

**Solapur University, Solapur**

**M.Sc. (Computer Science)**  
**Part - II**

**Syllabus (Semester – III and IV)**  
**(effective from June 2012)**

**M.Sc. (Computer Science) Part – II**  
**M.Sc. (Computer Science) Part – II Semester-III**

Paper Code	Paper No.	Title of the Paper	Contact hours/week	Distribution of Marks for Examination			Credits
				Internal	University	Total	
CS-301	IX	Java Programming	04	30	70	100	04
CS-302	X	Artificial Intelligence	04	30	70	100	04
CS-303	XI	Mobile Computing	04	30	70	100	04
CS-304	XII	Modeling and Simulation	04	30	70	100	04
CS-305		Project – III	02	30	70	100	04
CS-306		Practical - III	12	30	70	100	04
		Seminar	02	25	--	25	01
<b>Total</b>			<b>32</b>	<b>205</b>	<b>420</b>	<b>625</b>	<b>25</b>

**M.Sc. (Computer Science) Part–II Semester-IV**

Paper Code	Paper No.	Title of the Paper	Contact hours/w eek	Distribution of Marks for Examination			Credits
				Internal	University	Total	
CS-401	XIII	Distributed Operating System	04	30	70	100	04
CS-402	XIV	Data Mining and Warehouse	04	30	70	100	04
CS-403	XV	Digital Image processing	04	30	70	100	04
CS-404	<b>XVI</b>	.NET	04	30	70	100	04
CS-405		Project – IV	02	30	70	100	04
CS-406		Practical - IV	12	30	70	100	04
		Seminar	02	25	--	25	01
<b>Total</b>			<b>32</b>	<b>205</b>	<b>420</b>	<b>625</b>	<b>25</b>

**CS-301**  
**Paper No: IX**  
**Java Programming**

**Unit 1. Introduction to Java:** Importance and features of java, keywords, constants, variables and data types, Operators and expressions, Decision making, branching and looping: if..else, switch, ?: operator, while, do, for statements, labeled loops, jump statements: break, continue, return. (6 L)

**Unit 2. Introducing classes, objects and methods:** defining a class, adding variables and methods, creating objects, constructors, class inheritance. (4 L)

**Unit 3. Arrays and strings:** creating an array, one and two dimensional arrays, string array and methods, String and StringBuffer classes, Wrapper classes. (4 L)

**Unit 4. Inheritance:** Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages. (6L)

**Unit 5. Exception Handling:** Fundamentals exception types, uncaught exceptions, throw, throws, finally, built in exception, creating your own exceptions. (4 L)

**Unit 6. Multithreaded Programming:** Fundamentals, Java thread model: priorities, synchronization, messaging, thread class, Runnable interface, interthread Communication, suspending, resuming and stopping threads. (6 L)

**Unit 7. Input/Output:** Basics, Streams, Byte and Character stream, predefined streams, Reading and writing from console and files. Using Standard Java Packages (lang, util, io, net). (4 L)

**Unit 8. Event Handling:** Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, graphics and text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet. (6 L)

**Unit 9. JDBC:** JDBC API, JDBC Drivers, Products, JDBC Design considerations, Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements (4 L)

**References:**

1. “Java-2 the complete Reference” by Patrick Naughton and Herbertz Schidt.
2. “Programming with Java” by E Balaguruswamy.
3. Horstmann, “Computing Concepts with Java 2 Essentials”, John Wiley.
4. Decker & Hirshfield, “Programming.Java”, Vikas Publication.

**CS- 302**  
**Paper No: X**  
**Artificial Intelligence**

**Unit 1. What is Artificial Intelligence**

The AI Problems, The Underlying Assumption, What is an AI Technique? (2 L)

**Unit 2. Problems, Problem Spaces and Search**

Defining the problem, as a state space search, production systems, problem characteristics, production system characteristics, Issues in the design of search programs.

(2 L)

**Unit 3. Heuristic Search Techniques**

Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction Means-Ends Analysis. (4 L)

**Unit 4. Knowledge Representation Issues**

Approaches to Knowledge representation, Issues in Knowledge representation. (4 L)

**Unit 5. Using Predicate Logic**

Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural deduction. (4 L)

**Unit 6. Representing Knowledge Using Rules**

Procedural Versus Declarative Knowledge, Forward Versus Backward Reasoning, Matching. (4 L)

**Unit 7. Statistical Reasoning**

Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. (4 L)

**Unit 8. Weak Slot-and Filler Structures**

Semantic Nets, Frames. (4 L)

**Unit 9. Strong Slot-and-Filler Structures**

Conceptual Dependency, Scripts. (4 L)

**Unit 10. Game Playing**

Overview, The Minmax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening. (4 L)

**Unit 11. Natural Language Processing**

Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing. (4 L)

**Unit 12. Expert Systems**

Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition. (4 L)

**Reference Books:**

1. Artificial Intelligence by Elaine Rich, Kevin Knight, TMH, 2<sup>nd</sup> Edition.
2. Artificial Intelligence: Structures and Strategies for Complex Problem solving by George F Luger, 4<sup>th</sup> Edition, Pearson Education, Asia.
3. Introduction to Artificial Intelligence and Expert Systems by D W Patterson, PHI, 2<sup>nd</sup> Edition.

**CS- 303**  
**Paper No: XI**  
**Mobile Computing**

**Unit 1. WIRELESS TRANSMISSION:** Frequencies for radio transmission, Regulations. Signals, Antennas, Signal propagation-Path loss of radio signals, Additional signal propagation effects, Multipath propagation. Multiplexing-Space, Frequency, Time, Code division multiplexing. Modulation- Amplitude, Frequency, Phase Shift Keying, Advanced frequency and phase shift keying, Spread spectrum- DSSS, FHSS. Cellular System (6L)

**Unit 2 . MEDIUM ACCESS CONTROL:** CSMA/CD , Hidden and exposed terminals, Near and Far terminals, SDMA, FDMA, TDMA- Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA, Reservation TDMA,MACA , Polling, CDMA. (8L)

**Unit 3. TELECOMMUNICATION SYSTEM:**GSM – Mobile services, Architecture of a GSM System, Protocol Architecture, Radio Interface, Localization and calling, MTC, MOC, Handover, Security- Authentication, Encryption. (8L)

**Unit 4. WIRELESS LAN:** Introduction, Infrared vs radio transmissions, architecture of an infrastructure based IEEE 802.11 and Ad-hoc networks, Protocol architecture, Physical Layer, Medium access control layer, Format of an IEEE 802.11 frame using DSS. MAC management-synchronization, power management, Roaming. Bluetooth Architecture, simple Bluetooth piconet. (8L)

**Unit 5. MOBILE NETWORK LAYER:** Entities & terminology in Mobile IP, IP packet delivery agent discovery, Registration, IP in IP encapsulation, minimal encapsulation. Dynamic Host Configuration Protocol (DHCP). (8L)

**Unit 6. MOBILE TRANSPORT LAYER:** Traditional TCP- Congestion control, Slow start, Fast retransmit/Fast recovery, implications on mobility. Classical TCP- Indirect TCP, Snooping TCP, Mobile TCP, Transmission/time out freezing, selective retransmission, Transaction oriented TCP. (6L)

**Reference Books:**

- 1.Mobile communication (2 nd Edition) – John Schiller(Pearson Edition)
- 2.Wireless LAN: Peter T Davis, Craig R Mc Guffin (MGH International).

**Paper No: XII**  
**MODELING AND SIMULATION**

Unit 1. Stochastic Models: Introduction, Discrete distributions (Bernoulli, Binomial, Poisson, Geometric, Hypergeometric, Uniform), Continuous distributions (Uniform, Exponential, Gamma, Normal), Poisson Process, Markov chains and applications.

(6L)

Unit 2. Inventory Models: Introduction, Types of Inventories, Reasons for carrying inventory, Objectives of scientific Inventory Control, Concept of EOQ (Deterministic Model).

(6L)

Unit 3. Queuing Models: Introduction, Queuing System, Elements of queuing system, birth and death process model, Queuing Models M/ M/1, M/M/C. (6L)

Unit 4. Network Analysis: Applications of PERT and CPM techniques, Network diagram representation, Rules for constructing the network diagram, Determination of critical path.

(6L)

Unit 5. Simulation: Introduction, Uses of simulation, Steps in simulation study, Advantages and disadvantages of simulation, Simulation models: continuous and discrete simulations.

(4L)

Unit 6. Random Number Generation: Introduction, Types of random numbers, Pseudo random number generator, Tests for random numbers, Techniques for generating random numbers, Inverse transformation technique, Generating random variates from Uniform, Bernoulli, Binomial, Exponential and Normal distributions.

(8L)

Unit 7. Simulation Models: (Flow chart and/or algorithms): Monte-Carlo simulation, Simulation of inventory problem, Simulation of queuing system, Fixed time step versus event to event model, Simulation of PERT problems.

(8L)

**References:**

- 1) Allen Arnoldo (1978). Probability, Statistics and Queuing with Computer Science Applications, Academic Press.
- 2) Kishore Trivedi. (1982). Probability and Statistics with Reliability, Queuing with computer science Applications, Prentice Hall.
- 3) Geoffrey Gordon (1999). System Simulation, PHI, Second ed.
- 4) Narsingh Deo (1979). System Simulation with Digital Computer, PHI.
- 5) Fred Maryanski (1987). Digital Computer, Simulation, CBSPD.
- 6) Jerry Banks, John Carson, B. L. Nelson (1998). Discrete-Event Simulation. PHI, 2<sup>nd</sup> ed.
- 7) Taylor and Karlin, Stochastic Modeling, Academic Press.
- 8) Sharma J. K. (2003): Operations Research Theory and Applications, 2<sup>nd</sup> Ed. Macmillan
- 9) Sharma S.D. Operations Research.
- 10) J. Mehdi,(1982), Stochastic Process, Wiley

### **CS-305: Project - III**

Project work.

### **CS-306: Practical - III**

The practical course will contain 30 practical assignments covering syllabi of paper no. CS-301, CS-302, CS-303, CS-304.

CS-401  
Paper No: XIII  
Distributed Operating Systems

**Unit 1. Overview of Operating System:** Operating System - concept, need and requirements of operating system, Processor, Memory, Device and File management, Virtual memory, Pipes, Deadlocks and Protection issues, Comparative study of Various types of operating systems.  
(6L)

**Unit 2. Introduction to Distributed system:** Different models of distributed computing e.g. workstation model, workstation-server model, processor pool model, hybrid model, basic concept of distributed operating system.  
(8L)

**Unit 3. Communication in distributed system:** Layered protocols, client server model, remote procedure call, group communication, Comparison of Client Server Vs. Distributed operating system.  
(6L)

**Unit 4. Synchronization in distributed system:** Clock synchronization, mutual exclusion, election algorithms, automatic transaction, deadlocks in distributed systems.  
(6L)

**Unit 5. Processes and processors in distributed systems:** Threads, System models, processor allocation, Scheduling in distributed systems.  
(6L)

**Unit 6. Distributed file system:** Distributed file system, Design and Implementation trends in distributed file system.  
(6L)

**Unit 7. Case study:** Detail and comparative study of MS-windows NT and Novel Netware, Windows programming concepts.  
(6L)

**References:**

1. P. K. Sinha – Distributed Operating System-Concepts and Design.
2. A.S. Tanenbaum - "Modern Operating Systems" ( HI).
3. Donovan Madnick, Operating System.
4. Peterson, Operating System.
5. Hansen Per Brinch, Operating systems principles.
6. Cowart, Windows NT 4 - Server and Workstation unleashed(Techmedia).
7. Helen Custer - "Inside Windows NT" (Microsoft ress).
8. Jeffery Richter - "Advanced Windows NT: The Developer's Guide to the WIN32 application Interface.
9. Peter Norton's maximi ing Windows NT server 4 (Techmedia).
10. Peter Norton's complete guide to Windows NT workstation (Techmedia).
11. Charles et old - Programming windows 3.1 (Microsoft ress).
12. Novel Netware Manuals.

CS-402  
Paper No: XIV  
Data Mining and Warehouse

**Unit 1. INTRODUCTION**

What is Data Warehouse? A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data cube Technology, From Data Warehousing to Data Mining, Data Mining Functionalities, Data Cleaning, Data Integration and Transformation, Data Reduction.

(6L)

**Unit 2. DATA MINING PRIMITIVES, LANGUAGES, AND SYSTEM ARCHTECTURES**

Data Mining Primitives, Presentation and Visualization of discovered patterns, A Data Mining Query Language.

(6L)

**Unit 3. MINING ASSOCIATION RULES IN LARGE DATA BASES TRANSLATION**

Association Rule Mining Single-Dimensional Boolean, Association Rules from Transactional Databases, Mining Multilevel Association Rules From Transactional Databases.

(8L)

**Unit 4. CLASSIFICATION AND PREDICATION**

Issues regarding Classification and Predication, Classification by Decision tree induction, Bayesian Classification, Classification by Back propagation, Classification Based on the concepts from association rule mining, Other classification methods, Prediction.

(8L)

**Unit 5. Clustering**

What is Cluster Analysis? Types of data in Cluster Analysis, A Categorization of Major Clustering Methods. Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering Methods: Statistical Approach, Neural Network Approach, Outlier Analysis.

(8L)

**Unit 6. APPLICATIONS AND TRENDS IN DATA MINING**

Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining, Data Mining and Intelligent Query Answering, Trends in Data Mining.

(8L)

**REFERENCES:**

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Morgan Kauf Mann Publishers.
2. George M. Marakas, “Modern Data Warehousing, Mining and Visualization”, Pearson Education, 2003.
3. W.H.Inmon, “Building the Data Warehouse”, Wiley Dreamtech, Third Edition.

**CS- 403**  
**Paper No: XV**  
**Digital Image Processing**

- Unit 1. **Introduction** Digital image processing, Applications of digital image processing, Fundamental steps in digital image processing, Components of an image processing system. (4L)
- Unit 2. **Digital image fundamentals** Image sampling and quantization, Some basic relationships between pixels, Linear and nonlinear operation (4L)
- Unit 3. **Image enhancement in the spatial domain**  
Some basic gray level transformations  
Histogram processing, Enhancement using arithmetic/logic operations  
Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters (4L)
- Unit 4. **Image enhancement in the frequency domain**  
Introduction to the Fourier transform and the frequency domain  
Smoothing frequency-domain filters, Sharpening frequency domain filters  
homomorphic filtering (6L)
- Unit 5. **Image restoration**  
A model of the image degradation/restoration process  
Noise models, Restoration in the presence of noise only-spatial filtering  
Periodic noise reduction by frequency domain filtering (6L)
- Unit 6. **Morphological image processing**  
Preliminaries, Dilation and erosion, Opening and closing,  
The hit-or-miss transformation, Some basic morphological algorithms (6L)
- Unit 7. **Image segmentation**  
Detection of discontinuities, Edge linking and boundary detection  
Thresholding, Region-based segmentation,  
Segmentation by morphological watersheds (6L)
- Unit 8. **Representation and description**  
Representation, Boundary descriptors, Regional descriptors,  
Use of principal components for description, Relational descriptors (4L)
- Unit 9. **Object recognition**  
Patterns and pattern classes, Recognition based on decision- theoretic methods  
Structural methods (4L)

**References:**

1. Digital image processing by Gonzalez and Woods PHI
2. Image Processing, Analysis and Machine Vision: Milan Sonka, Vaclav Hlavac, Roger Boyle (Thomson Brooks / Cole Edition).
3. Fundamentals of Digital Image Processing: Anil K. Jain (Prentice Edition Hall of India)

**CS-404**  
**Paper No: XVI**  
**.NET**

**Unit 1. Microsoft .NET framework:** Structure, the common language runtime, JIT, CTS, Metadata. (4L)

**Unit 2. C#:** Introduction to C#, Programming structure of C#, editing, compiling & executing C# programs, namespace, comments, using aliases for namespace classes, using command line argument, math functions, scope of variables, boxing & unboxing, file operations, indexes, delegates, events, preprocessor, attributes, creating winform applications, COM interoperability, using COM / COM+, reflection, components in C#, Handling databases using ADO.net. (8L)

**Unit 3. Introduction to ASP.Net** (6L)

- Introduction, difference between ASP & ASP.Net Application, Web Architecture Model, Introduction to Visual Studio for Web Application.

**Application and Page Frameworks** (6L)

- Application Location Options, The ASP.NET Page Life Cycle, The ASP.NET Page Structure Options, ASP.NET Page Directives, ASP.NET Page Events, Dealing with PostBacks, ASP.NET Application Folders, Global.asax

**ASP.NET Server Controls and Validation Controls** (6L)

- ASP.Net Server Controls, Understanding Validation, Client-Side versus Server-Side Validation, Turning Off Client-Side Validation.

**Working with Master Pages** (8L)

- Need and basics of Master Pages, Master Page and Content Page, Programmatically Assigning the Master Page, Nesting Master Pages, Master Page Events.

**ASP.Net State Management** (6L)

Application State, Session State, Client & server storing, View state, Cache, Hidden Variable, Session object, Profiles, Overview of HTTP Handler & Modules.

**References:**

1. Microsoft Visual C# .NET Step-By-Step, Version 2003 by; Sharp, Jagger, Publisher: Microsoft Press (Published: 3/2003)
2. Programming in C# by E. Balagurusamy TMH
3. C# a beginner™s guide by Herbert Schildt TMH
4. Professional ASP.NET 2.0 – Wrox Publication by Bill Evjen, Scott Hanselman, Farhan Muhammed, Srinivasa Sivakumar, Devin Rader.
5. Microsoft ASP.NET 2.0 Step by Step - Microsoft Press By George Shepherd.

**CS-405: Project - IV**

Project work.

**CS-406: Practical - IV**

The practical course will contain 30 practical assignments covering syllabi of paper no. CS-401, CS-402, CS-403, CS-404.

Chairman  
Ad hoc BOS in Computer Science