Multi Agent Systems”, John Wiley, 2002.

SE5003 – DESIGN PATTERNS

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UNIT I FUNDAMENTALS 9

Design Pattern – Design Pattern in Smalltalk MVC – Describing Design Patterns – Organizing Catalog – Solving Problems using Design Patterns

UNIT II 9

Design Problems – Document Structure – Formatting – Embellishing User Interface – Supporting Multiple Look and Feel – Multiple Window Systems – User Operations – Spell Check and Hyphenation

UNIT III CREATIONAL PATTERNS 9

Abstract factory – Builder – Factory Method – Prototype – Singleton

UNIT IV STRUCTURAL PATTERNS 9

Adapter – Bridge – Composite – Decorator – Facade Flyweight – Proxy

UNIT V BEHAVIORAL PATTERNS 9

Chain of Responsibility – Command – Interpreter – Iterators – Mediators – Momento – Observer – State – Strategy – Template Method – Visitor – Case Study

Total: 45

TEXT BOOK

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vissides and Grady Booch, “Design Patterns”, Addison Wesley, 1995.

REFERENCES

1. Craig Larman, “Applying UML and Patterns”, Prentice Hall, 2nd Edition, 2002.
2. Thomas Mowbray and Raphael Malveaux, “CORBA and Design Patterns”, John Wiley, 1997.
3. William J Brown et al., “Anti-Patterns Re factoring Software, Architectures and Projects in Crisis”, .John Wiley, 1998.

SE5004 – PERSONAL SOFTWARE PROCESS & TEAM SOFTWARE PROCESS

L T P
3 0 0

UNIT I FUNDAMENTALS 9

Software Engineering – Time management – Tracking Time – Period and Product Planning – Product Planning – Product Size – Managing Your Time – Managing Commitments – Managing Schedules

UNIT II PLANNING 9

The Project Plan – The Software Development Process – Defects – Finding Defects – The Code Review Checklist – Design Defects – Product Quality – Process Quality

UNIT III TSP STRATEGY 9

Team Software Process Overview – The Logic of the Team Software Process – Launching a Team Project – The Development Strategy – The Development Plan – Defining the Requirement

UNIT IV PRODUCT IMPLEMENTATION 9

Designing with Teams – Product Implementation – Integration & System Testing – The Postmortem

UNIT V TEAM MANAGEMENT 9

The Team Leader Role – Development Manager Role – The Planning Manager Role – The Quality – Process Manager Role – The Support Manager Role

Total: 45

TEXT BOOK

1. Watt S Humphery, “Introduction to Personal Software Process, Addison Wesley, 2000.

SE5005 – SOFTWARE RELIABILITY AND METRICS

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UNIT I FUNDAMENTAL TO SOFTWARE RELIABILITY 8

Basic Concepts – Failure and Faults – Environment – Availability – Modeling – Uses

UNIT II SOFTWARE RELIABILITY MODELING 10

Concepts – General Model Characteristic – Historical Development of Models – Model Classification Scheme – Markovian Models – General Concepts – General Poisson – Type Models – Binomial – Type Models – Poisson – Type Models – Fault Reduction Factor for Poisson – Type Models

UNIT III COMPARISON OF SOFTWARE RELIABILITY MODELS 9

Comparison Criteria – Failure Data – Comparison of Predictive Validity of Model Groups – Recommended Models – Comparison of Time Domains – Calendar Time Modelling – Limiting Resource Concept – Resource Usage model – Resource Utilization – Calendar Time Estimation and Confidence Intervals

UNIT IV MEASUREMENTS THEORY 9

Fundamentals of Measurement – Measurements in Software Engineering – Scope of Software Metrics – Measurements theory – Goal based Framework – Software Measurement Validation

UNIT V PRODUCTS AND MANAGEMENT METRICS 9

Measurement of Internet Product Attributes – Size and Structure – External Product Attributes – Measurement of Quality – Quality Management Models – Rayleigh Model – Problem Tracking Report (PTR) Model – Reliability Growth Model – Model Evaluation – Orthogonal Classification

Total: 45

TEXT BOOKS

1. John D. Musa, Anthony Iannino and Kazuhira Okumoto, “Software Reliability, Measurement, Prediction, Application, Series in Software Engineering and Technology”, McGraw Hill, 1987.
2. Norman E, Fenton and Share Lawrence Pfleeger, “Software metrics”, Second Edition, Thomson, 2002.

REFERENCE

1. John D. Musa, “Software Reliability Engineering”, Tata McGraw Hill, 1999.

UNIT I FUNDAMENTALS 9

Natural Language Processing – Linguistic Background – Spoken Language Input and Output Technologies – Written Language Input – Mathematical Methods – Statistical Modeling and Classification Finite State Methods Grammar for Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation

UNIT II INFORMATION RETRIEVAL 9

Design Features – Evaluation Measures – Vector Space Model – Term Distribution Model – Latent Semantic Indexing – Discourse Segmentation – Search Engine – Features – Performance Measure – NLP Based Information Retrieval – Information Extraction

UNIT III TEXT MINING 9

Clustering – Hierarchical Clustering – Non Hierarchical Clustering – Text Categorization Decision Tree – Maximum Entropy Model – Perception – K-Nearest Neighbor Classification – Use of Categories and Clusters for Organizing Retrieval Result

UNIT IV GENERIC ISSUES 9

Multilinguality – Multilingual Information Retrieval and Speech Processing – Multimodality – Text and Images – Modality Integration – Transmission and Storage – Speech Coding– Evaluation of Systems – Human Factors and User Acceptability

UNIT V APPLICATIONS 9

Machine Translation – Transfer Metaphor – Interlingua and Statistical Approaches – Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning

Total: 45

TEXT BOOKS

1. Daniel Jurafsky and James H. martin, “Speech and Language Processing”, 2000.
2. Christopher D.Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.

REFERENCES

1. James Allen, “Natural Language Understanding”, Benjamin/ Cummings Publishing Co. 1995.
2. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
3. Tomek Strzalkowski, “Natural Language Information Retrieval “, Kluwer Academic Publishers, 1999.
4. Ron Cole, J.Mariani, et. al, “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.
5. Michael W. Berry, “ Survey of Text Mining Culstering, Classification and Retrieval”, Springer Verlag, 2003.

CS5003 – MOBILE COMPUTING

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UNIT I FUNDAMENTALS 9

Medium Access Control Motivation for Specialized MAC– SDMA – FDMA– TDMA – CDMA – Comparison of Access mechanisms – Tele communications GSM – DECT – TETRA – UMTS – IMT– 200 – Satellite Systems – Basics– Routing – Localization – Handover – Broadcast Systems – Overview – Cyclic Repetition of Data – Digital Audio Broadcasting – Digital Video Broadcasting

UNIT II WIRELESS NETWORKS 9

Wireless LAN Infrared Vs Radio Transmission – Infrastructure Networks – Ad hoc Networks – IEEE 802.11 – HIPERLAN – Bluetooth – Wireless ATM Working Group – Services – Reference Model – Functions – Radio Access Layer – Handover – Location Management – Addressing Mobile Quality of Service – Access Point Control Protocol

UNIT III MOBILE NETWORK LAYER 9

Mobile IP – Goals – Assumptions and Requirement – Entities – IP Packet Delivery – Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization – Reverse Tunneling – IPv6 – DHCP– Ad hoc Networks

UNIT IV MOBILE TRANSPORT LAYER 9

Traditional TCP– Indirect TCP – Snooping TCP– Mobile TCP – Fast Retransmit/ Fast Recovery – Transmission / Timeout Freezing – Selective Retransmission – Transaction Oriented TCP

UNIT V WAP 9

Architecture – Datagram Protocol – Transport Layer Security – Transaction Protocol – Session Protocol – Application Environment – Wireless Telephony Application

Total: 45

TEXT BOOK

1. J.Schiller, “Mobile Communication”, Addison Wesley, 2000.

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1. William Stallings, “Wireless Communication and Networks”, Pearson Education, 2003.
2. Singhal, “WAP–Wireless Application Protocol”, Pearson Education, 2003.
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4. William C.Y.Lee, “Mobile Communication Design Fundamentals”, John Wiley, 1993.

CS5006 – XML AND WEB SERVICES

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UNIT I FUNDAMENTALS 9

Role of XML – XML and The Web – XML Language Basics – SOAP – Web Services – Revolutions of XML – Service Oriented Architecture (SOA)

UNIT II XML TECHNOLOGY 9

XML – Name Spaces – Structuring with Schemas and DTD – Presentation Techniques – Transformation – XML Infrastructure

UNIT III SOAP 9

Overview of SOAP – HTTP – XML–RPC – SOAP Protocol – Message Structure – Intermediaries – Actors – Design Patterns and Faults – SOAP with Attachments

UNIT IV WEB SERVICES 9

Overview – Architecture – Key Technologies – UDDI – WSDL – ebXML – SOAP and Web Services in E-Com – Overview of .NET and J2EE

UNIT V XML SECURITY 9

Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines for Signing XML Documents – XML in Practice

Total: 45

TEXT BOOK

1. Frank. P. Coyle, XML, “Web Services and The Data Revolution”, Pearson Education, 2002.

REFERENCES

1. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, “Developing Java Web Services”, Wiley Publishing Inc., 2004.
2. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services”, Pearson Education, 2004.
3. McGovern, et. al., “Java Web Services Architecture”, Morgan Kaufmann Publishers, 2005.

CS5007 – BIO INFORMATICS

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UNIT I FUNDAMENTALS 9

The Central Dogma – Killer Application – Parallel Universes – Watson’s Definition – Top Down Vs Bottom Up Approach – Information Flow – Conversance – Communications

UNIT II DATABASE AND NETWORKS 9

Definition – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks Communication Models – Transmission Technology – Protocols – Bandwidth – Topology – Contents – Security – Ownership – Implementation

UNIT III SEARCH ENGINES AND DATA VISUALIZATION 9

Search Process – Technologies – Searching and Information Theory – Computational Methods – Knowledge Management – Sequence Visualizations – Structure Visualizations – User Interfaces – Animation Vs Simulation

UNIT IV STATISTICS– DATA MINING AND PATTERN MATCHING 9

Statistical Concepts – Micro Arrays – Imperfect Data – Basics – Quantifying – Randomness – Data Analysis – Tools Selection – Alignment – Clustering – Classification – Data Mining Methods – Technology – Infrastructure Pattern Recognition – Discovery – Machine Learning – Text Mining – Pattern Matching Fundamentals – Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools

UNIT V MODELING SIMULATION AND COLLABORATION 9

Drug Discovery Fundamentals – Protein Structure – System Biology Tools – Collaboration and Communication – Standards – Issues – Case Study

Total: 45

TEXT BOOK

1. Bryan Bergeron, “Bio Informatics Computing” , Prentice Hall, 2003.

REFERENCES

1. T.K. Affward, D.J. Parry Smith, “Introduction to Bio Informatics”, Pearson Education, 2001.
2. Pierre Baldi and Soren Brunak, “Bio Informatics, The Machine Learning Approach”, 2nd Edition, First East West Press, 2003.

UNIT I FUNDAMENTAL TO EMBEDDED SYSTEMS 9

Definition and Classification – Overview of Processors and Hardware Units in an Embedded System – Software Embedded into the System – Exemplary Embedded Systems – Embedded Systems on a Chip (Soc) and the use of VLSI Designed Circuits

UNIT II DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O Devices – Device I/O Types and Examples – Synchronous – ISO-Synchronous and Asynchronous Communications from Serial Devices – Examples of Internal Serial-Communication Devices – UART and HDLC – Parallel Port Devices – Sophisticated Interfacing Features in Devices/Ports – Timer and Counting Devices – ‘12C’– ‘USB’– ‘CAN’ and Advanced I/O Serial High Speed Buses – ISA– PCI– PCI-X– CPCI and Advanced Buses

UNIT II EMBEDDED PROGRAMMING 9

Programming in Assembly Language (ALP) vs. High Level Language – C Program Elements – Macros and Functions – Use of Pointers – NULL Pointers – Use of Function Calls – Multiple Function Calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of EMBEDDED PROGRAMMING in C++ – Objected Oriented Programming – Embedded Programming in C++ – ‘C’ Program Compilers – Cross Compiler – Optimization of Memory Codes

UNIT IV REAL TIME OPERATING SYSTEMS – PART – 1 9

OS Services – Interrupt Routines Handling – Task Scheduling Models – Handling of Task Scheduling and Latency and Deadlines as Performance Metrics – Inter Process Communication and Synchronization – Shared Data Problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or Mutex as Resource Key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – RPCs

UNIT V REAL TIME OPERATING SYSTEMS – PART – 2 9

Study of RTOS– VxWorks – Basic Features – Task Management Library at the System – Library Header File – VxWorks System Functions and System Tasks – Inter Process (Task) Communication Functions – Case Study of Coding for Sending Application Layer Byte Streams on a TCP/IP Network using RTOS Vxworks

Total: 45**TEXT BOOK**

1. Rajkamal, “Embedded Systems Architecture, Programming and Design”, TATA McGraw Hill, First reprint, 2003.

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1. David E.Simon, “An Embedded Software Primer”, Pearson Education Asia, First Indian Reprint, 2000.

CS5012 – SOFTWARE QUALITY ASSURANCE

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UNIT I CONCEPTS 9

Concepts of Quality Control – Quality Assurance – Quality Management – Total Quality Management – Cost of Quality – QC tools – 7 QC Tools and Modern Tools Other related topics – Business Process Re-Engineering – Zero Defect – Six Sigma – Quality Function Deployment – Benchmarking – Statistical Process Control

UNIT II SOFTWARE ENGINEERING CONCEPTS 9

Software Engineering Principles – Software Project Management – Software Process – Project and Product Metrics – Risk Management – Software Quality Assurance Statistical Quality Assurance – Software Reliability – Muse Model Software Configuration Management – Software Testing – CASE (Computer Aided Software Engineering)

UNIT III QUALITY ASSURANCE MODELS 9

Models for Quality Assurance – ISO-9000 – Series – CMM – SPICE – Malcolm Baldrige Award

UNIT IV SOFTWARE QUALITY ASSURANCE RELATED TOPICS 9

Software Process – Definition and Implementation Internal Auditing and Assessments Software Testing – Concepts – Tools – Reviews – Inspections & Walkthroughs P-CMM

UNIT V FUTURE TRENDS 9

PSP and TSP – CMMI – OO Methodology – Clean-Room Software Engineering – Defect Injection and Prevention

Total: 45

TEXT BOOKS

1. Watts Humphery, “Managing Software Process”, Addison Wesley, 1998.
2. Roger Pressman, “Software Engineering”, McGraw Hill, 1992.

REFERENCES

1. Philip B Crosby, “Quality is Free The Art of Making Quality Certain”, Mass Market, 1992.
2. James A Senn, “Software Analysis and Design”, McGraw Hill, 1989.

UNIT I FUNDAMENTALS 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – IEEE 802.11a–b Standard – Origin Of Ad hoc Packet Radio Networks – Technical Challenges – Architecture of PRNETs – Components of Packet Radios – Ad hoc Wireless Networks –What Is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks–Ad hoc wireless Internet

UNIT II AD HOC ROUTING PROTOCOLS 9

Issues in Designing a Routing Protocol for Ad hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On-Demand Approaches – Ad hoc On-Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) – Location – Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP)

UNIT III MULTICASTROUTING IN AD HOC NETWORKS 9

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 Protocols – Energy – Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols

UNIT IV TRANSPORT LAYER- SECURITY PROTOCOLS 9

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 – Other Transport Layer Protocols for Ad hoc Wireless Networks – Security in Ad hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Key Management – Secure Routing in Ad hoc Wireless Networks

UNIT V QOS AND ENERGY MANAGEMENT 9

Issues and Challenges in Providing QOS in Ad hoc Wireless Networks –Classifications of QOS Solutions – MAC Layer Solutions – Network Layer Solutions – QOS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad hoc Wireless Networks – Introduction – Need for Energy Management in Ad hoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes – System Power Management Schemes

Total: 45

TEXT BOOK

1. C. Siva Ram Murthy and B.S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall PTR, 2004.

REFERENCES

1. C.K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall PTR, 2001.
2. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000.

CS5014 – DATA WAREHOUSING AND DATA MINING

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UNIT I FUNDAMENTALS 9

Relation to Statistics – Databases – Data Mining Functionalities – Steps in Data Mining Process – Architecture of a Typical Data Mining Systems – Classification of Data Mining Systems – Overview of Data Mining Techniques

UNIT II DATA PREPROCESSING AND ASSOCIATION RULES 9

Data Preprocessing – Data Cleaning– Integration– Transformation – Reduction– Discretization Concept Hierarchies – Concept Description Data Generalization and Summarization based Characterization– Mining Association Rules in Large Databases.

UNIT III PREDICTIVE MODELING 9

Classification and Prediction Issues Regarding Classification and Prediction–Classification by Decision Tree Induction – Bayesian Classification – Other Classification Methods – Prediction – Clusters Analysis Types of Data in Cluster Analysis – Categorization of Major Clustering Methods Partitioning Methods – Hierarchical Methods

UNIT IV DATA WAREHOUSING 9

Data Warehousing Components – Multi Dimensional Data Model – Data Warehouse Architecture – Data Warehouse Implementation – Mapping the Data Warehouse to Multiprocessor Architecture – OLAP – Need – Categorization of OLAP Tools

UNIT V APPLICATIONS 9

Applications of Data Mining – Social Impacts of Data Mining – Tools – An Introduction to DB Miner – Case Studies – Mining WWW – Mining Text Database – Mining Spatial Databases

Total: 45

TEXT BOOK

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann Publishers, 2002.

REFERENCES

1. Alex Berson and Stephen J. Smith, “Data Warehousing- Data Mining & OLAP”, Tata Mcgraw Hill, 2004.
2. Usama M.Fayyad, Gregory Piatetsky, Shapiro, Padhraí Smyth and Ramasamy Uthurusamy, “Advances in Knowledge Discovery and Data Mining”, The M.I.T Press, 1996.
3. Ralph Kimball, “The Data Warehouse Life Cycle Toolkit”, John Wiley & Sons Inc., 1998.
4. Sean Kelly, “Data Warehousing In Action”, John Wiley & Sons Inc., 1997.

CS5018 – ADVANCED DATABASES

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UNIT I DATABASE MANAGEMENT 9

Relational Data Model – SQL – Database Design – Entity–Relationship Model – Relational Normalization – Embedded SQL – Dynamic SQL – JDBC – ODBC

UNIT II ADVANCED DATABASES 10

Object Databases – Conceptual Object Data Model – XML and Web Data – XML Schema – Distributed Databases – OLAP and Data Mining – ROLAP and MOLAP

UNIT III QUERY AND TRANSACTION PROCESSING 8

Query Processing Basics – Heuristic Optimization – Cost Size Estimation – Models of Transactions – Architecture – Transaction Processing in a Centralized and Distributed System – TP Monitor

UNIT IV IMPLEMENTING AND ISOLATION 9

Schedules – Concurrency Control – Objects and Semantic Commutativity – Locking – Crash– Abort and Media Failure – Recovery – Atomic Termination – Distributed Deadlock – Global Serialization – Replicated Databases – Distributed Transactions in Real World

UNIT V DATABASE DESIGN ISSUES 9

Security – Encryption – Digital Signatures – Authorization – Authenticated RPC – Integrity – Consistency – Database Tuning – Optimization and Research Issues

Total: 45

TEXT BOOK

1. Philip M. Lewis, Arthur Bernstein and Michael Kifer, “Databases and Transaction Processing An Application-Oriented Approach”, Addison-Wesley, 2002.

REFERENCES

1. R. Elmasri and S.B. Navathe, “Fundamentals of Database Systems”, 3rd Edition, Addison Wesley, 2004.
2. Abraham Silberschatz, Henry. F. Korth and S.Sudharsan, “Database System Concepts”, 4th Edition, Tata McGraw Hill, 2004.
3. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, 3rd Edition, TMH, 2003.

CS5020 – COMPONENT BASED TECHNOLOGY

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UNIT I FUNDAMENTALS 9

Software Components – Objects – Fundamental Properties of Component Technology – Modules – Interfaces – Callbacks – Directory Services – Component Architecture – Components and Middleware

UNIT II JAVA COMPONENT TECHNOLOGIES 9

Threads – Java Beans – Events and Connections – Properties – Introspection – JAR files – Reflection – Object Serialization – Enterprise Java Beans – Distributed Object Models – RMI and RMI-IIOP

UNIT III CORBA TECHNOLOGIES 9

Java and CORBA – Interface Definition Language – Object Request Broker – System Object Model – Portable Object Adapter – CORBA Services – CORBA Component Model – Containers – Application Server – Model Driven Architecture.

UNIT IV COM AND .NET TECHNOLOGIES 9

COM – Distributed COM – Object Reuse – Interfaces and Versioning – Dispatch Interfaces – Connectable Objects – OLE Containers and Servers – Active X Controls – .NET Components – Assemblies – App-Domains – Contexts – Reflection – Remoting

UNIT V COMPONENT FRAMEWORKS AND DEVELOPMENT 9

Connectors – Contexts – EJB Containers – CLR Contexts and Channels – Black Box Component Framework – Directory Objects – Cross-Development Environment – Component – Oriented programming – Component Design and Implementation Tools – Testing Tools – Assembly Tools.

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1. Clemens Szyperski, “Component Software Beyond Object-Oriented Programming”, Addison Wesley, 2nd Edition 2002.
2. Ed Roman, “Enterprise Java Beans”, 3rd Edition, Wiley, 2004.
3. Andreas Vogel and Keith Duddy, “Java Programming with CORBA”, John Wiley & Sons 1998.
4. Corry, Mayfield and Cadman, “COM/DCOM Primer Plus”, Techmedia, First Edition, 1999.