

**Medi-Caps University, Indore**

**Scheme of MCA**

**Semester III**

Sr. No.	Course Code	Subject	Hours Per Week			Credits
			L	T	P	
1	CA5BS03	Mathematics of Computer Applications	3	0	0	3
2	CA5CO11	Software Engineering	4	0	0	4
3	CA5CO12	Computer Networks	3	1	4	6
4	CA5CO13	Theory of Computation	3	1	0	4
5	CA5EL01	Object Oriented Programming Paradigm	3	0	0	3
6	CA5EL03	Java Programming	0	0	6	3
7	CA5MC02	Technical Communication and Soft Skills	2	0	0	0
		Total	18	2	10	23

Course Code	Course Name	Hours per Week	Total	Total
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		<b>L</b>	<b>T</b>	<b>P</b>	<b>Hrs.</b>	<b>Credits</b>
CA5BS03	Mathematics of Computer Applications	3	0	0	3	3

### **Unit-I**

Relation and Function: Review of set theory, Relations, Properties of binary relations in a set, Equivalence relation, Partial order relation, Function, Properties of function, Composition of functions.

### **Unit-II**

Matrix : Definition, types of matrix, Elementary transformation of matrix, Inverse of matrix: adjoint methods and Gaussian elimination, Normal form of matrix, Rank of matrix, Nullity of matrix (their applications) consistency and solution of linear simultaneous equations, Eigen Values and Eigen Vectors ,CayleyHamilton Theorem.

### **Unit-III**

Graph Theory : Introduction and applications of graph theory, Finite and infinite graphs, Incidence and degree, Isolated vertex, Pendant vertex and Null graph, Path and Circuits, Connected and Disconnected graphs. Euler graph, Hamiltonian path and circuits, Tree, Minimum spanning tree, Dijkstra's algorithm, Kruskal's and Prim's Algorithm for finding minimal spanning tree. Travelling salesperson problem.

### **Unit-IV**

Probability : Basic concept of Probability, Random variables, Binomial, Poisson, Normal, Exponential distributions (Mean, median, mode and standard deviation for each distribution).

### **Unit V**

Recurrence relation and generating function: Introduction to Recurrence relation and Recursive algorithms, Linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating function.

### **Text Books:**

1. J.P. Tremblay and R. Manohar; Discrete Mathematical Structures with Applications to Computer Science, Tata Mc-Graw-Hill Edition, 1997.
2. B.S. Grewal; Higher Engineering Mathematics, Khanna Publishers; 43rd edition (2014).
3. S.C. Gupta and V.K. Kapoor; Fundamentals of Mathematical Statistics, Sultan Chand & Sons (2014).

### **Reference Books:**

1. James L. Hein; Discrete Structure, Logic and Computability, Narosa Publishing. House,2010.
2. Kenneth H. Rosen,;Discrete Mathematics and Its Applications, Tata McGraw-Hill
3. Edition, 1981.

4. C. L. Liu; Elements of Discrete Mathematics, Tata McGraw-Hill Edition, 2012.
5. Sheldon Ross; A First Course in Probability, Pearson, 2012.
6. NarsinghDeo; Graph Theory with Applications to Engineering and Computer Science, PHI, 2014
7. Alan Doerr and Kenneth Levasseur; Applied Discrete Structures for Computer Science, (Asian Student Edition), Galgotia Pub. Ltd., 1996
8. Eric Lehman and Tom Leighton , Mathematics for Computer Science , MIT

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5CO11	Software Engineering	4	0	0	4	4

### Unit-I

Software Processes : Software Engineering, Software Myths, The Software Process, A Generic Process Model, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models , Specialized Process Models, The Formal Methods Model, The Unified Process Personal, Agile Process Model.

### Unit-II

Software Project Management: Project Planning and Management The Management Spectrum, Software Scope, Problem Decomposition, Process Decomposition, Project Size Estimation, Effort Estimation Techniques, Software Configuration Management, Risk Management.

### Unit-III

Requirement Engineering: Requirements Engineering Process, Requirements Elicitation, Requirements Analysis, Structured Analysis, Data-Oriented Analysis, Object Oriented Analysis, Prototyping Analysis, Requirements Specification, Validation and Management.

### Unit-IV

Software Design: The Design Process, Design Principles, Modular Design, Object-Oriented Design Concepts, UML, Software Architecture, Importance, Architectural Styles, Architectural Design.

### Unit-V

**Software Testing** : Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Test-Case Design. Software Quality and Reliability.

### Text Books

1. R. S. Pressman, "Software Engineering - A Practitioner's Approach" 7e Mcgraw Hill Int. Ed. 2014
2. Ian Sommerville, "Software Engineering" 9<sup>th</sup> edition Pearson Education.
3. Hong Zhu "Software Design Methodology", Elsevier ISBN: 978-81-312-0356-9
4. Pankaj Jalote "An Integrated Approach to Software Engineering" 3<sup>rd</sup> Edition Narosa Publication ISBN: 81-7319-702-4 pdf down loadable

### Reference Books:

1. Rajib Mall “Fundamentals of Software Engineering” 3<sup>rd</sup> Edition PHI
2. S L Pfleeger “Software Engineering- Theory and Practice” 4<sup>th</sup> Edition
3. Martin Fowler “Distilled UML” 3rd edition
4. Hans Van Vliet “Software Engineering Principles and Practice” 3rd Edition Wiley
5. Ugrasen Suman, “Software Engineering: Concepts and Practices” (ISBN: 9788131519301) Published by Cengage Learning.

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5CO12	Computer Networks	3	1	0	4	4

### Unit-I

Physical Layer : Introduction To Networks And Communication Media: Uses Network Hardware, OSI Model, Network Software Reference Models. Example Networks, Network Standardization. Basis for data communication, Transmission media Wireless, Transmission Telephone Systems, Satellite Communication. ATM LAN Virtual-Circuit Networks, Frame Relay and ATM.Design Goals Architecture Congestion Control and Quality of Service ATM LANs Architecture Client/Server Model

### Unit-II

Data Link Layer: The Data Link Layer, Data Link Layer design issues Error Detection and Correction Methods. Elementary Data Link Protocols, Sliding Window Protocols. Protocol Verification Methods, Channel Allocation. Multiple Access protocols IEEE 802 Standards.

### Unit-III

Network Layer: Network Layer Design issues, Routing algorithms, Routing Protocols, RIP,OSPF, BGP, Internetworking Network Layer in Internet. Internet Protocol, ICMP, IGMP, ARP, RARP. Distance Vectors and Link State Routing Algorithms

### Unit-IV

Transport Layer: The Transport Protocols: TCP, Transport Service, Transport Protocols, Internet Transport Protocols UDP, TCP, Congestion Control algorithms.

### Unit-V

Application Layer : Application Layer Design Issues Domain Name System - Electronic Mail, World Wide Web Multimedia - Other Applications, Network Security -- Performance issues. Introduction: Service mechanisms and attacks, The OSI security architecture, A Model for Network Security. Symmetric Ciphers: Symmetric cipher model, substitution Techniques Basic Cryptography - DES - RSA

### Text Books.

1. A.S.Tanenbaum,“ComputerNetwork”,4<sup>th</sup> addition, PHI
2. Forouzan“DataCommunicationandNetworking5<sup>th</sup>”,TMH
3. J.F.Hayes, “Moduling and Analysis of Computer Communication Networks”, Plenum Press.

### Reference Books:

1. D.E.Comer, “Internetworking with TCP/IP”, Volume Ist&IInd,PHI
2. WilliumStalling,“Data&Computercommunications”,MaxwellMacmillan International Ed.
3. D.Bertsekas and R.Gallager,”Data Networks”, 2<sup>nd</sup>Ed., PHI.
4. G.E.Keiser,”LocalAreaNetworks“, McGrawHill,InternationalEd.
5. Cryptography and Network Security: William Stallings, Pearson Education, 2003

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5CO13	Theory of Computation	3	1	0	4	4

### Unit-I

Review of Mathematical Preliminaries: Set, Graphs and Trees, String, Alphabets and Languages, Principle of Induction, Predicates and Propositional Calculus, Propositional Calculus.

Introduction: Motivation for studying theory of computation, a quick overview of the subject. Notion of formal language. Language membership problem, why this is taken as the central problem of the subject.

Finite automata and regular expressions: DFA, NFA (with and without transitions), their equivalence. Proof that for some languages NFAs can be exponentially more succinct than DFAs. Definition of regular expressions. Proof that NFAs recognize, and regular expressions denote the same class of languages, viz., regular languages.

Properties of regular languages: Pumping lemma and its use to prove non-regularity of a language, closure properties of class of regular languages, Minimization of DFAs, Myhill-Nerode theorem.

### Unit-II

Context-free grammars and languages: Derivation, parse trees. Language generated by a CFG. Eliminating useless symbols,  $\epsilon$ -productions, unit productions. Chomsky normal form. Properties of context-free languages: Pumping lemma for context-free languages and its use to prove a language to be not context-free. Closure properties of the class of context-free languages. CYK algorithm for CFL membership, testing emptiness of CFLs.

### Unit-III

Push Down Automata : Definition, instantaneous description as a snapshot of PDA computation, notion of acceptance for PDAs: acceptance by final states, and by empty stack; the equivalence of the two notions. Proof that CFGs generate the same class of languages that PDAs accept.

### Unit-IV

Turing machines: Historical context, informal proofs of undecidability. Definition of TM, instantaneous description as a snapshot of TM computation, notion of acceptance. Robustness of the model: both natural generalizations and restrictions keep the class of languages accepted invariant. (Generalizations: multi-track, multi-tape, nondeterministic, etc. Restrictions: semi-infinite tape, counter machines). Church-Turing hypothesis.

### Unit-V

Undecidability: Definitions of r.e. and recursive languages. Universal Turing machine. Universal language, its semi-decidability. Reducibility and its use in proving undecidability. Rice's theorem. Undecidability of Post's correspondence problem.

Intractability: Motivation for the notion. The class P as consensus class of tractable sets. Classes NP, co-NP. Polynomial time reductions. NP-completeness, NP-hardness.

**Text Book**

1. K. L. P Mishra & N. Chandrasekaran, "Theory of Computer Science", PHI Learning.
2. J Hopcroft, JD Ullman, R Motwani, Introduction to Automata Theory, Languages and Computation, 3rd Ed., Pearson, 2008

**Reference Books:**

1. John C Martin, "Introduction to languages and theory of computation", McGraw Hill.
2. Daniel I.A Cohen, "Introduction to Computer Theory", Wiley India
3. Lewis Papa Dimutrau , Theory of Computation , PHI , New Delhi
4. M Sipser, Theory of Computation , Brookscole,Thompson



Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5EL01	Object Oriented Programming Paradigm	3	0	0	3	3

### Unit-I

Introduction: Algorithms and Flowchart, Program Design, Object-oriented Design, Object oriented Features, Types and Declaration, Pointers, Arrays, Structures, Expressions and Statements, Functions, Namespaces and Exceptions.

### Unit-II

Abstract Data Types, Classes, Constructors, Destructors, Function Overloading, Operator Overloading, Conversions.

### Unit-III

Inheritance, Derived Class, Virtual Functions, Polymorphism, Abstract Base Class, Multiple Inheritance

### Unit-IV

Generic Programming, Templates, Generic Functions, Generic Classes, Standard Template Library, Containers, Iterators, Function Objects, Allocators.

### Unit-V

I/O and Exception Handling :Streams, Ostream, Istream, Files, Throwing Exceptions, Try Blocks, Handlers- OOP using C++.

### Text Book:

1. Ira Pohl, "Object, Oriented Programming using C++", Second Edition, Pearson Education, 2003.
2. HM Deitel and P J Dietel C++ How to Program, Prentice Hall
3. Robert Lafore ,Object Oriented Programming in C ++ , Pearson Education .

### Reference Books:

1. Bjarne Stroustrup, "The C++ Programming Language", Fourth Edition, Addison Wesley, 2013.
2. Herbert Schildt, "C++:The Complete Reference", Fifth Edition, McGraw Hill, 2015.
3. Stanley B. Lippman, JoséeLajoie, C++ Primer, Fifth Edition, Barbara E. Moo ,Pearson Education, 2012.

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5EL03	Java Programming	0	0	6	6	3

### Unit-I

Java Basics: What is Java, Object, First Program in Java, Compilation and Execution, control statements, Data types, Arrays.

Variable and Operators: Concept of variable, Data types in Java, Primitive data types, reference data types. Java identifier, java identifier rules, operators in java, operator precedence, type conversion, mixing operators, conversion of string to other data type and other data type to string type.

### Unit-II

Object Oriented Programming: Java's custom data type, defining a class, concept of object and instance, constructor, default constructor, constructor overloading, instance Vs static attributes. Object oriented key concepts: Encapsulation, Inheritance, calling of constructor during inheritance, polymorphism, compile and run time polymorphism, final modifier, abstract class and interface, use of super, data abstraction and data hiding, calling of constructor, method overriding.

### Unit-III

Exception Handling: Definition of exception, class hierarchy, Basic idea of exception handling; The try, catch and throw; throws; finally; Programmers-Defined exception, Exception Propagation.

Collections Framework: The collections framework, collection interfaces, Interface collection, interface List, interface Set, interface Queue, interface Map, concrete collection classes, interface Iterator, synchronize collections, comparable and comparator interface, Introduction of Generics. Introduction of Autoboxing and Unboxing.

### Unit-IV

Input/ Output Streams: Input/ Output Concepts, I/O streams, Types of Data, FileReader, Buffered Reader, FileWriter, PrintWriter, copy text file and binary file, serialization, read/write primitive data and file, use of Scanner and StringTokenizer.

Concurrency and Threads: Basic concept of process and thread, Basic concept of multitasking and multithreading; Creating thread with the thread class and runnable interface, Thread scheduling, The lifecycle of a thread; thread methods, concept of native and green thread model, thread priority, Daemon thread, Selfish threads, thread group, race condition, Thread synchronization, concept of monitor.

### Unit-V

AWT and Swings: Graphical User interface Components: JFrame, JPanel, JLabel, JButton; Components Hierarchy, Package javax.swing, Layout managers- Flow, Border, Grid, GridBag, Card layout, Absolute Position.

The Java Event Handling Model: Java's event delegation model – Ignoring the event, Self contained events, Delegating events; The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eey Event, Mouse Event, Text Event, Window Event. Anonymous classes, Introduction to Enum.

#### **Text Book:**

1. JAVA : The Complete Reference– Seventh Edition, by Herbert Schildt, Tata McGraw-Hill Publishing Company Limited.

#### **Reference Books:**

1. Just Java by Peter Van der Liden
2. OOP with Java - An Ultimate Tutorial by Jaffry A Borrer,
3. Java 6 Programming Black Book By Kogent Solution Inc, dreamTech Pub
4. Core Java 2 Volume - I Cay S Horstmann, Fary Cornell, Sun Microsystems Press
5. Core Java 2 Volume - II Cay S Horstmann, Fary Cornell, Sun Microsystems Press
6. Object oriented programming with java, Essentials and applications, Mc Graw Hill
7. Publications, RajkumarBuyya, S ThamaraiSelvi, Xingchen Chu
8. A programmer's Guide to java SCJP certification, Pearson,Khalid A. Mughal,
9. Rolf W. Rasmussen.

#### **List of Practicals**

1. Write a Java Program find the Area of circle.
2. Write a Java Program that will display Factorial of the given number.
3. Write a Java Program that will display the sum of  $1+1/2+1/3+....+1/n$ .
4. Write a Java Program that will display 25 Prime nos.
5. Write a Java Program that will accept command-line arguments and display the same.
6. Write a Java Program to sort the elements of an array in ascending order.
7. Write a Java Program which will read a text and count all occurrences of a particular word.
8. Write a Java Program which will read a string and rewrite it in the alphabetical order.
9. Write a java program which show the application of constructors.
10. Write a java program which show the use of methods overloading.
11. Write a java program which show the use of static members.
12. Write a java program which show the nesting of methods.
13. Write a java program which explaining the concept of single inheritance.
14. Write a java program which show the application of constructors.
15. Write a java program which show the method overriding.
16. Write a java program which implement interface.
17. Write a java program which implement multiple interface.

18. Write a java program which shows importing of classes from other packages.
19. Write a java program which create threads using the thread class.
20. Write a java program which shows the use of yield(),stop(),and sleep() methods.
21. Write a java program which shows the priority in threads.
22. Write a java program which use runnable interface.
23. Write a java program which use try and catch for exception handling.
24. Write a java program which use multiple catch blocks.
25. Write a java program which shows throwing our own exception.
26. Make an Applet that create two buttons named “Red” and “Blue” when a button is pressed the background color of the applets is set to the color named by the button’s label.
27. Write a Java Applet that create some text fields and text areas to demonstrate features of each.
28. Create an applet to display the scrolling text. The text should move from right to left.
29. Write a program to create three scrollbar and a label. The background color of the lable should be changed according to the values of the scrollbars (The combination of the values RGB)
30. Write a java program which copying characters from one file into another.
31. Write a java program which shows reading and writing bytes to a file.
32. Write a java program which shows the copying bytes from one file to another.
33. Write a java program which shows reading and writing primitive data.
34. Write a java program which shows the single file for storing and regrieving.
35. Write a java program which shows writing and reading with random access.

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5CO14	Network Lab	0	0	4	4	2

#### List of Practical

1. Implement the following forms of IPC.  
a) Pipes      b) FIFO
2. Implement file transfer using Message Queue form of IPC.
3. Write a Program to create an integer variable using Shared Memory concept and increment the variable simultaneously by two processes. Use Semaphores to avoid Race conditions.
4. Design TCP iterative Client and Server application to reverse the given input sentence.
5. Design TCP concurrent Client and Server application to reverse the given input sentence.
6. Design TCP Client and Server application to transfer file.
7. Design a TCP concurrent Server to convert a given text into upper case using multiplexing system call “select”.
8. Design a TCP concurrent Server to echo given set of sentences using Poll functions.
9. Design UDP Client and Server application to reverse the given input sentence.
10. Design UDP Client Server to transfer a file.
11. Design using Poll Client Server application to multiplex TCP and UDP requests for converting a given text into upper case.
12. Design a RPC application to add and subtract a given pair of integers.

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
CA5MC02	Technical Communication and Soft Skills	2	0	0	2	0

### Unit-I

Developing effective communication skills; Process, characteristics and principles, channels, verbal and non-verbal types, barriers to effective communication, importance of effective communication, Importance of Feedback in communication

### Unit-II

Listening Skills Listening: meaning, process, difference between hearing and listening, types, barriers, importance. Developing Listening Skills

### Unit-III

Developing speaking skills: Oral Presentation –Delivery using Audio – Visual Aids with stress on body language and voice modulations. (Topics to be selected by the Instructor for presentations), speeches, extempore, JAM, Interview skills , Group discussion skills.

### Unit-IV

Developing Writing Skills and Business Correspondence - Business Letters, Parts & Layouts of Business Letters, Writing job application and Resume, Calling/ Sending Quotations/ Orders/ Complaints and E-mails

### Unit-V

Report writing- types of reports, format, Presenting Diagrams/Graphs/Charts/Tables, Searching, Organizing, Presenting, Submitting. Technical description, Writing abstracts/Summary/Synopsis,

#### Text Books:

1. Rai U S, Rai SM. Effective Communication. Himalaya Publishing House.
2. Korlahalli J.S. ,Rajendra Pal. Essentials of Business Communication All Courses.Sultan Chand & Sons
3. Krishna Mohan, Sharma R C. Business Correspondence and Report Writing. Mc Graw Hill Education, New Delhi. Fourth Edition.

#### Reference Books:

1. Thompson A.J, A. V. Martinet. A Practical English Grammar. Oxford UP. New Delhi. Kumar Sanjay, PushpaLata. English for Effective Communication. Oxford UP. New Delhi.
2. Kumar Sanjay, PushpaLata Communication Skills. Oxford UP. New Delhi. II Edition