

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED.**

**Draft Syllabus of M.Sc.(CS)**

**M.Sc.(CS) FIRST YEAR**

CODE No.	SUBJECT TITLE	TEACHING PERIODS / WEEK		MAXIMUM MARKS		TOTAL MARKS (A+B)	DURATION OF EXAM Hours
		Theory	Practical	Theory / Practical (A)	Internal Test Marks (B)		
<b>SEMESTER 1 :</b>							
M.Sc.(CS).S1.1	Computer Architecture & Microprocessor	4	---	100	0	100	3
M.Sc.(CS).S1.2	Programming in C++	4	---	100	0	100	3
M.Sc.(CS).S1.3	Design Analysis of Algorithm	4	---	100	0	100	3
M.Sc.(CS).S1.4	Distributed Database Concepts	4	---	100	0	100	3
M.Sc.(CS).S1.PR1	Computer laboratory 1 (Programming in C++)	---	3	100	---	100	3
M.Sc.(CS).S1.PR2	Computer laboratory 2 (Advanced Computer Architecture)	---	3	100	---	100	3
<b>TOTAL MARKS</b>						<b>600</b>	
<b>SEMESTER 2 :</b>							
M.Sc.(CS).S2.1	Advanced Networking Concepts	4	---	100	0	100	3
M.Sc.(CS).S2.2	Mobile Computing	4	---	100	0	100	3
M.Sc.(CS).S2.3	C#.net	4	---	100	0	100	3
M.Sc.(CS).S2.4	Compiler Designing	4	---	100	0	100	3
M.Sc.(CS).S2.PR3	Computer Laboratory 3 (Advanced Networking Concepts)	---	3	100	---	100	3
M.Sc.(CS).S2.PR4	Computer Laboratory 4 (C#.net)	---	3	100	---	100	3
<b>TOTAL MARKS</b>						<b>600</b>	
<b>TOTAL MARKS (SEMESTER 1 + SEMESTER 2)</b>						<b>1200</b>	

**M.Sc.(C.S.).S1.1**  
**Computer Architecture and Microprocessors**

Theory : - 100 Marks

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- 1. Design Methodology:** (6)
- 1.1 Introduction to system modeling design levels of combinational and Sequential circuit design
  - 1.2 Register level design, Register transfer languages
  - 1.3 Design methods at processor level-components
  - 1.4 Design techniques
  - 1.5 Queuing
  - 1.6 models
  - 1.7 Simulation.
- 2. Processors Design:** (5)
- 2.1 Processor organization
  - 2.2 Information representation
  - 2.3 Instruction sets
  - 2.4 Instruction formats Instruction types and implementation.
  - 2.5 RISC, CICS, and Vector processor concepts.
- 3. Arithmetic Operation:** (5)
- 3.1 Fixed point arithmetic
  - 3.2 Algorithms for addition, subtraction, multiplication & division
  - 3.3 Floating point arithmetic.
- 4. Control Units:** (6)
- 4.1 Hardwired control units- organization and operation
  - 4.2 Micro programmed control units
  - 4.3 microgram decoder sequencer
  - 4.4 Interrupt and branch instruction processing
  - 4.5 Instruction sequencing interpretation.
- 5. Memory Organization:** (6)
- 5.1 Virtual memory  
Memory hierarchies, main memory allocation segmentation, paging paged segmentation,
  - 5.2 high speed memories  
Interleaved memories, associative memories.
- 6. 8085 Microprocessor Introduction:** (5)
- 6.1 Introduction to Microprocessor
  - 6.2 Features of 8085
  - 6.3 8085-CPU architecture
  - 6.4 De-Multiplexing of address and data bus
  - 6.5 8085 clock circuit
  - 6.6 Instruction fetching and execution operation of microprocessor.

**7. 8085 Instruction Set:**

**(8)**

- 7.1 Instruction formats
- 7.2 Addressing modes
- 7.3 Op-code formats
- 7.4 Classification of Instruction set
- 7.5 Programming technique
- 7.6 Instruction timings
- 7.7 WAIT state
- 7.8 single step and single cycle execution.

**8. 8086 Architecture and Instruction Set:**

**(8)**

- 8.1 8086 CPU Architecture.
- 8.2 EU & BIU activities,
- 8.3 Segmentation and address transition
- 8.4 8086 pin description
- 8.5 Addressing modes
- 8.6 data Transfer, arithmetic logical string, i/o instruction
- 8.7 control group of instruction
- 8.8 Assembly Language Programming of 8086.

**Ref. Books:-**

1. Computer Architecture & Organization- J. P. Hayes. (MGH) (Ch 1 to 5)
2. Microprocessor 8085 by B. Ram (Ch 6 & 7)
3. Microprocessor Architecture Programming & Application- Ramesh Gaonkar, Willey Estern.(Ch 8)
4. 8086/8088 Microprocessor Family – Liu Gibson (MGH)(Ch 8)

**M.Sc.(C.S.).S1.PR1**

At Least 20 practical consisting of

- i. 10 practical on 8085 instruction set
- ii. 10 practical on 8086 instruction set

**M.Sc(CS) S1.2**  
**Programming with C++**

**Total marks:100**

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- |  |              |
|--|--------------|
| <b>1. Introduction and basic concepts of C++</b>               | <b>6Hrs</b>  |
| 1.1 Procedure Oriented Programming.                            |              |
| 1.2 Object Oriented Programming Paradigm.                      |              |
| 1.3 Basic concepts of OOP's.                                   |              |
| 1.4 Benefits and Applications.                                 |              |
| 1.5 Structure of C++ program                                   |              |
|  |              |
| <b>2. Tokens ,Operators</b>                                    | <b>4Hrs</b>  |
| 2.1 Keywords, identifiers, data-types                          |              |
| 2.2 operators in C++   |              |
| 2.3 Operator precedence and associativity                      |              |
|  |              |
| <b>3. Functions in C++</b>                                     | <b>5Hrs</b>  |
| 3.1 Function, function prototype, default arguments,           |              |
| 3.2 Reference variable, call by reference, return by reference |              |
| 3.3 Inline function, function overloading                      |              |
|  |              |
| <b>4. Class and object</b>                                     | <b>10Hrs</b> |
| 4.1 Specifying a class and object                              |              |
| 4.2 Nesting of member function                                 |              |
| 4.3 Memory allocation for objects                              |              |
| 4.4 Static data member, static function                        |              |
| 4.5 Friend function  |              |
| 4.6 Returning objects  |              |
| <b>5. Constructor and destructor</b>                           | <b>5Hrs</b>  |
| 5.1 Constructor  |              |
| 5.2 Types of constructor                                       |              |
| 5.3 Destructor   |              |
| <b>6. Inheritance and polymorphism</b>                         | <b>8Hrs</b>  |
| 6.1 Types of inheritance                                       |              |
| 6.2 Virtual base class   |              |

**6.3** Operator overloading ( Unary and binary)

**6.4** Virtual function and there rules

**6.5** Pure virtual function

6.6 Abstract class

6.7 Pointer to object, This pointer

**7. Input / Output Operation**

**6Hrs**

**7.1** Console I/O operation, formatted I/O, unformatted I/O

7.2 C++ classes for console I/O, C++ stream classes for file I/O

7.3 Opening and closing file, sequential and random access

7.4 Error handling during a file operation, command line arguments

7.5 Templates, template function, template class.

**Reference Books:-**

1. The C++ Complete Reference -TMH Publication

2. Object-Oriented Programming with C++ -E-Balgurusamy

3. Let us C++ -Yashwant kanetkar

**M.Sc.(CS) S1.3**  
**Design and analysis of algorithm**

**Total Marks:100**

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<b>Chap 1: Introduction to data structure</b>	<b>5 Hrs</b>
1.1 concepts of data and algorithm	
1.2 Time and space	
1.3 Complexity of a given algorithm	
<b>Chap 2: Divide and Conquer</b>	<b>5 Hrs</b>
2.1 General Method	
2.2 Binary search	
2.3 Merge sort	
2.4 Quick sort	
2.5 Strassen's matrix multiplication	
<b>Chap 3: The Greedy method</b>	<b>8 hrs</b>
3.1 The general method	
3.2 Knapsack problem	
3.3 Optimal storage on tapes	
3.4 Job sequencing with deadlines	
3.5 Optimal merge pattern	
3.6 Minimum spanning tree	
3.7 Shortest path	
<b>Chap. 4 : Dynamic Programming</b>	<b>6 Hrs</b>
4.1 The general method	
4.2 Multistage graphs	
4.3 Optimal binary search tree	
4.4 Reliability Design	
4.5 Travelling sales person problem	
<b>Chap. 5 : Basic search and traversal techniques</b>	<b>6 Hrs</b>
5.1 Binary tree traversal	
5.2 Breadth first search(BFS)	
5.3 Depth first search(DFS)	
5.4 Disconnected components and DFS	
<b>Chap 6. Backtracking</b>	<b>10 Hrs</b>
6.1 The general method	
6.2 The 8 Queens problem	
6.3 Sum of subsets	
6.4 Graph coloring	

- 6.5 Hamiltonian cycle
- 6.6 Knapsack problem
- 6.7 Efficiency consideration

**Ref. BOOKS:-**

1. **Fundamentals of computer algorithm by Horowitz Sahani,Galgotial  
Publication**

M. Sc. (CS). S1.4  
Distributed Database System

Total marks: 100 marks

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- |   |           |
|---|-----------|
| <b>1. Database System Architecture</b>            | <b>05</b> |
| 1.1. Centralized and client server Architecture   |           |
| 1.2. Server System Architecture                   |           |
| 1.3. Parallel System                              |           |
| 1.4. Distributed System                           |           |
| 1.5. Network Types                                |           |
| <b>2. Indexing and Hashing</b>                    | <b>07</b> |
| 2.1. Basic Concepts                               |           |
| 2.2. Ordered indices                              |           |
| 2.3. B tree index files                           |           |
| 2.4. B+ tree index files                          |           |
| 2.5. Multiple key access                          |           |
| 2.6. Static Hashing                               |           |
| 2.7. Dynamic Hashing                              |           |
| 2.8. Comparison of Ordered indexing and Hashing   |           |
| 2.9. Bitmap indices                               |           |
| <b>3. Distributed Database</b>                    | <b>09</b> |
| 3.1. Homogeneous and Heterogeneous Databases      |           |
| 3.2. Distributed Database storage                 |           |
| 3.3. Distributed Transactions                     |           |
| 3.4. Commit Protocols                             |           |
| 3.5. Concurrency control in distributed databases |           |
| 3.6. Availability                                 |           |
| 3.7. Distributed Query Processing                 |           |
| 3.8. Heterogeneous Distributed Databases          |           |
| 3.9. Distributed Database in Oracle               |           |
| <b>4. Parallel Database</b>                       | <b>06</b> |
| 4.1. Introduction                                 |           |
| 4.2. I/O Parallism                                |           |
| 4.3. Interquery Parallism                         |           |
| 4.4. Intraquery Parallism                         |           |
| 4.5. Interoperation Parallism                     |           |
| 4.6. Intraoperation Parallism                     |           |
| 4.7. Design of Parallel system                    |           |



<b>5. Decision Support</b>	<b>05</b>
5.1. Introduction	
5.2. Aspects of decision support	
5.3. Database design for Decision support	
5.4. Data Preparation	
5.5. Data warehouses and Data marts	
5.6. Online Transaction Processing (OLTP)	
<b>6. Advanced Data types and New Applications</b>	<b>05</b>
6.1 Motivation	
6.2 Time in Database	
6.3 Spatial and Geographic data	
6.4 Multimedia Databases	
6.5 Mobility and Personal Databases	
<b>7. Advanced Transaction Processing</b>	<b>05</b>
7.1. Transaction Processing Monitors	
7.2. Transactional Workflows	
7.3. Main memory databases	
7.4. Real time transaction system	
7.5. Long duration transactions	
7.6. Transaction Management in Multidatabases	
<b>8. Recovery System</b>	<b>08</b>
8.1 Failure classification	
8.2 Storage structure	
8.3 Recovery and Atomicity	
8.4 Log based recovery	
8.5 Shadow Paging	
8.6 Recovery With concurrent Transactions	
8.7 Failure with loss of Nonvolatile storage	
8.8 Advanced recovery technique	
8.9 Remote backup system	

Ref Books:-

- Database System Concepts  
(Abraham, Korth and Sudarshan (4<sup>th</sup> edition) Tata McGraw-Hill)
- An Introduction to Database systems  
-C. J. Date (3<sup>rd</sup> Edition) Pearson Education

**Advanced Networking Concepts**

**Total marks: 100 Marks**

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**1 Review of Basic Concepts**

- 1.1 Network Architecture – Protocol Hierarchies, Layered model, services, interface
- 1.2 Reference Models
- 1.3 Underlying Technologies

**2 LAN Hardware**

- 2.1 Network Interface card
- 2.2 Transmission Media
- 2.3 Topologies
- 2.4 Active hub and passive hub
- 2.5 Repeaters
- 2.6 Wireless LAN

**3 The Internet Layer Protocols**

- 3.1 IP-Datagram , fragmentation and reassembly
- 3.2 ICMP –types of messages, error reporting, ICMP package
- 3.3 BOOTP and DHCP

**4 Routing Protocols**

- 4.1 Interior and Exterior routing – RIP, OSPF, BGP
- 4.2 Multicast Routing- Unicast, Multicast and Broadcast, Multicasting, Multicast trees

**5 The Transport Layer**

- 5.1 The transport service –Services provided, services primitives, Sockets
- 5.2 Process-to-process communication
- 5.3 Elements of transport protocols – addressing, connection establishment, connection release, flow control and buffering , multiplexing, crash recovery
- 5.4 UDP- Introduction, Remote Procedure Call
- 5.5 TCP –service model, protocol, frame format , connection establishment, release, connection management, silly window syndrome- Nagle’s algorithm, error control, congestion control, state transition diagram

**6 Sockets and Client –server Model**

- 6.1 Client-Server Model- Concurrency , Processes
- 6.2 Socket Interface –sockets, byte Ordering, Socket system calls, connectionless and connection Oriented applications
- 6.3 Implementation of Sockets (C/ Java etc)

## **7 The Application Layer**

- 7.1 DNS Telnet and Rlogin, FTP, TFTP, SNMP, SMTP,  
World Wide Web(Client and server side, cookies, wireless web), Java and the internet

## **8 Introduction to Network security**

- 8.1 Cryptography, symmetric key algorithm, Public key algorithms, Digital signatures, Certificates, IPSec, Firewalls, Virtual Private Networks, Network Address Translation, Authentication protocols, Social Issues

### **Reference Books:**

- Beehrouz Forouzan , TCP/IP protocol suit , second edition, Tata McGraw Hill
- Andrew S. Tanenbaum, Computer Networks , Fourth Edition, Prentice Hall
- Douglas E. Comer, Internetworking with TCP/IP , vol 1,
- William Stallings, Data and Computer Communications , Seventh edition , Pearson Edition

### **Lab Assignment**

- 1] Assigning an IP-address to client and server
- 2] Design a LAN with a given set of requirement.
- 3] Configuration of DHCP
- 4] Configuration of DNS
- 5] Active Directory Configuration
- 6] Creating an Network Users
- 7] Creating an Shared folders
- 8] Interconnecting client and server

# Mobile Communications

Total marks: 100

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- |   |              |
|---|--------------|
| <b>1. Introduction</b>                            | <b>8Hrs</b>  |
| 1.1 Applications                                  |              |
| 1.1.1 Vehicles                                    |              |
| 1.1.2 Emergencies                                 |              |
| 1.1.3 Business                                    |              |
| 1.1.4 Replacement of wired networks               |              |
| 1.1.5 Infotainment and more                       |              |
| 1.1.6 Location dependent services                 |              |
| 1.1.7 Mobile and wireless devices                 |              |
| 1.2 A short History of wireless communication     |              |
| 1.3 A market for mobile communication             |              |
| 1.4 Some open research topics                     |              |
| 1.5 A simplified reference model                  |              |
| 1.6 Basic Cellular System                         |              |
| 1.7 Performance Criteria                          |              |
| 1.8 Operation of Cellular System                  |              |
| 1.9 Planning a Cellular System                    |              |
| <b>2. Wireless transmission</b>                   | <b>8Hrs</b>  |
| 2.1 Frequencies for radio transmission            |              |
| 2.1.1 Regulations                                 |              |
| 2.2 Signals                                       |              |
| 2.3 Antennas                                      |              |
| 2.4 Multiplexing                                  |              |
| 2.5 Modulation                                    |              |
| 2.6 Cellular Systems                              |              |
| <b>3. Medium Access Control</b>                   | <b>7Hrs</b>  |
| 3.1 Motivation for specialized MAC                |              |
| 3.2 SDMA  |              |
| 3.3 TDMA  |              |
| 3.3.1 Fixed TDM                                   |              |
| 3.3.2 Classical Aloha                             |              |
| 3.3.3 Slotted Aloha                               |              |
| 3.3.4 CSMA  |              |
| 3.3.5 Multiple Access with collision avoidance    |              |
| 3.4 CDMA  |              |
| <b>4. Telecommunication and Satellite Systems</b> | <b>10Hrs</b> |
| 4.1 GSM   |              |
| 4.1.1 Mobile services                             |              |
| 4.1.2 System architecture                         |              |

## 4.2 Applications of satellite systems

### **5. Wireless LAN**

**10Hrs**

- 5.1 Infra red Vs Wireless LAN
- 5.2 Infrastructure and Ad-hoc network
- 5.3 IEEE 802.11
  - 5.3.1 System Architecture
  - 5.3.2 Protocol Architecture
- 5.4 HIPERLAN
  - 5.4.1 HIPERLAN 1
  - 5.4.2 WATM
- 5.5 Bluetooth
  - 5.5.1 Architecture

### **References**

1. Mobile Communications Second Edition – By Jochen Schiller (Pearson Education)
2. Mobile Cellular Telecommunications Second Edition-By William C.Y.Lee (Mc-Graw- Hill)

**M.Sc.(C.S.) S2.3**  
**Programming in C#.NET**

**Total marks: 100**

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- |   |              |
|---|--------------|
| <b>1. Introducing C#</b>                                | <b>03Hrs</b> |
| 1.1. What is c#   |              |
| 1.2. Why C# & Evolution of C#                           |              |
| 1.3. Characteristics of C#                              |              |
| 1.4. How C# differs from C++ & Java                     |              |
| 1.5. Introduction to .Net Technology & Framework        |              |
| 1.6. The Common language Runtime(CLR)                   |              |
| 1.7. Visual Studio .Net & .Net languages                |              |
| <b>2. Features in Visual Studio.net</b>                 | <b>05Hrs</b> |
| 2.1. Integrated Development environment                 |              |
| 2.2. Start page   |              |
| 2.3. Solution explorer window                           |              |
| 2.4. Class view window                                  |              |
| 2.5. Object browser                                     |              |
| 2.6. Code window  |              |
| 2.7. Intellisense                                       |              |
| 2.8. Heap facility                                      |              |
| 2.9. Code Debugging                                     |              |
| 2.10. Project types                                     |              |
| <b>3. Arrays, String &amp; Operators</b>                | <b>05Hrs</b> |
| 3.1. Jagged Arrays                                      |              |
| 3.2. Array & ArayList class                             |              |
| 3.3. string class                                       |              |
| 3.4. Boxing & Unboxing variable                         |              |
| 3.5. Short circuiting operators                         |              |
| <b>4. Properties, Indexers, Delegates &amp; Events</b>  | <b>06Hrs</b> |
| 4.1. Properties   |              |
| 4.2. Indexers   |              |
| 4.3. Delegates  |              |
| 4.4. Multicast Delegates                                |              |
| 4.5. Events   |              |
| <b>5. Namespace, interface &amp; Exception handling</b> | <b>04Hrs</b> |
| 5.1. Creating & using Namespace(DLL library)            |              |
| 5.2. Creating & using interface                         |              |
| 5.3. Exception  |              |
| <b>6. Multithreading</b>                                | <b>06Hrs</b> |
| 6.1. Understanding System. Threading Namespace          |              |
| 6.2. Creating & starting Thread                         |              |
| 6.3. Threading synchronization & Pooling                |              |

- 7. Windows Application** **10Hrs**
- 7.1. Event Driven Programming Model
  - 7.2. Important classes used in windows application
  - 7.3. TextBox & Label Control
  - 7.4. Button, CheckBox, RadioButton & GroupBox Control
  - 7.5. ListBox & ComboBox control
  - 7.6. Month Calendar Control
  - 7.7. Docking Control
  - 7.8. Tree View Control
  - 7.9. Menu & Toolbar control
  - 7.10. Dialog Boxes
- 8. Database Connectivity** **08Hrs**
- 8.1. Advantages of ADO.NET
  - 8.2. Managed Data providers
  - 8.3. Developing a Simple ADO.NET Based Application
  - 8.4. Retrieving & Updating Data From Tables.
  - 8.5. Disconnected Data Access Through Dataset Objects
- 9. Working with XML** **05Hrs**
- 9.1 Support for XML in .NET
  - 9.2 System.Xml namespace
  - 9.3 Working with streamed XML
  - 9.4 Implementing document object model in .NET
  - 9.5 XPath XSLT in .NET
  - 9.6 Using XML with ADO.NET
- 10 Web Services** **05Hrs**
- 10.1 Introduction to web services
  - 10.2 Simple object access protocol
  - 10.3 Web service description language
  - 10.4 UDDI
  - 10.5 Creating a web service
  - 10.6 Deploying a web service
  - 10.7 Using the Web service class
  - 10.8 Using the Web service
- References**
- 1. Programming in C# A Primer - Second Edition By - E Balagurusamy
  - 2. Visual C#.Net By – C Muthu
  - 3. C# 2005 Programming Black Book By Matt Telles & Kogenet Solution Inc.
  - 4. C#.Net Programming Wrox Publication

**Programming in C#.NET**  
**M.Sc.(C.S.) S2.PR4**

At least 20 practical according to syllabi.

## **M.Sc.(CS)S2.4 Compiler Design**

**(Total Lectures:50 )**

**Total marks: 100**

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- |   |               |
|---|---------------|
| <b>1. Introduction to Compilers:</b>                    | <b>4Hrs</b>   |
| 1.1.Compilers and translators                           |               |
| 1.2.The structure of compiler                           |               |
| 1.3.Compiler writing tools                              |               |
| <br>  |               |
| <b>2. Programming Languages</b>                         | <b>7. Hrs</b> |
| 2.1 High level programming languages                    |               |
| 2.2 Definitions of programming languages                |               |
| 2.3 A lexical and syntactic structure of a language     |               |
| 2.4 Data structures                                     |               |
| 2.5 Operators   |               |
| 2.6 Statements  |               |
| <br>  |               |
| <b>3. Lexical Analysis &amp; Syntax Analysis:</b>       | <b>10 Hrs</b> |
| 3.1 Lexical analysis                                    |               |
| 3.2 Role of a Lexical analyzer                          |               |
| 3.3 A simple approach to the design of lexical analyzer |               |
| 3.4 regular expressions                                 |               |
| 3.5 Syntax analysis                                     |               |
| 3.6 Finite automata                                     |               |
| 3.7 Minimizing number of states of a DFA                |               |
| 3.8 Implementation of a lexical analyzer                |               |
| 3.9 Context free grammars                               |               |
| <br>  |               |
| <b>4. Basic parsing techniques</b>                      | <b>8 Hrs</b>  |
| 4.1 Introduction to parsers                             |               |
| 4.2 Shift reduce parsing                                |               |
| 4.3 Top-down parsing                                    |               |
| 4.4 Operator Precedence parsing                         |               |
| 4.5 Predictive parsers                                  |               |
| 4.6 LR, SLR and LALR parsers.                           |               |
| <br>  |               |
| <b>5. Syntax Directed Translation:</b>                  | <b>8 Hrs</b>  |
| 5.1 Introduction  |               |
| 5.2 Syntax directed Schemes                             |               |



- 5.3 Implementation of Syntax directed translators
- 5.4 Intermediate code
- 5.5 Postfix notation and evaluation of postfix expressions
- 5.6 Parse trees and syntax trees

**6. Symbol Tables 4 Hrs**

- 6.1 The contents of a symbol table
- 6.2 Data structures for a symbol table

**7. Error detection and recovery 5 Hrs**

- 7.1 Errors
- 7.2 Lexical-phase errors
- 7.3 Syntactic phase errors
- 7.4 Semantic errors

**8. Introduction to Code Optimization : 4 Hrs**

- 8.1 Sources of optimization
- 8.2 Loop optimization

**RECOMMENDED BOOKS :**

1. Principals of Compiler Design By Alfred V. Aho, Jeffrey D. Ullman
2. Compilers - Principles, Techniques and Tools - A.V. Aho, R. Shethi and J.D.
3. Introduction to system softwere By D. M. Dhamdhere