Maharaja Surajmal Brij University

Bharatpur (Rajasthan)

Syllabus of UG Computer Science

(Basic degree)

Three/Four Under Graduate Programme in Science/Arts/Commerce

(Semester I,II,III,IV,V&VI)

Academic Session 2024-25

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The objectives of the Programme are:

1. The primary objective of this program is to prepare students for careers in software industry, understanding and skills, related to the use of computers and its applications.
2. The course is designed to function as an intermediate between the industry and academic institutes.
3. This course provides students with options to specialize in new and upcoming technologies.
4. To impart creativity and pursuit of excellence in computer applications.
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem solving skills through programming.
7. To develop the ability to use this knowledge to analyze new situations.
8. To be able to blend the acquired knowledge, understanding, and experience, for a better and improved intellectual capacity of the real-life problems.
9. To prepare students who wish to go on to further studies in computer science and related subjects.

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Course Structure for Computer Science Course

B.Sc./B.A./B.Com. Semester - I & II 2023-24 Onwards

Semester-wise Titles of the Papers in Computer Science						
Certificate in B.Sc./B.A./B.Com.						
Sem	Course Code	Course Title	Course Type	Theory/ Practical	Teaching Hours/ Week	Credits
I	COMP-20T-101	Computer Basics & Office Management Tools	CC	Theory	4	4
	COMP-20P-102	Computer Basics & Office Management Tools Lab	CC	Practical	4	2
			Total		8	6
II	COMP-20T-201	Programming with C	CC	Theory	4	4
	COMP-20P-202	Programming with C Lab	CC	Practical	4	2
			Total		8	6

Computer Science Course B.Sc./B.A./B.Com.

Semester - III & IV 2024-25 Onwards

Semester-wise Titles of the Papers in Computer Science						
Diploma in B.Sc./B.A./B.Com.						
Semester	Course Code	Course Title	Course Type	Theory/ Practical	Teaching Hours/ Week	Credits
III	COMP-20T-301	Operating Systems	CC	Theory	4	4
	COMP-20P-302	Operating Systems Lab	CC	Practical	4	2
			Total		8	6
IV	COMP-20T-401	Database Management Systems	CC	Theory	4	4
	COMP-20P-402	DBMS Lab	CC	Practical	4	2
			Total		8	6

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Program Outcomes: Computer Science

1. Discipline knowledge: Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity.
2. Problem Solving: Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. Difficulty Analysis: Talent to classify, significantly evaluate and prepare complex computing problems using fundamentals of computer knowledge and request domains.
4. Design and Development of Solutions: Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
5. Accomplish Investigations of Compound Computing Troubles: Ability to invent and ways experiments interpret data and present well up to date conclusions.
6. Application Systems Knowledge: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
7. Modern Tool Usage: Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
8. Mission Administration: Skill to recognize administration and computing philosophy with computing acquaintance to supervise projects in multidisciplinary environments.
9. Communication: Must have a reasonably good communication knowledge both in oral and writing.
10. Ethics on Profession, Environment and Society: Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
11. Motivation to take up Higher Studies: Inspiration to continue educations towards advanced studies on Computer Science.

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Course Content for Computer Science Course

B.Sc./B.A./B.Com. Semesters I and II

Semester: I

Corse Code:COMP-20T-101	Course Title: **Computer Basics & Office Management Tools**
Course Credit : 04	Hours/Week: 04

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Office Activities using Word Processor Software
- Office Activities using Spreadsheets Software
- Office Activities using Presentation Software
- Office Activities involving Multimedia Editing (Images, Video, Audio …)
- Operating System Configuration, MS Configuration.

COMP-20T-101 : Computer Basics & Office Management Tools

Unit-I

Evolution and generations of Computers, Characteristics of Computer, Classification of Computer, Application of Computers, Block diagram of Computer and role of each block, software & hardware, relations between software & hardware, Input and Output Devices, Software: Types of Software-System Software, Application software, and utility Software; Computer Languages: Machine, Assembly, High Leve; Generations of programming languages, Features of good programming language, Translators: Assemblers, Compilers and Interpreter.

Unit-II

Number System: Introduction to number system, Binary, Octal, Decimal, Hexadecimal, Conversion between number bases, Arithmetic Operations on Binary Numbers, Alphanumeric Codes-BCD, EBCDIC, ASCII, Unicode.

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Primary and Secondary Memory: Memory Hierarchy, Random Access Memory(RAM), Types of RAM, ROM, Types of ROM, Start-up Process (Booting), Classification of Secondary Storage Devices, Magnetic Tape, Magnetic Disk, Optical Disk.

Unit-III

Internet Basics: Introduction, Features of Internet, Internet Applications, Services of Internet, Logical and Physical addresses, Internet Service Providers, Domain Name System.

MS Word: Word Processing, MS-Word features, Creating Saving and Opening Documents in Word, Toolbars, Ruler, Menus, Keyboard shortcuts, editing, previewing, Printing & Formatting a document, Find & Replace, Thesaurus, Mail Merge, Tables, Converting a Word document into various formats like-text, Rich Text Format, Word Perfect, etc.

Unit-IV

MS Excel: Worksheet Basics, Creating Worksheet, Entering data into Worksheet, Data, Text, Dates, Alphanumeric values saving & Quitting Worksheet, Opening and Moving around in an existingWorksheet, Toolbars and Menus, Keyboard shortcuts, Working with Formula & Cell Referencing, Auto Sum,Format Feature, Changing alignment, Character styles, Date Format, Border &Colors etc. Previewing & Printing a worksheet, Graphs and Charts.

Power Point: Creating and Viewing a Presentation, Managing Slide Shows, Navigating through a Presentation, Using Hyperlinks, Advanced navigation with action setting and Action buttons, Organizing formats with Master Slides, Applying and Modifying designs, Adding Graphics, Multimedia and Special Effects.

Recommended Books:

1. Sanjay Saxena; A First Course in Computers 2003 Edition; Vikas Pub.
2. Computer Fundamentals by P.K. Sinha, BPB Publication.
3. Computer Fundamentals and Programming in C,Reema Thareja,OXFORD University Press.
4. Microsoft; 2007/2010 Microsoft Office System; PHI.
5. Microsoft; Microsoft Office 2007/2010: Plain & Simple; PHI.
6. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.
7. Office 2019:In Easy Steps,Michal Price ,BPB Publication.

Corse Code: **COMP-20P-102**	Course Title: **Office Management Tools Lab**
Course Credit : 02	Hours/Week: 04

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Content: Content : Recommended exercises

Exercises based on Internet, Word, Excel and Power Point.

Semester: II

Corse Code: **COMP-20T-201**	Course Title: **Programming with C**
Course Credit : 04	Hours/Week: 04

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays Course Content

COMP-20T-201 : Programming with C

UNIT- I

Basic concepts of Programming languages, Programming Domains, Language Evaluation criteria and language categories, Evolution of major programming languages. Describing syntax and semantics, formal methods of describing syntax, Pseudo code, Design of Algorithm & Flowchart

UNIT- II

Fundamentals of C: History and importance of C, basic structure and execution of C programs, constants, variables, and data types, Various type of declarations, operators types and expressions, evaluation of expressions, operator precedence and associability. Managing input and output operations,

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decision making and branching. **Iteration:** while, do…while, for loop, nested loops, break & continue, goto statements.

UNIT- III

Array and String: One-dimensional array and their declaration and initialization, two-dimensional arrays and their initializations, character arrays (One and Two dimensional), reading and writing strings, string - handling functions.

Functions: Need and elements for user –defined functions, definition of functions, return values and their types, function calls and declaration, recursion, parameter passing, passing arrays and strings to functions, the scope, visibility and life time of variables.

UNIT-IV

Understanding Pointers: Accessing the address of a variable, declaration and initialization of pointer variables, accessing a variable through its pointer, pointers and arrays, pointers and function arguments, functions returning pointers.

Structures and Unions: Defining structure, declaring structure variable and accessing structure members, initialization of structure, operation on individual members, and array of structures, union, size of structure.

Recommended Books:

1. Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill,2011.
2. Kanetkar Y.; LET US C; X Edition, BPB,2010.
3. Deitel HM & Deitel JP; C How to program; 5th Edn; Pearson Pub
4. Gottfried B; Programming with C: Schaum Qutlines; Mc Graw Hill Edition.

Corse Code: **COMP-20P-202**	Course Title: **Programming with C Lab**
Course Credit : 02	Hours/Week: 04

Content : **Recommended exercises**

Part A:

1. Program to read radius of a circle and to find area and circumference
2. Program to read three numbers and find the biggest of three
3. Program to demonstrate library functions in math.h
4. Program to check for prime

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5. Program to generate n primes
6. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Program to find the roots of quadratic equation (demonstration of switch Case statement)
10. Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:

1. Program to find the length of a string without using built in function
2. Program to demonstrate string functions.
3. Program to demonstrate pointers in C
4. Program to check a number for prime by defining isprime( ) function
5. Program to read, display and to find the trace of a square matrix
6. Program to read, display and add two m x n matrices using functions
7. Program to read, display and multiply two m x n matrices using functions
8. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Program to Reverse a String using Pointer
10. Program to Swap Two Numbers using Pointers
11. Program to demonstrate student structure to read & display records of n students.
12. Program to demonstrate the difference between structure & union.

Note: **Student has to execute a minimum of 10 programs in each part to complete the Lab course.**

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Course Content for Computer Science Course

B.Sc./B.A./B.Com. Semesters III and IV

Semester: III

Corse Code: **COMP-20T-301**	Course Title: **Operating Systems**
Course Credit : **04**	Hours/Week: **04**

Course Outcomes (COs):

1. Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Analyse important algorithms e.g. Process scheduling and memory management algorithms
3. Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques
4. Demonstrate the ability to perform System Administration tasks in LINUX

COMP-20T-301 : Operating Systems

Unit I

Concepts: Operating System & its need, Objectives of Operating System, Functions of Operating System, Types of OS: Simple Batch Systems, Multiprogrammed Batch System, Time Sharing Systems, Parallel System, Distributed Systems and Real-Time Systems. Booting Process of OS, Operating System Structure. Introduction to File System : File Concepts(Operations and Attributes), Directory Structure, File System Structure

Unit II

Process Management: Process Concept, Process States, Process Scheduling.

CPU Scheduling Algorithms: Basic Concepts, Scheduling Criteria, FCFS, SJF, Priority, Round-Robin, Multilevel Queue, Multiple Feedback Queue, Multiple- Processor Scheduling.

Unit III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Memory Management: Background, Why use memory management in OS, Logical versus Physical Address Space, Swapping, Contiguous Allocation (Fragmentation), Paging, Segmentation, Basic concept of Virtual Memory and Demand paging.

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Unit IV

Introduction of different Operating System(Linux, Unix, Windows Server), Linux History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File System, Input and Output, Inter Process Communication, network Structure, Security; Basic essential Linux commands and Shell Scripts.

Recommended reference books:

1. A. Silbersachatz and P.Galvin, "Operating System Concepts", Addison-Wesley, 5th Ed., 2001.
2. Gary Nutt: Operating Systems-A Modern Perspective (Second Edition), Pearson Education, 2000.
3. Tanenbaum A.S., Modern Operating Systems, PHI Publ.
4. Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
5. Simitabha Das, "Unix/Linux Concepts & Applications". Tata McGraw Hill
6. Achyut S. Godbole: Operating Systems, Tata Mc-Graw Hill Publishing Company Limited, 2000.
7. Harvey M. Deitel, Operating Systems, Pearson Education, 2001.

Corse Code: **COMP-20P-302**	Course Title: **Operating Systems Lab**
Course Credit : **02**	Hours/Week: **04**

Course Outcomes (COs):

1. Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Analyse important algorithms e.g. Process scheduling and memory management algorithms
3. Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques
4. Demonstrate the ability to perform System Administration tasks in LINUX

Content : Recommended exercises

1. To Installation of Windows.
2. Setings and configurations of OS
3. To learn directory navigation in Linux-like systems.
4. To practice Linux commands
5. Practice pattern matching commands.
6. Practice file editing with vi/nano.

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7. Shell script to demonstrate application programs.

Semester: IV

Corse Code: **COMP-20T-401**	Course Title: **Data base Management Systems**
Course Credit : 04	Hours/Week: 04

Course Outcomes (COs): On completion of the course, the student will be able to:

1. Understand terms related to database design and management
2. Assess various database models.
3. Evaluate the normality of a logical data model, and correct any anomalies
4. Implement relational databases using MySQL.

COMP-20T-401 : Data base Management Systems

UNIT- I

Database System Concepts & Architecture: Overview of DBMS, Basic DBMS terminology, data base system v/s file system, Advantages and dis-advantages of DBMS, Coded rules, data independence. Architecture of a DBMS, Schemas, Instances, Database Languages, Database Administrator, Data Models.

UNIT- II

Data Modeling: Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

Relational Model : Concepts, Constraints, Languages, Relational database design by ER & EER mapping, Relational algebra relational calculus. Relational Algebra, Fundamental operations of Relational Algebra.

UNIT –III

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Database Design: Functional dependencies, loss less decomposition, Normalization : 1-NF, 2-NF,3-NF and BCNF. **Transaction Management :** Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, Checkpoints, Deadlock Handling.

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Introduction to Security & Authorization.

UNIT- IV

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection, Minus in SQL.

Recommended Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill,2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. Ivan Bayross; SQL/PL 4th Edn: BPB,2009
4. Navathe S.B. Elmasri R.; Fundamentals of Database Systems, Fifth Edition, Pearson 2011.
5. Ramakrishan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill, 2007.
6. Singh S.K.; Database Systems; I Edition; Pearson, 2006.

Corse Code: **COMP-20P-402**	Course Title: **DBMS Lab**
Course Credit : 02	Hours/Week: 04

Course Contents : Recommended exercises

1. Analyze the organization and identify the entities, attributes and relationships in it.
2. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.
3. Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any).
4. Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion.
5. Apply the First, Second and Third Normalization levels on the database designed for the organization
6. Installation of Mysql and practicing DDL commands .
7. Creating databases, how to create tables, altering the database, dropping tables and databases if not required. Try truncate, rename commands etc.
8. Practicing DML commands on the Database created for the example organization
9. DML commands are used to for managing data within schema objects. Some examples: SELECT, INSERT, UPDATE, DELETE

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10. Practice queries (along with sub queries) involving ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.
11. Practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

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Computer Science Course B.Sc./B.A./B.Com.

Semester - V & VI 2025-26 Onwards

Semester-wise Titles of the Papers in Computer Science						
Bachelor of B.Sc./B.A./B.Com.						
Semester	Course Code	Course Title	Course Type	Theory/ Practical	Teaching Hours/ Week	Credits
V	COMP-20T-501	Web Application Development	CC	Theory	4	4
	COMP-20P-502	Web Application Development Lab	CC	Practical	4	2
			Total		8	6
VI	COMP-20T-601	Object Oriented Programming Using Java	CC	Theory	4	4
	COMP-20P-602	Java Lab	CC	Practical	4	2
			Total		8	6

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Course Content for Computer Science Course

B.Sc./B.A./B.Com. Semesters V and VI

Semester: V

Corse Code: **COMP-20T-501**	Course Title: **Web Application Development**
Course Credit : **04**	Hours/Week: **04**

Course Outcomes (COs):

On completion of the course, the student will be able to:

1. Understand best technologies for solving web client/server problems
2. Analyze and design real time web applications
3. Use Java script for dynamic effects and to validate form input entry
4. Analyze to Use appropriate client-side and Server-side application technology

COMP-20T-501 : Web Application Development

Unit – I

The Internet – Basic of internet, file transfer, telnet, usenet, gopher, wais, Archie and veronica. Introduction to Internet Protocols-, HTTP, FTP, SMTP protocols.

World Wide Web : Elements of the Web, Web browser and its architecture, The web server, the proxy server, Microsoft internet explorer, viewing pages with a browser, using a browser for Mail, News and chat, Security and Privacy issues (cookies, firewalls, Data Security, executable Applets and scripts, blocking system).

Unit – II

HTML Fundamentals: Introduction to HTML, HTML Elements, HTML Semantics, HTML 5 Doc Types, New Structure Tags, Section, Nav, Article, Aside, Header, Footer, HTML Attributes, Headings, Paragraphs, Styles, Quotations, Blocks, Classes, Layout, Iframes, Creating HTML Pages, incorporating Horizontal Rules and Graphical Elements, Hyper-links, Creating HTML Tables, Creating HTML Forms, HTML and Image Techniques, HTML and Page, Development of Website and Webpage (Planning, Navigation and Themes, Elements of a Web page, steps of creating a site, publishing and publicizing site structuring web site.

Unit–III

Cascading Style Sheets: Understanding Style Sheets, CSS Syntax and Applying Style Sheets to HTML document, Developing Style Sheets: inline, internal and external. CSS Selectors, <DIV> tag, Using class and ID, Styling Backgrounds, Styling borders, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables, Margin,

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Flex and Grids. **Bootstrap & Web page design** : CMS, Banks of CMS, Joomla/wordpress-Installation, Design and development of websites.

Unit–IV

Java script: Introduction to scripting language, Client Side Scripting, memory concepts, arithmetic decision making. Java script control structures, Java script functions, JS Popup Boxes, events, program modules in java script, function definitions duration of identifiers, scope rules, Controlling Programming Flow, recursion java script global functions. Arrays handling in Java script, The Java Script Object Model, Developing Interactive Forms, Validation of Forms, Cookies and Java Script Security Controlling Frames in Java Script, Client – Side Java Script Custom.

References :

1. The Colete eference: HTML & XHTML; Thomas A. Powel, 4th Edn.
2. Mastering HTML 4.0 by Deborah S.Ray an Eric J. Ray From BPB
3. Mastering Java Script, BPB publication.
4. Internet and web technology by Raj Kamal, TMH Publication 2. Steven Holzner,
5. The Complete Reference Java Scripts,, Tata McGraw – Hill,3rd Edn.
6. Java Script, Don Gosselin,Vikas publications

Corse Code: **COMP-20P-502**	Course Title: **Web Application Development Lab**
Course Credit : **02**	Hours/Week: **04**

Content : Recommended exercises

HTML:

1. Basics Elements & Attributes, HTML Formatting tags, Links,
2. Images, Tables, Forms Elements
3. HTML5 Audio and Video, HTML5 Input Types & Attributes
4. CSS Syntax, CSS Attribute Selectors
5. CSS properties: Fonts, Background, Colors, Links, Lists,
6. CSS Box Model, Display, Opacity, Float, Clear
7. CSS Layout, CSS Navigation Bar,
8. CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:

1. Displaying Output, DeclaringVariables, Operators, Arithmetic, Data Types,Assignment,
2. JavaScript Functions, Booleans, Comparisons, Conditional ,
3. JavaScript Switch, Loops, Break, Type,
4. JavaScript Objects, Scope,
5. Strings and String Methods
6. Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
7. JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
8. JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

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Semester: VI

Corse Code: COMP-20T-601	Course Title: Objevt Oriented Programming Using Java
Course Credit : 04	Hours/Week: 04

Course Outcomes (COs):

On completion of the course, the student will be able to:

1. Understand programming languages, Object Oriented Programming concepts and internet concepts
2. Read, understand and trace the execution of programs written in Java language
3. Perform input and output operations using programs in Java
4. Write programs that perform operations on Classes and Objects.
5. Understand inheritance and multi threading concepts
6. Write programs to handle excepts in java .
7. Analyze and design real time web applications
8. Use Java script for dynamic effects and to validate form input entry
9. Understand Collections and GUI feature in java applications.

COMP-20T-601 : Object Oriented Programming Using Java

UNIT – I

Java Programming : Basic concepts of object oriented programming - Objects and Classes, Data Abstraction & Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message passing, Java features, JVM, Byte code interpretation, simple java program, command line argument, Data types, type casting, operators (Arithmetic, increment, decrement, relational, logical, bit wise, conditional) and expressions.

UNIT – II

Decision Making and Branching : Decision making and branching (if...else, else if, switch), looping, classes, objects and methods, constructors, wrapper classes, nesting of methods, overriding methods, final class, visibility control, Arrays, strings.

UNIT – III

Inheritance & Multithreaded Programming : Inheritance, Types of Inheritance, Abstract class, interfaces, packages, multithreaded programming, extending thread, life cycle of thread, using thread methods, thread priority, synchronization.

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UNIT – IV

Exception Handling : Exception-Handling fundamentals, Exception types, try, catch, throw, finally, creating exception sub classes.

AWT controls (Button, Labels, Combo box, list and other Listeners), Layout and component managers, Event handling, string handling (only main functions), graphic programming (line, rectangles, circle, and ellipses).

Recommended Text Books

1. Mastering java 2 ", BPB Publications. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. The complete reference JAVA2, Herbert schildt. TMH
4. Arnold,Gosling, " The Java Programming Professional 2000", Addison Wesley Publication
5. C.Thomas wu, "An introduction to oop with Java", TMH

Corse Code: **COMP-20P-602**	Course Title: **Java Lab**
Course Credit : **02**	Hours/Week: **04**

Content : Recommended exercises

List of experiments:

1. Simple java applications for understanding references to an instant of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling

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