

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.**



CIRCULAR NO.SU/B.Sc./CBC & GS/17/2024

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted the following Syllabi under the Faculty of Science & Technology as per Choice Based Credit Grading System** as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Chemistry (Optional)	Vth & VIth semester
2.	B.Sc. Analytical Chemistry (Optional)	Vth & VIth semester
3.	B.Sc. Polymer Chemistry (Optional)	Vth & VIth semester
4.	B.Sc.Biochemistry (Optional)	Vth & VIth semester
5.	B.Sc.Dairy Science & Technology (Optional)	Vth & VIth semester
6.	B.Sc.Microbiology (Optional)	Vth & VIth semester
7.	B.Sc. Botany (Optional)	Vth & VIth semester
8.	B.Sc. Computer Science (Optional)	Vth & VIth semester
9.	B.Sc. Computer Science (Degree)	Vth & VIth semester
10.	B.Sc.Information Technology (Optional)	Vth & VIth semester
11.	B.Sc.Information Technology (Degree)	Vth & VIth semester
12.	Bachelor of Computer Application (Optional)	Vth & VIth semester
13.	Bachelor of Computer Application (Degree)	Vth & VIth semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar.
-431 004.

REF.NO.SU/2024/1786-94
Date:- 21.06.2024.

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**Deputy Registrar,
Academic Section**

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 2] **The Section Officer,[B.Sc.Unit] Examination Branch,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 3] **The Programmer [Computer Unit-1] Examinations,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 4] **The Programmer [Computer Unit-2] Examinations,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 5] **The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 6] **The Public Relation Officer,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 7] **The Record Keeper,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.

Dr. BabasahebAmbedkarMarathwadaUniversity
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Undergraduate BachelorDegree Program
In Science(B.Sc.)
Computer Science (Optional Subject)
Third Year

Course Structure and Curriculum
(Outcome based Curriculum)
Choice Based Credit System
(Effective from Academic Year 2024-25)

Dr. BabasahebAmbedkarMarathwada University
Chhatrapati Sambhajinagar– 431004 (MS) India

Structure and Curriculum for Bachelor of Science (B. Sc.) Third Year Computer Science (Optional Subject)

(Choice Based Credit System)

Semester V								
	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 A) Discipline Specific Elective	CMP-511	DSE-1A(1) (Theory Paper-IX) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	CMP-512	DSE-1A(2) (Theory Paper-X) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	CMP-521	Lab course 6 (based on CMP-511)	3 hours	1.5	50	10	40	20
	CMP-522	Lab course 7 (Seminar)	3 hours	1.5	50	10	40	20
Skill Enhancement course (SEC-3)	CMP-513	SEC-3 Any one skill to be chosen out of two SEC-3(E) , SEC-3 (F) SEC-3(E): Programming in SCILAB SEC-3 (F): R Programming	2 hours	2	50	10	40	20
Non-Credit Course	CMP-514	Professional Ethics and Moral Values	2 hours					
			14	9	250	50	200	100
Total Credits for Semester V : 9 (Theory : 06 ; Laboratory : 03)								
Semester VI								
	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 B) Discipline Specific Elective	CMP-611	DSE-1B(1) (Theory Paper-XI) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	CMP-612	DSE-1B(2) (Theory Paper-XII) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	CMP-621	Lab course 8 (based on COM-611)	3 hours	1.5	50	10	40	20
	CMP-622	Lab course 9	3 hours	1.5	50	10	40	20



		(Project Work /Dissertation)						
Skill Enhancement course (SEC-4)	CMP-613	SEC-4 Any one skill to be chosen out of two SEC-4(G) , SEC-4 (H) SEC-4(G): Web Designing SEC-4 (H): XML Programming	2 hours	2	50	10	40	20
			15	9	250	50	200	100
Total Credits for Semester VI : 09 (Theory : 06 ; Laboratory : 03)								
Total Credits for three years : Sem I (11.5) + Sem II (11.5) + Sem III (15) + Sem IV (15) + Sem V (09) + Sem VI (09) = 71 Credits								

Skill Enhancement Courses (Credit: 02 each)

Semester	Code	Skill Code	Title of Paper
V(SEC-III)	CMP 513	SEC-3(E):	Programming in SCILAB
		SEC-3 (F):	R Programming
Programming in Core JAVA VI(SEC-IV)	CMP 613	SEC-4(G):	Web Designing
		SEC-4 (H):	XML Programming

Discipline Specific Elective (Credit: 02 each)

V Semester			VI Semester		
Code	DSE Code	Title of Paper	Code	DSE Code	Title of Paper
COM-511 (Select any one paper from A1/B1/C1/D1)	DSE-1A(1)	Programming in Core JAVA	CMP-611 (Select any one paper from A1/B1/C1/D1)	DSE-2A(1)	Programming in advance JAVA
	DSE-1B(1)	Programming in Visual Basic		DSE-2B(1)	Programming in ASP.NET
	DSE-1C(1)	Software Engineering		DSE-2C(1)	Software Testing
	DSE-1D(1)	Unix operating system		DSE-2D(1)	Android programming
COM-512 Select any one paper from (A2/B2/C2/D2)	DSE-1A(2)	Compiler Design	CMP-612 (Select any one paper from A2/B2/C2/D2)	DSE-2A(2)	Theory of Computation
	DSE-1B(2)	Basic Computer Networks		DSE-2B(2)	Advance Computer Network
	DSE-1C(2)	Computational Mathematics		DSE-2C(2)	Computational Statistics
	DSE-1D(2)	Matlab Programing		DSE-2D(2)	Python

Curriculum for Semester V

Course Code: **COM-511 -DSE-1A(1)**

Course Title: **Programming in Core JAVA**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

1. Introduce students to the basic concepts of Java programming
2. Introduce student to use constructors, wrapper classes, and string operations in Java.
3. Enable students to use exception handling in Java.
4. Introduce students the concept of Interface and threads in Java.

Unit-I: : (10 periods)

Introduction of Java, History of Java, how Java is different from C++. JDK Tools, class files, Java Bytecode, JVM, identifiers, Data types, Operators, Control statements, loop, arrays, Inheritance in Java, Multilevel hierarchy, method overriding, Abstract classes, Final classes.

Unit-II: : (10 periods)

Defining, Implementing and applying packages, Importing Packages, Exception handling in Java, try, catch, throw, throws and finally, Uncaught Exceptions, Multiple catch, built in exceptions.

Unit-III: (10 periods)

Constructors, types of constructors, Role of constructor in inheritance, Introduction to wrapper classes String operations in Java, Immutability, Creating and initializing strings using methods of string and string buffer classes.

Unit-IV: (10 periods)

Defining interface, abstract methods in interface, Implementing interface, extending interface, interface references, default method, Static methods in Interface, Constants in interface. Threads: Thread life cycle, Creating and implementing threads, multi-threaded programming, thread priorities, synchronization of thread, resuming and stopping threads.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

- 1) Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath "
- 2) Complete Reference J2EE by James Keogh mcgraw publication
- 3) Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
- 4) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication

Course Code: **COM-521**

Course Title: **Lab course 1 (Based on COM-511 –DSE-1A(1))**

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

1. Creating a simple program in Java to print "Hello Word"
2. Implementing basic control statements such as if else switch and loops
3. Creating and using arrays in Java.
4. Implementation of inheritance in Java.
5. Overriding methods in Java
6. Implementing user –define packages and importing them.
7. Implementing exception handling in Java with try catch throw and finally block.
8. Creating and using interface in Java.
9. Staring operations in Java such as concatenation, substring and length.
10. Creating and using Interface in Java.
11. Implementing multi-threaded programming in Java.
12. Implementing tread synchronization in Java.
13. Creating and using constructor methods in Java.
14. Using string and string buffer classes in Java.
15. Creating a Java program that combines multiple concepts such as inheritance, interface, an exception handling.

Course Code: **COM-511 –DSE-1B(1)**
Course Title: **Programming in Visual Basic**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

- The .NET platform has evolved quickly to become a robust technology platform for enterprise application development and systems integration.
- The students of this course will be able to cultivate programming skills by imparting in-depth knowledge of .NET Programming techniques using VB.NET.
- The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency: To design user interface, code, test and debug related vb.net applications

Unit-I: : (10 periods)

Concept IDE- Menu, Tool Bars, Property Window, Solution Explorer, Windows Form, Designer, Visual Basic Code Editor, Console Applications Development, Introduction to Writing First VB.NET Program Debugging

Unit-II: : (10 periods)

Data Types, Variables and Constants, Program Control Statements - Loop Structure(For/Next, While, Do while, Do Until), Test Structure (If Else, Nested If, Select Case), Subroutines, Functions and Events, Arrays, Enumerations, Structures.

Unit-III: (10 periods)

Form, Label, Button, Textbox, Rich text box, Radio Button, Check Box, List Box, Combo Box, Scrollbar, Trackbar, TreeView, Listview, (Basic properties, methods and events of each control)

Unit-IV: (10 periods)

Dialog Boxes(OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog) Menus, MDI Form, Exception Handling - Types Of Error, Error Detection, Exception Handling, Structured Error Handling(Try-Catch-Finally), Throwing Manual Exception.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

- 1) Beginning Visual Basic 2008, Thearon Willis, Bryan Newsome - Wrox Publication, New Delhi, 2008
- 2) Visual Basic 2008 Programmer's Reference, Rod Stephens, Wrox Publication, New Delhi, 2008
- 3) VB.Net in Nutshell , 2 nd Edition., Steven Roman, Paul Lomax, Oreilly

Course Code: COM-521

Course Title: Lab course 1 (Based on COM-511 -DSE-1B(1))

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

Perform following practical using VB.NET

- a) Implement Arithmetic calculator using console.
- b) Develop a program to produce grade sheet using console.
- c) Develop a program to check given number is prime or not using console.
- d) Develop a program to print Fibonacci series using console.
- e) Develop a program to check given number is palindrome or not using console.
- f) Develop a program to factorial of a number using function using console.
- g) Create form to demonstrate use of methods and properties of array.
- a) Display message using Textbox, Label and ButtonControl.
- b) Implement simple textpad to perform undo, redo, cut, copy, paste, select all, find, replace, loadfile, savefile operations using richtextbox.
- c) Create employee registration form to collect details (using radio button, checkbox and other controls).
- d) Create form to select hobbies and nationality using checkbox and radio button.
- e) Create a form to demonstrate use of methods and properties of listbox.
- f) Create a form to demonstrate use of methods and properties of combobox.
- g) Implement canteen order form to take order from customer (using listbox and combobox)
- h) Create a form to change the height and width of label using trackbar.
- i) Implement colour palate to change the backcolor and forecolor of textbox using scrollbar.
- j) Create form to demonstrate use of methods and properties of treeview.
- k) Create MDI application having file menu (New, Open, Save, Print, Close) and Format menu (Font, Forecolor, Backcolor).
- l) Create form to demonstrate use of structured exception handling.

Course Code: **COM-511 –DSE-1C(1)**

Course Title: **Software Engineering**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

- To study Software Development Life Cycle,
- To study different Software Development models
- To study Agile Software development.
- To study software project planning
- To study software cost estimation.

Unit-I: : (10 periods)

Introduction to Software and Software Engineering

The nature of Software, Defining software, Software application domain, legacy software, Unique Nature of WebApps, Software Engineering the Process, Practice, the essence of practice, general principles, Software Myths

Unit-II: : (10 periods)

Software Process Models: Generic Process model, Defining a framework activity, Identifying a task set, process patterns., Process assessment and Improvement, Prescriptive Process Models the waterfall model, Incremental, Evolutionary process Models, concurrent models.

Unit-III: (10 periods)

Specialized Process Models, Component based development, the formal method model, Aspect oriented, Software development, the unified Process and its phases, Personal and team Process Models. Agile Development: what is an Agile and Agile process, Agility principles, politics of agile development, human factors.

Unit-IV: (10 periods)

Software Project Planning: Observations on Estimating, Project Planning Objectives, Software Scope, Obtaining Information Necessary for Scope, Feasibility, Resources, Human Resources, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, The COCOMO Model

UNIT-5: Tutorial and Assignment (05 periods)

Course Code: **COM-521**

Course Title: **Lab course 1 (Based on COM-511 – DSE-1C(1))**

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

A case study is carried out to understand the software development Life cycle. It will content

<p>Course Code: COM-511 – DSE-1D(1) Course Title: Unix Operating System Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective</p> <ol style="list-style-type: none"> 1. Student will get knowledge of basic concepts of Unix like Kernel Shell Multiuser OS, editor etc. 2. The will be able to Connect to a Unix system and use of the command line interface. 3. The student will be able to navigate the Unix file system, view and edit the contents of files 4. Student will get knowledge of different Unix commends. 5. Student will get knowledge of shell scripting and shell commends.
<p>Unit-I: : (10 periods) Working with UNIX-like Systems Brief history of UNIX and LINUX, strengths and weaknesses of UNIX-like operating systems Basic concepts in UNIX-like systems: the kernel, shells, multiuser multitasking operation, remote access, file system, processes, environment and environment variables, the command line, online manual Using the vi editor – modes of operation and switching between them, text navigation, editing text, saving and quitting, using buffers (cut-copy-paste), pattern searching and replacement, undoing and repeating commands Basic commands related to handling files and the file system</p>
<p>Unit-II: : (10 periods) The Bourne Again Shell (bash) Prompts, the command line, quoting and escaping, internal and external commands, the path, shell variables, basic command line processing Using the echo command A quick introduction to basic filters – cat and cut The building blocks approach Input/output redirection Command substitution</p>
<p>Unit-III: (10 periods) Introduction to Shell Scripting Shell scripts Fundamental shell programming constructs – conditional execution, loops, input and output, turning debugging on and off, etc.</p>
<p>Unit-IV: (10 periods) Shell Scripting using Filters Definition of a filter Basic filters like the grep family, expr, sed, etc. Processing the output of commands like ls, ps, who, etc. Processing data in text files (fixed-width format and delimited format)</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. Das S. : Your UNIX – The Ultimate Guide, Tata McGraw-Hill, 2001.
2. Kernighan B. W. and Pike R. : The Unix Programming Environment, Prentice-Hall of India, 1994.
3. Prata S. : Advanced Unix – A Programmer's Guide, BPB Publications, 1986

Course Code: **COM-521**

Course Title: **Lab course 1 (Based on COM-511 – DSE-1D(1))**

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

1. Study of UNIX basic commands: cal, date, echo, printf, bc, script, mailx, passwd, who, uname, tty, stty, pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, more, file, wc, od, cmp,comm, diff, chmod, vi
2. Study of vi editor
3. Write a Script to print "hello world"
4. Write a script to create function.
5. Write a script to study local variables
6. Write a script to study if...else
7. Write a script to study for, while and until
8. Write a script yhat finds the prime factors of a given number.
9. Write a script to check if the two strings are same or not.
10. Write a script that will print a message "Good Morning" or "Good Afternoon" according to the user login time.
11. Study of Unix commands: cmp, find, grep, od, tar, ps, df, du, finge, kill, nice, nonhup, sleep, test,
12. Study of Unix commands: umask, who, cal, tee, expr, uname, fsck, xargs. Filters for stream handling features of the shell for input and output. E.g. pr, head, tail, cut, paste, sort, nl, uniq, tr.

Course Code: COM-512 – DSE-1A(2)

Course Title: Compiler Design

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

- Compiler Design is a fundamental/core subject of Computer Engineering. It teaches how Compiler of a Programming Language works.
- It also focuses on various designs of Compiler and structuring and optimizing various phases of a Compiler.
- It is also necessary to learn types of Grammar, Finite state machines, lex, yacc and related concepts of languages.

Unit-I: : (10 periods)

Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Overview and use of linker and loader, types of Compiler, Analysis of the Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers, Front-end and Back-end of compiler, pass structure

Unit-II: : (10 periods)

Lexical Analyzer Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA.

Unit-III: (10 periods)

Parsing Theory Top Down and Bottom up Parsing Algorithms, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators, Automatic Generation of Parsers. Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, syntax directed definitions and translation schemes

Unit-IV: (10 periods)

Intermediate Code Generation Different Intermediate Forms, Syntax Directed Translation Mechanisms And Attributed Mechanisms And Attributed Definition. Code Generation Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Compilers: Principles, Techniques and Tools By Aho, Lam, Sethi, and Ullman, Second Edition, Pearson, 2014
2. Compilers: Principles, Techniques and Tools By Aho, Sethi, and Ullman, Addison-Wesley, 1986
3. Compiler Design in C By Allen I. Holub, Prentice-Hall/Pearson.

Course Code: **COM-512 – DSE-1B(2)**
Course Title: **Basic Computer Networks**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

- 1 Design and implement Computer Network
- 2 Analyze and troubleshoot Computer Network related problems
- 3 Understand the various network protocols and services
- 4 Understand network security threats and vulnerability, as well as various security protocols and encryption techniques

Unit-I: : (10 periods)

Overview of Computer network and their applications, Network topologies and architectures, Layered network architecture and the OSI reference model, Physical layer and its functions, Transmission medias and their characteristics.

Unit-II: : (10 periods)

LAN,MAN,WAN, IP Address and sub netting, Transmission mode-Simplex, Half-duplex, Full-duplex, Data encoding and modulation techniques, Error detection and correction, Data link layer and its functions.

Unit-III: (10 periods)

Farming, Flow control, Error control in data link layer protocol, Network layer and its functions, Routing algorithms and protocols, IPv4 and IpV6, Transport layer and its functions, Reliable data transfer and flow control.

Unit-IV: (10 periods)

TCP & UDP Protocols, Application layer and its functions, Client server and peer to peer architecture, HTTP, FTP, SMTP, DNS, Encryption and Decryption, Security protocols – SSL/TLS, IPSec, VPN

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Computer Network – by Andrew S. Tanenbaum and David J. Watherall
2. Data Communication and networking – by Behroz A. Forouzan
3. TCP/IP and protocol suit – by Behroz A. Forouzan
4. Computer Networking : A top down approach – by James F. Kurose and Keith W. Ross

Course Code: **COM-512 – DSE-1C(2)**
 Course Title: **Computational Mathematics**
 Total Credits: 02
 Contact Hours: 30 (Clock Hours)
 Marks: 50
 Periods: 45 (45 minutes each)

Objective

To expose the students to the following:

1. Propositional function, statements, well-formed formulas.
2. Set theory concepts like Finite Set, Subset, Empty Set and operations on set.
3. Matrices and its various types.
4. Binary relations, posets, Functions, and pigeonhole principle.
5. Algebraic structures like groups and elementary combinatorics.
6. Various concepts in graphs and trees like its representation and its types.

Unit-I: : (10 periods)

Set Theory:

Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set.

Unit-II: : (10 periods)

Introduction to Matrices: Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix, Rank of a Matrix and Special Matrices.

Combinatorics:

Review of Permutation and Combination, Mathematical Induction - Pigeon hole principle, Principle of Inclusion and Exclusion

Unit-III: (10 periods)

Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Isomorphism, Subgraph, Walks

Unit-IV: (10 periods)

Path and Circuit, Union and Intersection Operation. Graph, Planner Graph, Trees, Pendant Vertices on Tree, Binary Tree, Spanning Tree.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Elements of Discrete Mathematics-A Computer Oriented Approach C. L Liu, D.P. Mohapatra, 3rd edition Tata McGraw Hill.
2. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill
3. Foundations of Computer Science, A. Aho and J. Ullman- W. H. Freeman, 1992.
4. Discrete Mathematics-Dr. Bembalkar

<p>Course Code: COM-512 – DSE-1D(2) Course Title: Matlab Programing Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective</p> <ol style="list-style-type: none"> 1. This course is designed to give science students experience with the Matlab programming language. 2. Apply the skills to evaluate scientific problems. Understand basic concepts in computer science 3. Learn data structures (such as strings, matrices and arrays), data manipulation and presentation (loading data files, computing simple statistics and graphing data), and basic programming techniques
<p>Unit-I: : (10 periods) Handling Data And Data Flow In MATLAB Data Types, Creating Variables, Scalars, Vectors And Matrix Operations & Operators, Importing & Exporting Of Data ,File Input-Output</p>
<p>Unit-II: : (10 periods) File Editing And Debugging In MATLAB, Writing Script Files, Writing Function Files, Inserting Breakpoints And Debugging, Error Correction, MATLAB Graphics ISimple Graphics & Types, Plotting Functions, Creating And Editing Plots (2D & 3D) ,Handling Graphics</p>
<p>Unit-III: (10 periods) Conditional Statements, Iterative Statements, Flow Control, Efficient Coding Practices, Linear Algebra Polynomials, Curve Fitting , Differentiation & Integration</p>
<p>Unit-IV: (10 periods) Introduction To Graphical User Interfaces (GUI), GUI Tools , Creating Functioning GUIs, Introduction To MATLAB Toolboxes</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. Matlab An Introduction With Applications 4Th Edition by Gilat A , John Wiley

Additional Reference:

1. Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Oxford publications.
2. MATLAB and Its Applications in Engineering, Book by Ashok K. Goel, Manoj Kumar Sharma, and Raj Kumar Bansal

Online Resources

1. <https://www.tutorialspoint.com/matlab/index.htm>
2. https://www.youtube.com/watch?v=R3_b2tRcoew

Course Code: **COM-522**

Course Title: **Seminar**

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

Guidelines for seminar:

1. Student should select any topic associated with current trends in computer field individually.
2. The topic should be other than the curriculum.
3. A report is to be submitted.
4. A presentation on the topic choose is to be delivered by the student in the examination.

<p>Course Code: COM-513 – SEC-3 (E) Course Title: Programing in SICLAB Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective</p> <ol style="list-style-type: none"> 1. To explore the various basic feature of SCILAB for a user who has never used numerical computation software. 2. Computations, graphs and illustrations are made with SCILAB
<p>Unit-I: : (10 periods)</p> <p>Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy. Programming Environment: SCILAB Environment, Workspace, Working Directory, Expressions, Constants, Variables and assignment statement, Arrays.</p>
<p>Unit-II: : (10 periods)</p> <p>Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Matrices and Some Simple Matrix Operations, Sub- Matrices. Procedures and Functions: Arguments and return values.</p>
<p>Unit-III: (10 periods)</p> <p>Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop.</p>
<p>Unit-IV: (10 periods)</p> <p>Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list.</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. M.Affouf, SCILAB by Example , CreateSpace Independent Publishing Platform, 2012
2. H. Ramchandran, A.S. Nair, SCILAB , S.Chand, 2011

<p>Course Code: COM-513 – SEC-3 (F) Course Title: R Programing Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective</p> <ol style="list-style-type: none"> 1. Student will learn how to program in R 2. Student will learn how to use R for effective data analysis. 3. Student will learn reading data into R, accessing R packages, 4. Student will learn writing R functions, debugging, profiling R code
<p>Unit-I: (10 periods) Basics to get started up with R. The Background Materials lesson contains Information about course mechanics and installation of R. History of R, basic data types in R, functions for reading and writing data. Operator Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Miscellaneous Operators.</p>
<p>Unit-II: : (10 periods) control structures and functions. Decision Making statements if statement, if...else statement, switch statement, if...else Ladder, ifelse0 function, Loop Introduction, for loop, while Loop, repeat Loop, Break Statement, Next Statement.</p>
<p>Unit-III: (10 periods) loop functions and the debugging tools in R. Matrix Introduction, Matrix Construction, Addition & Subtraction, Multiplication & Division. Simulation Studio, Simulate data in R, profiler in R, data frame introduction and details.</p>
<p>Unit-IV: (10 periods) Filtering and sub setting data aggregate functions, profiling to optimize the R program. str function. Input types CSV, Excel files reading and writing data. Graphics procedures, plot function.</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. R in Action By Robert L. Kabacoff paperback publisher- Dreamtech Press
2. R for Data Science By Hadley Wickham and Garrett Gorlemund, O'Reilly Publication.

Curriculum for Semester VI

<p>Course Code: COM-611 –DSE-2A(1) Course Title: Programming in advance JAVA Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective To understand the Advanced Java features& Programming like .</p> <ul style="list-style-type: none"> • Implement Networking and Data base connectivity in Java for given application. • Implement webpage with dynamic content and server side web application using Servlet and JSP. • Use web application framework JSF to build user interfaces. • Apply Model-View-Controller architecture to build complex client-server applications
<p>Unit-I: : (10 periods) JDBC: JDBC Introduction JDBC Architecture, Types of JDBC Drivers, Introduction to major JDBC Classes and Interface, creating simple JDBC Application, Types of Statement (Statement Interface, Prepared Statement, Callable Statement), Exploring Result Set Operations. Socket Programming: URL class, Inet Address class, URL Connection class, Data Gram Socket class, client side & Server side program</p>
<p>Unit-II: : (10 periods) Applet: Applet life cycle, applet tag, param tag, Graphics class, applet program, awt package. Servlet API : Servlet Interface, Generic Servlet Http Servlet, Servlet Life Cycle Servlet, Example How servlet works? Servlet Request, Servlet Response, Servlet Collaboration Request Dispatcher, Attribute in Servlet Session Tracking, Session Techniques, Cookies in Servlet Cookies: Login & Logout.</p>
<p>Unit-III: (10 periods) Java Server Pages Introduction to JSP , Comparison with Servlet, JSP Architecture, JSP: Life Cycle, Scripting Elements, Directives, Action Tags, Implicit Objects, Expression Language(EL), JSP Standard Tag Libraries(JSTL), JST tags :Function Tags, Formatting Tags, XML Tags, SQL tags.</p>
<p>Unit-IV: (10 periods) JSP Standard Tag Libraries(JSTL) : Struts2 Introduction, What is Struts Struts2 FeaturesModel1 vs Model2Struts 2Core ComponentsInterceptorsValue,StackAction,ContextAction,InvocationOGNLStruts 2 Architecture</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

- 1) Black Book “ Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath ”
- 2) Complete Reference J2EE by James Keogh mcgraw publication
- 3) Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
- 4) SCWCD, Matthew Scarpino, Hanumant Deshmukh, Jignesh Malavie, Manning publication
- 5) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
- 6) Java Persistence with Hibernate by Christian Bauer, Gavin King

- 7) Spring in Action 3rd edition , Craig walls, Manning Publication
- 8) Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication
- 9) Java Server Faces in Action, Kito D. Mann, Manning Publication
- 10) JDBC API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
- 11) Beginning JSP, JSF and Tomcat, Giulio Zambon, Apress
- 12) JSF2.0 CookBook, Anghel Leonard, PACKT publication
- 13) Advanced Java, M. T. Savaliya, dreamtech

Course Code: COM-621

Course Title: Lab course 1 (Based on COM-611 –DSE-2A(1))

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

1. Implement java applet to print "Hello" word.
2. Implement java applet to draw different shapes.
3. Implement java code use of jdbc statements.
4. Implement java program to connect database using DSN
5. Implement java program to print computer IP address
6. Write a java program to communicate client side and server side socket
7. Implement cookies to store firstname and lastname using Java server pages.
8. Program to demonstrate use requestdispatcher using jsp/servlet.
9. Write a Servlet program to print system date and time.
10. Write JSP code to implment JSTL tag structure

Course Code: **COM-611 –DSE-2B(1)**

Course Title: **Programming in ASP.NET**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

- The .NET has become a platform of choice for the development of web based data driven pages among webpage developer community due to its potential and strong features available to develop virtually all kind of dynamic web sites.
- It is a popular platform for development of robust desktop and web based applications.
- Students will be able to use ASP.NET platform for developing web based application with database support.
- Aim of this course is to enable students to develop dynamic and data driven web applications utilizing the power of .NET Technology.

Unit-I: : (10 periods)

Introduction to .NET Framework and ASP.NET :

Microsoft .NET framework Overview, .Net framework Architecture, .Net Framework components: (CLR, CLS, CTS, MSIL, NameSpace, JIT, Metadata, FCL, Assembly, GAC, GC, Memory Management), Features of ASP.NET, Differences between ASP.NET and Classic ASP. Web Applications and Webpage, Client Server Architecture, Parts Of website (HTML,XHTML, CSS, Client side and Server Side Scripting, Database), Creating simple Web Application in ASP.NET.

Unit-II: : (10 periods)

ASP.NET Web Forms and Controls :

Adding Controls to the Web Page, Types of ASP.NET Files, Page Life Cycle Web Form Processing, Stages(Roundtrip), ASP.Net In-Built Objects (Response, Request, Server, Trace Objects), Web Server Controls (Button, Check Box, Check Box List, Drop Down List, HyperLink, Image, Image Button, Label, Link Button, List Box, List Item, Panel, Place Holder, Radio Button, Radio Button List, Text Box) Working with Control Properties and Events, Validation Controls (Required Field Validator, RangeValidator Control, Compare Validator, RegularExpression Validator, Custom Validator, Validation Summary)

Unit-III: (10 periods)

Styles, Themes and Master pages, Styles, Creating Style Sheets, Applying Style Sheet Rules, Themes, How Themes Work, Handling Theme Conflicts, Creating Multiple Skins for the Same Control, Master Page, Basics of Master page, How Master page and Content pages are connected, Nesting Master Pages. Tuples and Sets: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip () Function, Sets, Set Methods, Traversing of Sets, FrozenSet.

Unit-IV: (10 periods)

Connecting Database Using ADO.NET, ADO.NET Architecture, DataProvider, Connection Object, Command Object, DataReader Object, DataAdapter Object, DataSet, DataView, Data Binding, Types of data binding (Single Value, Repeated Value), SQL Data Source, Selecting, Updating and Deleting Records.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. ASP.NET: The Complete Reference Books by Matthew Macdonald , McGraw Hill education
2. Programming in Visual Basic. NET by Julia Case Bradley, Anita C. Millsbaugh, McGraw Hill, latest edition
3. Visual Basic .net Comprehensive Concepts and Techniques by Shelly, Cashman Quasney, Cengage learning, 2012.

Course Code: COM-621

Course Title: Lab course 1 (Based on COM-611 -DSE-2B(1))

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

1. Getting acquainted with Visual Studio environment. (create new web project, open existing web project, building website, and study of toolbars, menu etc.)
2. Develop simple application using .net facility
3. Design a web form to allow user to enter following details in his Resume using Web Server Controls. Set validations using properties. When data is submitted it must be viewed in the panel below the form. Fields of Resume are FirstName, Surname, Gender, Address, City, Pin code, Phone, Qualification (Diploma, Bachelor, Master), Specialization subject, Percentage.
4. Create a web form where user enters following marks. ASP.NET, JAVA, ISS, Project (All out of 100). When user submits the marks, numeric value validation must be done. On entering marks, the grade should be displayed in message box
% > 90 and <=100 AA
 > 80 and <=90 AB
 > 70 and <=80 BB
 > 60 and <=67 BC
 >50 and <=60 CC
 >40 and <= 50 DD
 Else Fail
5. Create a web page using the concept of cascading style sheets in ASP.NET
6. Create a web page using the concept of Theme & Skin in ASP.NET
7. Create Home page of your website using master page concept
8. Create a simple web application to illustrate the concept of nesting master page in ASP.NET
9. Write sample application to connect to database (connection object), Fetching and inserting data from database (command object) and using Data Reader.
10. Create a Web page and test the connectivity of your database with biodata form in exercise 1. If connected, display the message that connection with database is successful, and redirect the user to his homepage
11. Create a login page in your web application. Login page must have user name and password fields. If user enters correct ID, Password, he must be redirected to the homepage of your website.
12. Create a webpage to display the information about user on his homepage once he has logged in through the login form.
13. Create a webpage to bind the user data from database into a gridview dynamically.
14. Create a simple web application that integrates the above concepts of ASP.NET into your application. Suggestive web application can be your own Personal website and host on free domain, Your department website etc,

Course Code: **COM-611 –DSE-2C(1)**

Course Title: **Software Testing**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
- To learn the process of improving the quality of software work products.
- To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Unit-I: : (10 periods)

Introduction to software Quality and Assurance, The software quality challenge, Software quality, Software quality factors, Management and its role in software quality assurance, Components of SQA, The components of the software quality assurance system – overview, Pre-project Software Quality Components, Contract review, Development and quality plans.

Unit-II: : (10 periods)

SQA Components in the Project Life Cycle and Strategies, Integrating quality activities in the project life cycle, Reviews, Software testing – strategies

Unit-III: (10 periods)

Software Testing – Implementation: Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality

Unit-IV: (10 periods)

Software Quality Infrastructure Components Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control, Software Quality Metrics, Software Quality metrics, Cost of Quality

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Quality and Management Standards (ISO, CMMi, ISO/IEC, IEEE, EIA).
2. Kshirsagar Naik and Priyadarshi Tripathy, Software Testing & Quality Assurance- Theory and Practice, Wiley Student edition
3. William E. Perry, Effective Methods for Software Testing, WILEY, . 3rd Edition
4. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
5. M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009

Course Code: **COM-621**

Course Title: **Lab course 1 (Based on COM-611 – DSE-2C(1))**

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

Part 1: Test Planning

- a) Prepare Quality Plan for any Application like online shopping etc.
- b) Prepare Test Plan for any Application like Railway Reservation System etc.

Output: Test plan and Quality Plan

Part 2: Software Testing

- a) Create Test cases (Unit, Integration, System and Acceptance Test Cases) for Application
- b) Perform manual testing using test case created and prepare test Metrics.

Part 3: Software Testing

Test automation – script creation and execution.

Tools: Selenium

Course Code: COM-611 – DSE-2D(1))

Course Title: Android Programming

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

1. To provide basic ideas about how to create mobile application using android operating System
2. Get idea about Android SDK Android development environment.
3. Designing user interface
4. Managing data using SQLite
5. Using Android APIs

Unit-I: : (10 periods)

Introduction to Android, History of Mobile Software Development ,The Open Handset Alliance, The Android Platform Android SDK, Building a sample Android application, Anatomy of Android applications, Android terminologies, Application Context, Activities, Services, Intents Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, Working with different types of resources.

Unit-II: : (10 periods)

Android User Interface Design Essentials, User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Unit-III: (10 periods)

Using Android APIs – Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers

Unit-IV: (10 periods)

Using Android APIs – 2, Using Android Networking APIs,Using Android Web APIs Using Android Telephony APIs, Deploying (selling) your Android application.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, 2nd edition, Pearson Education
2. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
3. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
4. Sayed Y Hashimi and Satya Komatineni, “Pro Android”, Wiley India Pvt Ltd

Course Code: COM-621

Course Title: Lab course 1 (Based on COM-611 – DSE-2D(1))

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the red color with white background.
2. To understand Activity, Intent Create sample application with login module. (Check username and password), On successful login, go to next screen. And on failing login, alert user using Toast. Also pass username to next screen.
3. Create login application where you will have to validate Email ID (Username). Till the username and password is not validated, login button should remain disabled
4. Create and Login application as above. On successful login, open browser with any URL
5. Create an application that will pass some number to the next screen, and on the next screen that number of items should be display in the list.
6. Create spinner with strings taken from resource folder (res >> value folder)
7. Create an application that will change color of the screen, based on selected options from the menu.
8. Create an UI such that, one screen has list of all the types of cars.
9. Create application which have usage of animation
10. On selecting of any car name, next screen should show Car details like: name, launched date, company name, images (using gallery) if available, show different colors in which it is available.
11. Understanding content providers and permissions: Read phonebook contacts using content providers and display in list.

Course Code: **COM-612 – DSE-2A(2)**

Course Title: **Theory of Computation**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

- Theory of computation teaches how efficiently problems can be solved on a model of computation, using an algorithm.
- It is also necessary to learn the ways in which computer can be made to think.
- Finite state machines can help in natural language processing which is an emerging area.

Unit-I: : (10 periods)

Review of Mathematical Theory: Sets, Functions, Logical statements, Proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions

Unit-II: : (10 periods)

Regular Languages and Finite Automata: Regular expressions, regular, languages, applications, Automata with output-Moore machine, Mealy, machine, Finite automata, memory requirement in a recognizer, definition, union, intersection and complement of regular languages. Non Determinism Finite Automata, Conversion from NFA to FA, - Non Determinism Finite Automata Conversion of NFA- \square to NFA and equivalence of three Kleene's Theorem, Minimization of Finite automata Regular And Non Regular Languages – pumping lemma

Unit-III: (10 periods)

Context free grammar (CFG): Definition, Unions Concatenations And Kleen's of Context free language Regular grammar, Derivations and Languages, Relationship between derivation and derivation trees, Ambiguity Unambiguous CFG and Algebraic Expressions BacosNaur Form (BNF), Normal Form – CNF

Unit-IV: (10 periods)

Pushdown Automata, CFL And NCFL: Definition, deterministic PDA, Equivalence of CFG and PDA, Pumping lemma for CFL, Intersections, and Complements of CFL, Non-CFL

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria & Sons
2. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
3. Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall
4. Compiler Design By Alfred V Aho, Addison Wesley
5. Introduction to the Theory of Computation By Michael Sipser

Course Code: **COM-612 – DSE-2B(2)**
Course Title: **Advance Computer Networks**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

- The major components of computer based information systems is computer networks. Through computer networks we can share hardware, Software, Processing, Data and Applications besides getting global connectivity for internet based communication and services.
- To make students learn the technology of establishing, commissioning (making operational) and maintaining computer networks.

Unit-I: : (10 periods)

Protocols and Interfaces in Upper Layers of TCP/IP : Introducing, TCP/IP suite, Explaining Network Layer Protocols, Explaining Transport, Layer Protocol, Explaining Application Layer Protocol, Routing in the Internet Introduction to Intra-domain and inter-domain routings, Unicast Routing Protocols, Multicast Routing Protocols

Unit-II: : (10 periods)

Network Management and Services : Introduction to Network Management, Standard Network Management Protocol, Traffic Engineering Basics : Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Protocols, Time and Delay Consideration, Connectivity, Availability, Reliability, and Maintainability, Throughput Calculation

Unit-III: (10 periods)

Multimedia over Internet : Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet, Explaining IP Multicasting, Explaining VOIP

Unit-IV: (10 periods)

Bluetooth : Bluetooth Architecture, Bluetooth Applications, The Bluetooth Protocol Stack, The Bluetooth Frame Structure.

UNIT-5: Tutorial and Assignment (05 periods)

Course Code: **COM-612 – DSE-2C(2)**

Course Title: **Computational Statistics**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

1. To introduce students to the fundamentals of statistics and their applications in various fields.
2. To develop proficiency in using the R programming language for data analysis and visualization.
3. To teach students essential statistical techniques, including descriptive statistics, inferential statistics, and regression analysis.
4. To enable students to apply statistical methods to real-world datasets and interpret the results.

Unit-I: : (10 periods)

1. **Importance of Statistics in Various Fields** (01 Period): Definition and purpose of statistics, Applications of statistics in different fields, such as: Business and economics (e.g., market research, financial analysis), Healthcare (e.g., clinical trials, epidemiology), Social sciences (e.g., psychology, sociology, political science), Natural sciences (e.g., physics, chemistry, biology), Engineering (e.g., quality control, reliability engineering).
- Introduction to R Programming Language and R-Studio** (05 Period): **Overview of R and its advantages:** Installing R and R-Studio, Navigating the R-Studio interface (console, script editor, environment, plots, and help), R packages and CRAN repository, Basic R Syntax, Data Types, and Operations, **R syntax and expressions**, Data types: numeric, character, logical, factor, and date/time, **Data structures:** vector, matrix, list, and data frame, Basic R operations: arithmetic, relational, and logical, **Control structures:** if-else, for loops, and while loops, Functions: built-in and user-defined.
3. **Measures of Central Tendency (Mean, Median, Mode)** (02 Period): Definition and properties of mean, median, and mode. Calculation of mean, median, and mode using **R** functions: mean, median, and mode, **Measures of Dispersion (Range, Variance, Standard Deviation):** Definition and properties of range, variance, and standard deviation, Calculation of range, variance, and standard deviation using R functions: range, var, and sd.
4. **Introduction to data visualization**(02 period): Importance of data visualizations, types of data visualizations (e.g., bar chart, pie chart, line chart, scatter plot, histogram, box plot), Basic principles of good data visualization.

Unit-II: : (10 periods)

1. **Basics of Probability** Theory: Definition of probability and its properties, Sample space, events, and outcomes, Basic rules of probability: addition rule, multiplication rule, and conditional probability, Independent and dependent events, Bayes' theorem
2. **Discrete Probability Distributions:** Introduction to discrete probability distributions, Probability mass function (PMF), Expected value and variance of discrete random variables, Binomial distribution: definition, properties, and applications, R functions: dbinom, pbinom, qbinom, rbinom, Poisson distribution: definition, properties, and applications, **R** functions: dpois, ppois, qpois, rpois.
3. **Continuous Probability Distributions:** Introduction to continuous probability distributions, Probability density function (PDF) and cumulative distribution function (CDF), Expected value and variance of continuous random variables, Normal distribution: definition, properties, and applications, R functions: dnorm, pnorm, qnorm, rnorm, Exponential distribution: definition, properties, and applications, R functions: dexp, pexp, qexp, rexp
4. **Working with Probability Distributions in R:** Generating random samples from discrete and continuous distributions, Estimating distribution parameters from data, Computing probabilities and

percentiles using R functions, Visualizing probability distributions: histograms, density plots, and empirical CDFs, Fitting probability distributions to data using R packages like fitdistrplus

Unit-III: (10 periods)

- 1. Sampling and Sampling Distributions:** Definition and importance of sampling, Types of sampling methods (e.g., simple random sampling, stratified sampling, cluster sampling), Sampling distribution and its properties, Central Limit Theorem and its implications, Standard error of the mean and its calculation using R: sd and length functions.
- 2. Confidence Intervals:** Definition and purpose of confidence intervals, Interpretation of confidence intervals. Calculation of confidence intervals for population mean (using t-distribution), R functions: t.test, qt, and manual calculation, Calculation of confidence intervals for population proportion, R functions: prop.test and manual calculation.
- 3. Hypothesis Testing:** t-test and chi-square test: Definition and purpose of hypothesis testing, Null hypothesis and alternative hypothesis, Type I and Type II errors, significance level, and power, One-sample t-test, two-sample t-test, and paired t-test, R functions: t.test, Chi-square test for goodness-of-fit and independence, R functions: chisq.test
- 4. Introduction to Linear Regression:** Definition and purpose of linear regression, Simple linear regression model: assumptions and parameters, Estimation of parameters using the least-squares method, Interpretation of the regression coefficients and the coefficient of determination (R-squared), R functions for linear regression: lm, summary, confint, predict, and plot

Unit-IV: (10 periods)

- 1. Data Visualization Techniques in R:** **Histograms:** visualizing the distribution of a continuous variable, R functions: hist, **Box plots:** displaying the five-number summary of a continuous variable, R functions: boxplot, **Scatter plots:** visualizing the relationship between two continuous variables, R functions: plot, **Bar charts:** representing the frequency or proportion of categorical variables, R functions: barplot, table
- 2. Analysing Real-World Datasets and Case Studies**
 - Choosing appropriate datasets for practice and analysis (e.g., from sources like Kaggle, UCI Machine Learning Repository, or government websites)
 - Steps for analysing real-world datasets:
 - 1. Data exploration and pre-processing:** handling missing values, outliers, and data transformations
 - 2. Descriptive statistics:** calculating measures of central tendency, dispersion, and visualizing the data
 - 3. Inferential statistics:** applying hypothesis testing and regression analysis to answer research questions
 - 4. Interpretation and communication of results**

Encourage students to work on real-world case studies related to their interests or field of study

UNIT-5: Tutorial and Assignment (05 periods)

Textbook :

1. "Introductory Statistics with R" by Peter Dalgaard (Springer, 2nd Edition, 2008)
2. "Discovering Statistics Using R" by Andy Field, Jeremy Miles, and Zoe Field (SAGE Publications, 2012)

References:

1. "Statistics for Business and Economics" by Paul Newbold, William Carlson, and Betty Thorne.
2. "Probability and Statistics for Engineers and Scientists" by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye.
3. "Introduction to Probability and Statistics" by William Mendenhall, Robert J. Beaver, and Barbara M. Beaver.

Course Code: **COM-612 – DSE-2D(2)**

Course Title: **Python**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

1. Student will understand basic of Python viz. keywords, data types, built in functions.
2. They will understand python control flow
3. Get Knowledge about Python Functions and strings.
4. Get Knowledge about Python lists, dictionaries, tuples and sets.
5. Get Knowledge about Python file handling and exception handling.
6. Get Knowledge of OPP concepts used in Python
7. Get Knowledge about Python user interface, data analysis and data visualisation.

Unit-I: : (10 periods)

Introduction: Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.

Unit-II: : (10 periods)

Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions. Strings: Creating and Storing Strings; Accessing String Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.

Unit-III: (10 periods)

Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.

Unit-IV: (10 periods)

Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism Definition, Operator Overloading. GU Interface: The Tkinter Module; Window and Widgets; Layout Management- pack, grid and place. Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays;

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. **Think Python How to Think Like a Computer Scientist**, Allen Downey et al., 2nd Edition, 2015, Green Tea Press. Freely available online @ <https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>
2. **Introduction to Python Programming**, Gowrishankar S et al., 2019, CRC Press
3. **Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language**, Fabio Nelli, 2015, Apress®
4. **Advance Core Python Programming**, Meenu Kohli, 2021, BPB Publications
5. **Core PYTHON Applications Programming**, Wesley J. Chun, 3rd Edition, 2012, Prentice Hall
6. **Automate the Boring Stuff**, Al Sweigart, 2015, No Starch Press, Inc.

Course Code: COM-622

Course Title: Project Work / Dissertation

Total Credits: 1.5

Contact Hours: 03 Hours (Week)

Marks: 50

Guidelines :-

1. The synopsis approval will be given by the project Guides
2. The Project work should be either an individual (one) or a group of not more than three members.
3. The project work/Dissertation will focused on survey, planning, designing, coding and testing of the project.
4. The project report will content at least following documentation
 - a. Abstract of the project.
 - b. Current system
 - c. Proposed system.
 - d. User Interview.
 - e. Feasibility Study report.
 - f. Data Flow Diagram
 - g. E-R Diagram
 - h. Data Dictionary/ Table Structure
 - i. Sample Screen Layouts
 - j. Limitations.
 - k. Conclusion.

Course Code: **COM-613 – SEC-4 (G)**

Course Title: **Web Designing**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (45 minutes each)

Objective

1. Understand the basic concepts and principles of web technologies, including HTML, CSS, and JavaScript.
2. Gain practical skills in creating responsive and accessible web designs.
3. Learn how to validate web pages and follow web standards set by the W3C.
4. Develop proficiency in manipulating the Document Object Model (DOM) using JavaScript.

Unit-I: : (10 periods)

1. Web Browsers: Introduction to web browsers, types of web browsers, how they work.
2. Web Servers: Introduction to web servers, types of web servers, how they work.
3. Client-side vs Server-side: Understanding the difference between client-side and server-side processing.
4. Web Standards: Introduction to **web** standards, W3C. HTML validation, CSS validation.
5. **HTML Syntax and Basic Tags:** study the basic syntax of an HTML document, including the doctype declaration, opening and closing tags, and nesting of elements. We will also explore fundamental HTML tags like <head>, <body>, <h1>-<h5>, <p>, <a>, and .
6. **Structure of an HTML Document:** delve into the standard structure of an HTML document, including the <!DOCTYPE> declaration, the <html> element, and the <head> and <body> sections. how to use comments and the proper organization of elements within the document.
7. **HTML Elements and Attributes:** learn about the different types of **HTML** elements, including block-level and inline elements. cover how to use attributes to provide additional information about an element, such as the 'src' attribute for images or the 'href' attribute for links.
8. **Semantic HTML:** explore the importance of using semantic elements in **HTML5**, such as <article>, <section>, <header>, <nav>, and <footer>, and how these elements can enhance the accessibility and search engine optimization of web pages.
9. **HTML5:** study the new features and improvements introduced in HTML5, including multimedia elements like <video> and <audio>, new form input types and attributes, and JavaScript APIs for advanced functionality.
10. **Lists:** learn how to create ordered and unordered lists using the and elements,
11. **Link and Navigation:** study how to create different types of links using the <a> element including internal, external, and anchor links, as well as email and telephone links

Unit-II: : (10 periods)

1. Introduction to CSS

Understanding the purpose of CSS, Syntax and structure of CSS rules, Applying CSS: inline, internal, and external stylesheets, Linking a CSS file to an **HTML** document using the <link> element

2. Basic Selectors

Element, class, and ID selectors, Universal and attribute selectors, Grouping and chaining selectors, Understanding selector specificity

3. Advanced Selectors and Combinators

Descendant, child, and sibling combinators, Pseudo-classes: :hover, :active, :visited, :first-child, :last-child, and :nth-child Pseudo-elements: ::before, ::after, and ::first-letter, Attribute selectors with various matching patterns

<p>4. Box Model: Basics Understanding the CSS box model (content, padding, border, margin), Setting width and height of elements, Managing overflow and scrollbars</p> <p>5. Box Model: Padding, Margin, and Border Setting padding, margin, and border properties, Using shorthand notation for cladding, margin, and border, box-sizing property and its values (content-box, border-box)</p> <p>6. Layout and Positioning: Display Property Understanding the display property (block, inline, inline-block) Using the display property to create layouts Controlling element visibility with display: none and visibility: hidden</p> <p>7. Layout and Positioning: Floats and Positioning Creating multi-column layouts with float Clearing floats with the clear property Static, relative, absolute, and fixed positioning</p> <p>8. Layout and Positioning: Flexbox Introduction to the CSS Flexbox layout system Defining a flex container and flex items Controlling the direction, alignment, and order of flex items Handling flexible sizes and growing/shrinking of items</p> <p>9. Layout and Positioning: CSS Grid Introduction to the CSS Grid layout system Defining a grid container and grid items Setting up grid columns, rows, and gaps Positioning grid items and controlling their size</p> <p>10. Review and Best Practices Review of key concepts covered in the course Organizing and structuring CSS code CSS naming conventions and methodologies (e.g., BEM) Tips for writing maintainable and efficient CSS</p>
<p>Unit-III: (10 periods)</p> <p>1. Advanced HTML: Tables, forms, multimedia, accessibility, SEO.</p> <p>2. Responsive Web Design: Understanding responsive design principles, media queries, fluid grids, responsive images.</p> <p>3. CSS3: Advanced CSS3 techniques, transitions, animations, transforms, and gradients</p>
<p>Unit-IV: (10 periods)</p> <p>1. Introduction to JavaScript: Basic concepts, syntax, and usage.</p> <p>2. Control Structures and Functions: Variables, data types, operators, control structures, functions, and arrays.</p> <p>3. DOM Manipulation: Accessing and manipulating the Document Object Model (DOM) using JavaScript.</p> <p>4. Events and Event Handling: Handling user events, event propagation, and delegation.</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. WEB TECHNOLOGIES 2010 by Uttam K.
2. Learning Web Design: A Beginner's Guide to **HTML**, CSS, JavaScript, and Web Graphics" 5th Edition by Jennifer Niederst Robbins
3. "Responsive Web Design with HTML5 and CSS" by Ben Frain
<https://vdoc.pub/download/responsive-web-design-with-html5-and-css3-5vkOjcsnmdv0>

Additional Reference:

1. "HTML and CSS: Design and Build Websites" by Jon Duckett
2. "Web Design with **HTML**, CSS, JavaScript and jQuery Set" by Jon Duckett
3. "Web Development and Design Foundations with HTML5" by Terry Felke-Morris
4. "Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages" by Elisabeth Robson and Eric Freeman.

<p>Course Code: COM-613 – SEC-3 (H) Course Title: XML Programing Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)</p>
<p>Objective</p> <ol style="list-style-type: none"> 1. Introduction of skills and practices related to Extensible Markup Language (XML). 2. To understand Document Type Definition (DTD) 3. To Understand well-formed and valid XML documents 4. To understand the XML schemes and Extensible Style Language (XSL). 5. Understand the processing of XML document, the parsing technique.
<p>Unit-I: : (10 periods)</p> <p>XML syntax, tags, Entity references, comments, processing instructions, Document type declarations, CDATA section, States of XML, Styling XML, Browsing XML, Parsing XML. Data Type Definitions DTD, data modelling basics, modelling with DTDs, modelling with XML schemas, comparing both approaches. DTD and document structure, internal and external DTDs, valid and well-formed documents, elements and attributes, Elements and types of Elements.</p>
<p>Unit-II: : (10 periods)</p> <p>XML schemas, benefits of schemas, Different Elements: Schema, datatype, ElementType, element, group, AttributeType, attribute, description. XML schema data types, creating document form XML schema. XML Namespace, declaration, default and explicit declaration, referencing schema as namespace, using namespace in schema, document object model</p>
<p>Unit-III: (10 periods)</p> <p>Rendering XML with style sheets, understanding CSS and XSL, comparing CSS and XSL, using CSS and XSL together, processing an XSL style sheet, the architecture of XSL, XSL transformation, XPath, XSL Formatting objects. XSL templates and patterns, XSLT template constructvalue-of, if, for-each, apply templates elements, Developing XSL style sheet.</p>
<p>Unit-IV: (10 periods)</p> <p>XML processing: processing an XML document, Why parse XML, Why Validate an XML document, Document class, Using DTD to validate, DTD with XML EDI, DTD with DOM, Inside XML Parse, parse tree, the well-formed parser, validating parser, parsing a document as tree, parsing a document as Flat data structure, parsers as objects.</p>
<p>UNIT-5: Tutorial and Assignment (05 periods)</p>

Core Reference:

1. XML unleashed by Michael Morrison, et al. Techmedia SAMS.
2. SAMS Teach yourself XML in 21 days by Steven Holzner.