

MALLA REDDY (MR)

(DEEMED TO BE UNIVERSITY)

Recognized under Section 3 of the UGC Act, 1956

School of Computer Science and Engineering

Course Structure and Syllabus

from Academic Year 2025-2026

Approved by AICTE, Accredited by NAAC with 'A++' Grade (Cycle-III)
Maisammaguda, Dhulapally (Post, Via Kompally) Medchal - Malkajgiri. Pin – 500100,
www.mrdtbu.edu.in,

COMPUTER SCIENCE AND ENGINEERING (MR-25 Regulation)										
Course Structure: Semester - I										
S NO	Category	Course Code	Course Details	L	T	P	Credits	CIE	SEE	Total
1	BSC	25UBT02	Mathematical Foundation for Computer Science	3	1	-	4	50	50	100
2	ESC	25UST02	Python for Scientific Computing	3	1	-	4	50	50	100
3	HSMC	25UHT01	Language and Professional Skills	3	1	-	4	50	50	100
4	ESC	25UST01	Foundations of Web Development	3	1	-	4	50	50	100
5	ESC	25USP01	Foundations of Web Development Lab	-	-	3	1.5	50	50	100
6	ESC	25USP02	Python for Scientific Computing Lab	-	-	3	1.5	50	50	100
7	HSMC	25UHP01	Language and Professional Skills Lab	-	-	2	1	50	50	100
8	MC	2500M02	Life Skills for Engineers - I	1	1	-	-	100	-	100
9	MC	25UUM01	Indian Knowledge System	1	1	-	-	100	-	100
			Total	14	6	8	20	550	350	900

COMPUTER SCIENCE AND ENGINEERING(MR-25 Regulation)										
Course Structure: Semester - II										
S NO	Category	Course Code	Course Details	L	T	P	Credits	CIE	SEE	Total
1	BSC	25UBT05	Applied Mathematics for Engineers	3	1	-	4	50	50	100
2	PCC	25UST03	Applied Data Structures with Python	3	1	-	4	50	50	100
3	PCC	25UST04	Web Technologies	3	1	-	4	50	50	100
4	PCC	25UIT01	Cloud Computing Foundations	3	1	-	4	50	50	100
5	PCC	25USP03	Applied Data Structures with Python Lab	-	-	4	2	50	50	100
6	PCC	25USP04	Web Technologies Lab	-	-	4	2	50	50	100
7	MC	2500M03	Life Skills for Engineers - II	1	1	-	-	100	-	100
8	MC	2500M04	Universal Human Values	1	1	-	-	100	-	100
			Total	14	6	8	20	500	300	800

COMPUTER SCIENCE AND ENGINEERING (MR-25 Regulation)										
Course Structure: Semester - III										
S.No	Category	Course Code	Course Details	L	T	P	Credits	CIE	SEE	Total
1	PCC	2505T05	Statistical Foundation for Computer Science	3	1	-	4	50	50	100
2	PCC	2506T01	Artificial Intelligence: Concepts and Techniques	3	-	-	3	50	50	100
3	PCC	2507T02	Cloud Cyber Security	3	1		4	50	50	100
4	PCC	2505T07	Operating System Fundamentals	3			3	50	50	100
5	PCC	2505T08	Object Oriented Programming through Java	3	1	-	4	50	50	100
6	PCC	2505P06	Operating System Lab			3	1.5	50	50	100
7	PCC	2505P07	Object Oriented Programming through Java Lab	-	-	3	1.5	50	50	100
8	PCC	2506IN1	Internship - 1			2	1	50		50
9	PCC	2506SD1	Skill Development Course -1			2	1	50		50
10	PCC	2506SD2	Skill Development Course -2			2	1	50		50
11	MC	2500M05	Environmental Science	1	1		0	100		100
			Total	**16**	**4**	**12**	**24**	**600**	**350**	**950**

COMPUTER SCIENCE AND ENGINEERING (MR-25 Regulation)										
Course Structure: Semester - IV										
S.No	Category	Course Code	Course Details	L	T	P	Credits	CIE	SEE	Total
1	HSMC	250HT03	Management Science	3	1		4	50	50	100
2	PCC	2505T09	Database Management System	3	1		4	50	50	100
3	PCC	2507T03	Cloud Data Analytics	3	1		4	50	50	100
4	PEC	2505T11	Design and Analysis of Algorithms	3			3	50	50	100
5	PCC	2505T12	Software Engineering & Modeling	3			3	50	50	100
6	PCC	2505P09	Database Management Systems Lab			3	1.5	50	50	100
7	PCC	2505P10	Software Engineering & Modeling Lab			3	1.5	50	50	100
8	PCC	2505IN2	Internship -2			2	1	50		50
9	PCC	2505SD3	Skill Development Course -3			2	1	50		50
10	PCC	2505SD4	Skill Development Course -4			2	1	50		50
11	MC	2500M06	Gender Sensitization Lab		1	1		100		100
			Total	**15**	**4**	**13**	**24**	**600**	**350**	**950**

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 250BT02	MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE (Common for CSE, IT, CSE-AIML, CSE-CS & CSE-DS)	L	T	P
Credits: 4		3	1	-

Prerequisites: NIL

Course Objectives: To learn

1. Statement, Connectives and Normal Forms.
2. The theory of inference for the statement calculus, predicate calculus, quantifiers and Relations.
3. The functions, group, homomorphism and isomorphism.
4. The permutations, combinations, Binomial theorem Multinomial theorems and Principle of Inclusion and Exclusion.
5. Concepts of graphs, Trees, Spanning trees, Euler circuit, Hamilton graphs and Chromatic numbers.

MODULE I: Mathematical Logic **[8 Periods]**

Basic Logics - Statements and notations, Connectives, Well-formed formulas, Truth Tables, Tautology. Equivalence Implication, Logical Equivalence, Normal forms.

MODULE II: Predicate Logic and Relations **[10 Periods]**

Predicate Logic – The Theory of Inference for the statement Calculus-Validity using Truth tables. Rules of Inference, Consistency of premises and Indirect Method of proof. Quantifiers, Predicate formulas, Free and Bound variables, The Universe of Discourse. Theory of inference for the predicate calculus.

Relations - Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse diagram, Lattices and its Properties.

MODULE III: Functions and Algebraic Structures **[10 Periods]**

A: Functions - Inverse Function, Composition of functions, recursive Functions.

B: Algebraic structures - Algebraic systems Examples and general properties, Semi-groups and Monoids, Group, Sub-group, Homomorphism, Isomorphism.

MODULE IV: Counting Techniques **[09 Periods]**

Counting Techniques - Basics of counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumeration of Combinations and Permutations with Repetitions, Enumeration of Combinations and Permutations with Constrained Repetitions.

Counting Theorems -Binomial Coefficients, The Binomial and Multinomial theorems, Principles of Inclusion – Exclusion. Pigeon hole principle and its applications.

MODULE V: Graph Theory **[11 Periods]**

Basic Concepts, Isomorphism and sub graphs, Trees and their properties, Spanning Trees, Directed Trees, Binary trees, Planar graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers.

TEXTBOOKS: 1. J P Tremblay & R Manohar, "Discrete Mathematics with applications to Computer Science", Tata McGraw Hill.

REFERENCES:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications", TMH, Fifth Edition.
2. Thomas Koshy, Discrete Mathematics with Applications,, Elsevier.
3. Grass Man, Trembley, Logic and Discrete Mathematics", Pearson Education.
4 C L Liu, D P Nohapatra, "Elements of Discrete Mathematics - A Computer Oriented Approach", Tata McGraw Hill, Third Edition.

E – RESOURCES

Concerned Website links:

1) https://web.stanford.edu/class/archive/cs/cs103/cs103.1132/lectures/09/Small09.pdf (Mathematical Logic)
2) https://www.cs.toronto.edu/~david/course-notes/csc110-111/03-logic/02-predicate-logic.html (Predicate Logic)
3) https://www.geeksforgeeks.org/relation-in-maths/ (Relations)
4) https://testbook.com/maths/function (Functions)
5) https://gecnilokheri.ac.in/GPContent/Discrete%20Mathematics%20Unit4.pdf (Algebraic Structure)
6) https://www.geeksforgeeks.org/permutations-and-combinations/ (Permutations and Combinations)

Course Outcomes: At the end of the course, a student will be able to

1. Apply the concepts of connectives logical equivalence and normal forms in real time applications.
2. Summarize predicate logic, relations and their operations.
3. Describe functions, algebraic systems, groups and homomorphism.
4. Illustrate practical applications of basic counting principles, permutations, combinations, and the pigeonhole methodology.
5. Analyze different types of graphs, Trees, Hamiltonian graphs, Euler Circuit and Chromatic numbers.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO Mapping (3/2/1 indicates strength of correlation) 3- Strong, 2 -Medium, 1-Weak															
COs	Program Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	-	-	1	1	-
CO2	3	3	2	2	2	-	-	-	-	-	-	1	1	1	-
CO3	3	3	3	3	2	-	-	-	-	-	-	1	1	1	-
CO4	3	3	2	3	2	-	-	-	-	-	-	-	1	1	-
CO5	3	3	2	3	2	-	-	-	-	-	-	-	1	1	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 2505T02	PYTHON FOR SCIENTIFIC COMPUTING (Common for All)	L	T	P
Credits: 4		3	1	-

Prerequisites: Programming for Problem Solving

Course Objectives: This course will enable students to

1. Learn syntax and semantics along with the basic data structures of Python
2. Python functions to facilitate code reuse, Handle modules
3. Use Python to read and write files, Explore Python's object-oriented features
4. Understand Exception handling and multithreaded programming in Python.
5. Build GUI programming in Python.

MODULE - I **[10 Periods]**

Introduction: Introduction to Python, Input and Output Functions, Comments, Variables, Data Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Type conversions, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries.

MODULE – II **[9 Periods]**

Functions: Functions, Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Lambda Functions, Recursion.

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, and Other Features of Modules.

MODULE - III **[10 Periods]**

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Classes and Object-Oriented Programming (OOP): OOP, Classes, Class Attributes, Instances, Instance Attributes, Binding and Method Invocation, Composition, Subclassing and Derivation, Inheritance, Built-in Functions for Classes, Instances, and Other Objects, Types vs. Classes/Instances, Customizing Classes with Special Methods, Privacy, Delegation and Wrapping.

MODULE – IV **[10 Periods]**

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module.

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

MODULE - V **[9 Periods]**

GUI Programming: Introduction, Tkinter and Python Programming, Creating Your First Python GUI Application WithTkinter, Adding a Widget, Text and Images With Label Widgets, Clickable Buttons With Button Widgets, User Input With Entry Widgets, Multiline User Input With Text Widgets, Widgets to Frames With Frame Widgets, Standard attributes, Layout Controlling With Geometry Managers, pack( ),place( )grid( ).

Network programs, Using Web Services, Using databases and SQL

Advance Topics: Regular Expression, NumPy, matplotlib, Pandas

TEXT BOOKS

1. Wesley J. Chun, Core Python Programming, Second Edition, Prentice Hall, 2007.
2. Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2011.

REFERENCE BOOKS

1. Allen B. Downey, "Think Python, How to think like a Computer Scientist", First Edition, O'reilly Publishing, 2018.
2. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson India, 2017.
3. Mark Lutz, "Learning Python", Fifth Edition, O'rielly Publishers, 2013.
4. Reema Thareja, "Python Programming: Using Problem Solving Approach", OUP, 2017.
5. RaghunadhP. , "Python Programming", First Edition, AP, 2024

E–RESOURCES

1. Learn Python - Free Interactive Python Tutorial", https://www.learnpython.org/
2. Free Python Tutorial - Python For Beginner," https://www.udemy.com/share/101EfoB UcccV1SQHw
3. "Basics of Python for Data Science", https://olympus.greatlearning.in/courses/11265
4. "Beginners Guide / Programmers - Python Wiki", https://wiki.python.org/moin/BeginnersGuide/Programmers
5. "Introduction to Python", https://www.datacamp.com/courses/intro-to-python-for-data-science

Course Outcomes:

At the end of the course, students will be able to

1. Learn syntax and semantics along with the basic data structures of Python
2. Handle modules, files and packages in Python.
3. Understand exceptions and multithreaded programming in Python

4 Implement Object Oriented Programming concepts in Python.

5. Implement exemplary applications related to GUI Programming in Python.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3		1	-	-	-	-	-	-	1	2	1	-
CO2	-	-	2	1	1	-	-	-	-	-	-	1	1	-	-
CO3	-	-	2	1	1	-	-	-	-	-	-	1	-	-	2
CO4	1	2	3	2	1	-	-	-	-	-	-	1	-	-	3
CO5	-	-	2	2	1	-	-	-	-	-	-	1	-	-	2

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. I Sem		
Code: 250HT0	LANGUAGE AND PROFESSIONAL SKILLS (Common to All)	L	T	P
Credits: 2		2		-

Course Objectives:

This course is designed to improve students' language proficiency, critical thinking, and communication skills through the study of diverse literary works, vocabulary enrichment, grammar fundamentals, and practical applications in listening, speaking, reading, and writing.

This course will enable the students to:

1. Equip students with the ability to analyse and appreciate various literary genres and to achieve proficiency in foundational grammar.
2. Cultivate effective oral communication abilities by mastering listening and speaking techniques and by analysing communication dynamics through case studies.
3. Improve written communication skills, covering critical reading and professional writing.
4. Equip students with practical writing skills necessary for professional communication
5. Develop essential power skills, including creativity, critical thinking, teamwork, and time management, for effective application in both academic and real-world scenarios.

MODULE - I **[10 Periods]**

Theory: Elon Musk on Education (Essay)

Vocabulary: Comprehensive Vocabulary – Synonyms, Antonyms, Prefixes, Suffixes.

Grammar: Phrases, Clauses and Sentences, Synthesis of Sentences

Listening: Importance of Listening, Sub-skills of Listening, Demonstrating Listening Skills

MODULE – II **[9 Periods]**

Theory: Unknown Citizen (A Poem) by W.H. Auden.

Vocabulary: Word Formation, Homophones, Homonyms, Homographs.

Grammar: Articles, Prepositions, Errors Diagnoses.

Speaking: Narration, Descriptions, Case studies dealing with the Communication Process

MODULE - III **[10 Periods]**

Theory: The Tell-Tale Heart (Short Story)

Vocabulary: Idiomatic expressions, One-word Substitutes.

Grammar: Tense and its Aspect- Concord- Noun – Pronoun Agreement

Reading: Critical Reading, Newspaper Reading to enhance creative thinking skills, Reading for Inference and Specific Details.

MODULE – IV **[10 Periods]**

Theory: The Nightingale and the Rose by Oscar Wilde (Short story)

Vocabulary: Transition Words, Words often confused.

Grammar: Voice- Active and Passive- Speech- Direct and Indirect Speech.

Writing: Email and Netiquette, Resume Writing, Technical Report Writing and Letter Writing.

MODULE - V **[9 Periods]**

Theory: The Machine that Won the War (Science Fiction) by Isaac Asimov.

Vocabulary: Analogies, Technical Vocabulary.

Grammar: Adjectives and Degrees of Comparison

Power Skills: Creativity, Critical Thinking, Teamwork, Time Management.

TEXTBOOKS

1. Prompt-English for Digital Natives, 2025

REFERENCE BOOKS

1. Vishwa Mohan, Aysha. (2013). English for Technical Communication for Engineering Students. McGraw-Hill Education India Pvt. Ltd.
2. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar, and Vocabulary. (2nd ed.). Sage Publications India Pvt. Ltd.
3. Laplente, Phillip A., Technical Writing: A Practical Guide for Engineers, Scientists, and Non-Technical Professionals, Routledge, Second Edition.
4. Lester, Mark, and Larry Beason, Handbook of English Grammar and Usage. McGraw-Hill Education, Third Edition.
5. Henning, Serena, Technical Writing: A reference Guide to Reports, E- Mails, Resumes and More. Amazon.in.
6. Effective Academic Writing by Liss and Davis (OUP)
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

E–RESOURCES

1. https://xpressenglish.com/our-stories/machine-that-won-the-war/
2. https://literariness.org/2021/05/29/analysis-of-isaac-asimovs-the-machine-that-won-the-war/
3. https://cummingsstudyguides.net/Guides7/Telltale.html
4. https://www.britannica.com/topic/Brave-New-World
5. https://cummingsstudyguides.net/Guides9/UnknownCitizen.html

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Understand & apply foundational grammar and utilize an expanded vocabulary for effective comprehension and communication.
2. Analyse diverse literary texts and evaluate the effectiveness, accuracy, and nuances of varied spoken and written communications.
3. Create and produce effective written and oral communications.
4. Apply and adapt language for effective professional communication.
5. Develop and exhibit essential power skills, including creativity, critical thinking, teamwork, and time management.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO3
CO1	-	-	-	-	-	-	-	2	2	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	2	-	2	-	2	-	-	-
CO5	-	1	1	-	-	-	1	-	-	2	-	-	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 2505T0	FOUNDATIONS OF WEB DEVELOPMENT (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 4		3	1	-

Course Objectives:

The students able to

- Understand the usage of the HTML5 tags
- Understand the cascaded style sheets, CSS on styling HTML elements,
- Apply JavaScript to web documents for dynamic changes
- Develop responsive web applications with the usage of Bootstrap framework

MODULE – I HTML **[10 Periods]**

Introduction to Anatomy of webpage, Structure of the webpage, Basic Tags, Meta Tags and their impacts on Search Engines, HTML Elements, HTML Headings, HTML Paragraph, HTML Lists , HTML Hyperlink, HTML Tables, HTML Images, HTML iFrame, HTML Block and Inline.
HTML5: Basic tags of HTML5, HTML5 Forms and Attributes, HTML Input Types and Attributes, HTML5 Multimedia Support (Audio – Video and Controls).Tools for web designing.

MODULE – II:CSS MEDIA QUERIES, LAYOUT & ANIMATIONS **[10 Periods]**

Introduction to CSS, CSS Syntax, Types of CSS, CSS Selector, Colors, Backgrounds, Borders, Margins, Padding, Height/Width, Box Model, Outline, Text, Fonts, Icons, Links, Lists, Tables, Display, Max-width, Position, Overflow, Float, Inline-block, align.
Media Query Fundamentals, Media Types Implementation, Media Feature Detection, Logical Operators in CSS, Layout Sizing Properties, Width and Height Manipulation, Minimum/Maximum Constraints, Overflow Control, CSS Grid System, Grid Layout Implementation, CSS Transition Properties, Transform Functions, Animation Key frames, Animation Properties, Animation Timing

MODULE – III:: JAVASCRIPT BASICS AND DOM MANIPULATION **[08 Periods]**

JavaScript Language Basics, Data Type Systems, Variable Declaration, Operators and Expressions, Control Structures, Conditional Statements, Loop Implementations, Function Declaration, Parameter Passing, Document Object Model, DOM Hierarchy, Element Selection Methods, Node Properties, Text Content Manipulation, Attribute Modification, Style Property Access

MODULE – IV:JAVASCRIPT EVENTS & HTTP REQUESTS **[09 Periods]**

Form Structure, Input Element Types, Form Control Components (Textarea, Select), FormValidation, Event Model, Event Listener Registration, Event Propagation, Event ObjectProperties, Asynchronous JavaScript, Callbacks, Scheduler Functions, HTTP Communication,Fetch API Implementation, JSON Data Structure, JSON Parsing and Serialization

MODULE – V: BOOTSTRAP JS FRAMEWORK **[10 Periods]**

Bootstrap Grid System, Container Components, Row Implementation, Column Structure, Display Properties, Flex Utilities, Sizing Utilities, Spacing Utilities, Color Systems, UIComponents (Navbar, Buttons), Dynamic Elements (Carousel), Media Integration, Flexbox, Flex Container Properties, Flex-wrap Mechanics, Flex-direction Applications, Alignment Properties(Align-items, Align-self), Justify-content, Responsive Design Principles

Text Books:

1. Internet and World Wide Web, How To Program by Harvey M. Deitel & Paul J. Deitel, Pearson Publication.
2. A Beginner's Guide JavaScript by John Pollock, McGraw Hill Publication.
3. Javascript The Definitive Guide 7/Ed by David Flanagan, O'Reilly.
4. Bootstrap 5 Foundations by by Daniel Charles Foreman, Daniel Foreman.

References:

1. HTML& CSS: The Complete Reference by Thomas A Powell, McGraw Hill Publication.
2. O'Reilly HTML5 Pocket Reference
3. O'Reilly CSS Pocket Reference
4. O'Reilly JavaScript Pocket Reference

Course Outcomes:

The students able:

- To apply basic HTML tags for designing the static web pages that are building structured content.
- To create CSS cascaded style sheetsfor designing so as to make web pages dynamic.
- To Apply JavaScript to web documents for dynamic changes
- To Apply DOM manipulation techniques to dynamically update web content
- To Develop responsive web applications with the usage of Bootstrap framework and also Fetch API and JSON to manage data and interactwith web servers

CO-PO Mapping (3/2/1indicates strength of correlation) 3-Strong, 2-Medium,1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	-	-	-	-	1	1	3	3	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	3	-
CO3	2	3	3	3	-	-	-	-	-	-	1	1	3	3	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	3	1	-	-	-	-	-	-	2	1	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 2505P0	FOUNDATIONS OF WEB DEVELOPMENT LAB (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 1.5		-	-	3

Course Objectives:

The students able:

- Understand the usage of the HTML5 tags
- Understand the cascaded style sheets, CSS on styling HTML elements,
- Apply JavaScript to web documents for dynamic changes
- Develop responsive web applications with the usage of Bootstrap framework

Experiment 1 (HTML Page)

a) Create a webpage with HTML describing your department. Use paragraph and list tags.
b) Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.
c) Create links on the words e.g. "Wi-Fi" and "LAN" to link them to Wikipedia pages.
d) Insert an image and create a link such that clicking on image takes user to other page.
e) Change the background color of the page. At the bottom create a link to take user to the top of the page.

Experiment 2 (HTML Page with Tables)

a) Create a table to show your class time-table.
b) Use tables to provide layout to your HTML page describing your university infrastructure.
c) Use and tags to provide a layout to the above page instead of a table layout.
d) Use frames such that page is divided into 3 frames 20% on left to show contents of pages,60% in center to show body of page, remaining on right to show remarks.
e) Embed Audio and Video into your HTML web page.

Experiment 3 (CSS)

a) Apply in-line CSS to change colors of certain text portion, bold, underline and italics certain words in your HTML web page. Also change background color of each paragraph using inline CSS.
b) Write all the above styling in CSS in different file (.css) and link it to your webpage such that changes made in CSS file are immediately reflected on the page. Group paragraphs intosingle class and add styling information to the class in CSS.
c) Create a simple form to submit user input like his name, age, address and favorite subject, movie and singer.
d) Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last.

Experiment 4 (JavaScript)

a) Create a form similar to the one in previous experiment. Put validation checks on values entered by the user using JavaScript (such as age should be a value between 1 and 150).
b) Write a JavaScript program to display information box as soon as page loads.
c) Write a JavaScript program to change background color after 5 seconds of page load.
d) Write a JavaScript program to dynamically bold, italic and underline words and phrases based on user actions.
e) Write a JavaScript program to display a hidden div (e.g. showing stats of a player when user clicks on his name).

Experiment 5 (JSON)

a) Design a function find-value that takes a JSON and a Symbol and returns the first JSON pair-value where the pair-name is equal to the given symbol. You should produce some dummy value if the pair does not exist. The dummy value returned should not be a JSON. Be sure to test your function thoroughly!
b) Design json=? which determines if two JSONs are equal. Note that two JSON Objects with the same keys (symbols) that map to the same JSON values are equal, even if the order in the list is not the same.
c) Design a function max-temp which, given a JSON, returns the maximum temperature from the data as a Number (look at the data you got back from the weather service to see what label they use for the maximum temperature). Beware it might be different based on which URL you use.
d) Design a function get-humidity which, given a JSON, returns the humidity from the data as a Number.
e) Design a function current-weather which given a JSON returns a [List of String] of all the descriptions of the current weather from the data for the latest data point.

Experiment 6 (Bootstrap)

a) Install Bootstrap framework and understand various tags, attributes of HTML and other necessary files to make responsive web page.
b) Design web page that shows department name, college name at center of web page by using bootstrap framework and without using bootstrap framework.
c) Create responsive web page of your class time table by using bootstrap grid system.
d) Design responsive web page for student registration form using bootstrap form layout, form control, bootstrap buttons.
e) Create various types of menus using bootstrap menu components such as right aligned dropdown menu, drop up menu, adding headers of each item etc. and glyphicons components.

Course Outcomes:

The students able:

- To apply basic HTML tags for designing the static web pages that are building structured content.
- To create CSS cascaded style sheets for designing so as to make web pages dynamic.
- To Apply JavaScript to web documents for dynamic changes
- To Apply DOM manipulation techniques to dynamically update web content

- To Develop responsive web applications with the usage of Bootstrap framework and also Fetch API and JSON to manage data and interact with web servers

CO-PO Mapping (3/2/1indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	3	-	-	-	2	-	3	3	3	-
CO2	3	3	3	-	-	3	-	-	-	3	-	3	3	3	-
CO3	3	3	3	-	-	2	-	-	-	3	-	2	3	3	-
CO4	3	2	1	-	-	1	-	-	-	1	-	1	-	-	-
CO5	3	1	1	-	-	1	-	-	-	-	-	1	-	-	-

2025-26 Onwards	Malla Reddy (MR) (Deemed to be University)	B.Tech. - I Sem		
Code: 2505P02	PYTHON FOR SCIENTIFIC COMPUTING LAB (Common for All)	L	T	P
Credits: 1.5		-	-	3

Prerequisites: Programming for Problem Solving

Course Objectives:

This course enables the students to develop various applications using python.

Software Requirements: Python IDLE

WEEK-1

1. a) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.

b) Start the Python interpreter and type help( ) to start the online help utility.

2. a) Start a Python interpreter and use it as a Calculator.

b) Write a program to purposefully raise Indentation Error and correct it.

c) Write a program to demonstrate different number data types in Python

3. a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).

b) Write a program to perform different Arithmetic Operations on numbers in Python.

WEEK-2

1. a) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero

b) Write a Program for checking whether the given number is even number or not.

2 a) Write a Python script that prints prime numbers less than N (N to be taken from user), and print the sum of all primes.

b) Write a program, that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . ., 1/10, using for loop

3) Print the below triangle using for loop.

```
2   2                   *   *   *
3   3   3           *   *   *   *   *
2   2   2   2   *   *   *   *   *   *   *
1   1   1   1   1
```

WEEK-3

1. a) Write a program to create, concatenate and print a string and accessing sub- string from a given string

b) Write a program to count the numbers of characters in the given string and store them in a dictionary data structure

2 a) Write a program to combine two lists into a dictionary.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

WEEK-4

1.a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
b) Write a python program to define a module and import a specific function of that module to another program.

2. a) Write a function reverse to reverse a list. Without using the reverse function.
b) Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len( ), to check the length of a string.

WEEK-5

1. a) Write a program to perform addition of two square matrices
b)Write a program to perform multiplication of two square matrices

2 a)Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
b)Write a program to print each line of a file in reverse order.
c)Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
d)Write a program to compute the number of characters, words and lines in a file.

WEEK-6

1. a)Program to implement Animal Communication using Inheritance
b)Program demonstrates encapsulation by managing bank account details

2 a)Program to implement Vehicle Engine Startup using Abstraction
b)Program to draw different shapes by using Polymorphism

WEEK-7

1. a)Program to implement Bank Account Management System using Exception handling?
b)Basic calculator that performs arithmetic operations and handles exceptions for invalid inputs and operations.

2. a)program to implement user registration system using Exception Handling?

b) Program to implement multi-threading with threading module?

WEEK-8

1.a)Write a GUI for an Expression Calculator using tkinter
b)A simple to-do list application where users can add and remove tasks.

2.a)Write a GUI Application for student registration form using tkinter?
b) Write a GUI Application for Employee Login Page form using tkinter?

WEEK-9

1. Write a python programming to implement Stack and Queue using array

2. Write a python programming to implement Single Linkled List

WEEk-10

1. Write a python program to implement various methods in Numpy, Matplotlib and Pandas

TEXT BOOKS

1. Wesley J. Chun, Core Python Programming, Second Edition, Prentice Hall, 2007.
2. Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2011.

REFERENCE BOOKS

1. Allen B. Downey, "Think Python, How to think like a Computer Scientist", First Edition, O'reilly Publishing, 2018.
2. VamsiKurama, "Python Programming: A Modern Approach", Pearson India, 2017.
3. Mark Lutz, "Learning Python", Fifth Edition, O'rielly Publishers, 2013.
4. RaghunadhP. , "Python Programming", First Edition, AP, 2024

Course Outcomes

At the end of the course, students will be able to

1. Able to learn core Python scripting elements such as variables and flow control structures
2. Able to know how to work with lists and sequence data
3. Able to write Python functions to facilitate code reuse
4. Able to use Python to read and write files
5. Able to manage exceptions, implement multi-threading, and create GUIs with Tkinter in Python.

CO- PO,PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	-	2	-	-	-	-	-	-	1	2	1	-
CO2	-	-	2	1	2	-	-	-	-	-	-	1	1	-	-
CO3	-	-	2	1	1	-	-	-	-	-	-	1	-	-	2
CO4	1	1	3	2	1	-	-	-	-	-	-	1	-	-	3
CO5	-	-	2	2	1	-	-	-	-	-	-	1	-	-	2

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. I Sem		
Code: 250HP0	LANGUAGE AND PROFESSIONAL SKILLS LAB (Common to All)	L	T	P
Credits: 1		-	-	2

Course Objectives:

This course is designed to develop effective communication skills through focused learning in acoustics, pronunciation, interactive communication, and structured expression.

This course will enable the students to:

1. Master accurate English pronunciation and articulation, including speech sounds, word stress, rhythm, and intonation, to reduce mother tongue influence.
2. Effectively comprehend and document information from varied audio sources.
3. Participate confidently in a range of interactive communication contexts, including formal presentations and spontaneous discussions.
4. Articulate descriptive and expressive content effectively across both oral and various written formats.
5. Participate proficiently in formal communication settings and integrate an expanded vocabulary.

MODULE - I **[8 Periods]**

Speech Sounds -Building correct Pronunciation/articulation of words & symbols consulting dictionary and developing fluency through practice, Ice- Breaking Activity, Introducing Oneself and Others, Non-Verbal Communication, Conversations (Greetings and Taking Leave), JAM Session.

MODULE – II **[9 Periods]**

Errors in Pronunciation, Fun with English- Tell a story in just six words (include articles, prepositions and conjunctions), Making a Short Speech – Extempore,SWOC Analysis.

MODULE - III **[7Periods]**

Descriptions of current and past events, Jigsaw Activity with Newspapers, Expression through Structured Talk, Describing cartoons, Building and playing with GRE words

MODULE – IV **[8 Periods]**

Minimizing Mother Tongue interference to improve fluency. (Mind your Language), Make a Brochure, Journaling,writing a Book Review, A letter to your future self, "What if" Scenarios.

MODULE - V **[7 Periods]**

Debating, Panel Discussion, TEDx Talks (Listening to Achievers, Eminent Personalities), Listening to Technical Seminar Speeches.

Text Books:

1. Leaver, Betty Lou, and Boris Shekhtman- **Developing Professional-Level Language Proficiency**
2. Steve Hart **-Expand Your English.**
3. Mahanand Anand- **English for Academic and Professional Skills**

REFERENCE BOOKS

1. Shobha, KN&Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
2. Kumar, Sanjay & Lata, Pushp. (2019). Communication Skills: A Workbook. Oxford University Press
3. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities. Orient Black Swan Pvt. Ltd.
4. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press
5. Cambridge IELTS by Cambridge University Press
6. How to prepare for the TOEFL iBT 12th edition by Pamela. J Sharp, Galgotia Publications
7. The GRE for Dummies, 2nd edition by Suzee Vik, Comdex Computer Publishing.

E–RESOURCES

1. Listening Skills (Audio Lectures, Audio Dialogues), https://takeielts.britishcouncil.org/take-ielts/prepare/free-ielts-english-practice-tests/listening
2. SWOC Analysis, https://www.oneeducation.org.uk/how-to-conduct-a-swot-analysis-for- students/
3. "Jill Diamond for Rhythm and Intonation", https://www.byjilldiamond.com/blog/speak-english-with-confidence-and-inner-trust-a-foundational-lesson
4. Neutralization of Mother Tongue Influence| Mind your Language
5. Listening for British and American Pronunciation| https://www.espressoenglish.net/british-english-vs-american-english-pronunciation/

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply phonetic knowledge and practice to produce accurate English pronunciation, thereby minimizing mother tongue influence. *(*Applying, Creating*)*.
2. Analyze and evaluate spoken content from diverse audio sources to extract key information and construct effective notes. *(*Analyzing, Evaluating, Creating*)*.
3. Engage confidently and effectively in various interactive communication contexts and deliver prepared and impromptu public speeches. *(*Applying, Creating*)*.
4. Articulate descriptive and expressive content effectively across both oral presentations and diverse written formats. (Creating)
5. Participate proficiently in formal communication settings and integrate an expanded, contextually appropriate vocabulary. (Applying, Evaluating, Creating)

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	3	3	-	1	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	2	3	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	1	2	1	-	1	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 25S0M02	LIFE SKILLS FOR ENGINEERS – I (Quantitative Aptitude) (Common for All)	L	I	P
Credits: 0				-

Course objectives:

The Quantitative Aptitude course is designed to equip students with essential mathematical and analytical skills required for various competitive exams, academic pursuits, and real-world problem-solving scenarios. The primary objective of this course is to enhance participants' numerical ability and logical reasoning, enabling them to tackle quantitative questions with confidence and efficiency.

MODULE - I **[6 Periods]**

Quants: Percentages, Profit and Loss.

Percentages- Percentage Increase/Decrease; Results on Population; Results on Depreciation.
Profit & Loss- Cost Price; Selling Price: Profit or Gain; Gain Percentage; Loss Percentage.

Logical: Blood Relation

Blood Relations- Classification of blood relations, Pointing a person, Equation related problems.

MODULE - II **[8 Periods]**

Quants: Interests

Interests- Types of interest; Simple interest; principle; Rate of interest; compound interest; interest is compounded Annually; interest is compounded Half-yearly; interest is compounded Quarterly; Rates are different for different years, say $R_1\%$, $R_2\%$, $R_3\%$ for 1st, 2nd and 3rd year respectively; Present worth of Rs. x due n years.

Logical: Clocks

Clocks: Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss problems.

MODULE - III **[6 Periods]**

Quants: Ratio and Proportion, Averages

Ratios & Proportion- The ratio of two quantities a and b in the same units; Proportion; The equality of two ratios is called proportion; Fourth Proportional; Mean Proportional; Comparison of Ratios; Duplicate Ratios; Variations.
Averages- Average Speed, Weighted average.

Logical: Coding and Decoding

Coding and Decoding- Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.

MODULE - IV **[6 Periods]**

Quants: Time and Work;

Time & Work- Work from Days: Calculate the one-day work; Days from Work: Shortcut to calculate the work in given time.

Logical: Directions

Directions - Introduction, Direction based questions, Shadow based problems.

MODULE - V **[6 Periods]**

Quants: Mixtures and Alligations

Alligation- Mean Price; Rule of Alligation; a container contains x of liquid from which y units are taken out and replaced by water;

Logical: Cubes

Cubes- Cube & cuboid concepts, 3-2-1-0 faced problems.

Text Books:

1. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal

Reference Books:

2. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma
3. "Fast Track Objective Arithmetic" by Rajesh Verma
4. "Magical Book on Quicker Maths" by M. Tyra
5. "Quantitative Aptitude Quantum CAT" by Sarvesh K. Verma

e-Resources:

1. Khan Academy (https://www.khanacademy.org/):
2. MathIsFun (https://www.mathsisfun.com/)
3. GMAT Club (https://gmatclub.com/)
4. IndiaBIX (https://www.indiabix.com/)
5. Studytonight (https://www.studytonight.com/)

Course Outcomes:

After completion of the course students will be able to:

1. Develop Strong Mathematical Foundations: Gain a comprehensive understanding of fundamental mathematical concepts, including arithmetic, algebra, geometry, and data interpretation, providing a solid basis for tackling quantitative problems.
2. Enhance Problem-Solving Skills: Learn diverse problem-solving techniques and strategies to approach quantitative questions in a systematic manner, enabling efficient and accurate solutions.
3. Improve Speed and Accuracy on Averages: Practice through a variety of exercises and timed quizzes to enhance computational speed and precision, vital for competitive exams

and time-sensitive tasks.

4 Master Time and work: Acquire skills in interpreting data from time and work scenarios decisions based on the given information.

5. Build Allegation and mixtures: Strengthen logical reasoning abilities to analyze and deduce patterns, aiding in solving complex quantitative problems.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1 -Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO3	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO4	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO5	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - I Sem		
Code: 25OOMO1	INDIAN KNOWLEDGE SYSTEM (Common for All)	L	T	P
Credits: 0		-		-

Pre requisite: NIL

Course Objectives:

1. Creating awareness amongst the youths about the true history and rich culture of the country;
2. Understanding the scientific value of the traditional knowledge of Bhārata;
3. Promoting the youths to do research in the various fields of Bhāratīya knowledge system;
4. Converting the Bhāratīya wisdom into the applied aspect of the modern scientific paradigm;
5. Adding career, professional and business opportunities to the youths.

Module -I: Bhāratīya Civilization and Development of Knowledge System **[4 hours]**

Genesis of the land, Antiquity of civilization, On the Trail of the Lost River, Discovery of the Saraswatī River, the Saraswatī-Sindhu Civilization, Traditional Knowledge System, The Vedas, Main Schools of Philosophy (6+3), Ancient Education System, the Takṣaśilā University, the Nālandā University, Alumni, Knowledge Export from Bhārata.

Module-II: Arts, Literature, and Scholars **[4 hours]**

Art, Music, and Dance, Naṭarāja– A Masterpiece of Bhāratīya Art, Literature, Life and works of Agastya, Lopāmudrā, Ghoṣā, Vālmīki, Patañjali, Vedavyāsa, Yājñavalkya, Gārgī, Maitreyī, Bodhāyana, Caraka, Suśruta, Jīvaka, Nāgārjuna, Kaṇāda, Patañjali, Kauṭīlya, Pāṇini, Thiruvalluvar, Āryabhaṭa, Varāhamihira, Ādi Śaṅkarācārya, Bhāskarācārya, Mādhavācārya.

Module-III: Science, Astronomy, and Mathematics **[4 hours]**

Concept of Matter, Life and Universe, Gravity, Sage Agastya's Model of Battery, Velocity of Light, Vimāna: Aeronautics, Vedic Cosmology and Modern Concepts, Bhāratīya Kāla-gaṇanā, Kerala School for Mathematics and Astronomy, History and Culture of Astronomy, Sun, Earth, Moon, and Eclipses, Earth is Spherical and Rotation of Earth, Archaeostronomy; Concepts of Zero and Pi, Number System, Pythagoras Theorem, and Vedic Mathematics.

Module-IV: Engineering, Technology, and Architecture **[4 hours]**

Pre-Harappan and Sindhu Valley Civilization, Laboratory and Apparatus, Juices, Dyes, Paints and Cements, Glass and Pottery, Metallurgy, Engineering Science and Technology in the Vedic Age and Post-Vedic Records, Iron Pillar of Delhi, Rakhigarhi, Mehrgarh, Sindhu Valley Civilization, Marine Technology, and Bet–Dwārkā.

Module-V: Life, Environment, and Health **[4 hours]**

Ethnic Studies, Life Science in Plants, Anatomy, Physiology, Agriculture, Ecology and Environment, Āyurveda, Integrated Approach to Healthcare, Medicine, Microbiology, Medicine, Surgery, and Yoga, etc.

Text books:

1. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,
2. Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).

Reference Books:

1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

Course outcomes:

At the end of the course the student shall be able to

1. Discover the true history and examine the rich culture of India.
2. Compare the art and literary work of the renowned scholars of Bhārata.
3. Compare and contrast the contributions of Bhārata scholars in the field of Science and Engineering.
4. Evaluate the applicability of the ancient Indian Knowledge to the modern day knowledge.
5. Explore the career opportunities in the realm of Indian Knowledge System

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1- Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	2	-	-	-	-	3	-	-	-
CO2	2	2	2	-	-	-	3	-	-	-	-	2	-	-	-
CO3	3	3	2	-	-	-	3	-	-	-	-	2	-	-	-
CO4	3	2	2	-	-	-	3	-	-	-	-	3	-	-	-
CO5	3	3	2	-	-	-	3	-	-	-	-	3	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University			B.Tech. II Sem
Code: 250BT05	APPLIED MATHEMATICS FOR ENGINEERS (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 2		3	1	-

Course Objectives: To learn

1) The types of matrices, finding the inverse of a matrix, rank of a matrix, and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if any exist.
2) Eigen values and Eigen vectors of a matrix, Diagonalisation of a matrix, the Cayley Hamilton theorem, and reducing a quadratic form into a canonical form through an orthogonal transformation.
3) Define Linear Transformations and find the find the Domain, Range, Kernel, rank, and nullity of a linear transformation.
4) Apply vectors, inner products, and linear transformations to real world situations.

MODULE I: Matrices **[8 Periods]**

Matrices: Types of Matrices; Determinant of a matrix, Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, Solving systems of Homogeneous and Non-Homogeneous linear equations.

MODULE II: Eigen Values and Eigen Vectors **[8 Periods]**

Eigen values, Eigen vectors and their properties; Diagonalisation of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem.

Module-III: Quadratic Forms and Vector Spaces **[8 Periods]**

A) Quadratic forms: Nature, rank, index and signature of the Quadratic Form, Reduction of the Quadratic form to canonical forms by the Orthogonal Transformation Method.

B) Vector Spaces: Vector spaces, general properties of vector spaces, vector subspaces, algebra of subspaces(Only Definition and problems).

Module-IV:Basis, Dimensions and Linear Transformations **[10 Periods]**

Linear combination of vectors Linear independence and dependence of vectors. basis and dimension. (Only Definition and problems) Linear transformations. (Only Definition and problems)

Module-V: Inner product spaces **[12 Periods]**

Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Orthogonality, normed vector space, Schwartz inequality, triangular inequality, Bessel's inequality, Gram-Schmidt orthogonalisation process. (Only statement and problems)

Text Books.

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna PrakashamMandir, Meerut-250002

Reference Books:

1. Feryal Alayont Steven Schlicker ,Linear Algebra and Applications An Inquiry-Based Approach , Grand Valley State University.
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education (low priced edition), New Delhi.

E – RESOURCES

Concerned Website links:

1. https://www.geeksforgeeks.org/how-to-solve-a-system-of-equations-using-inverse-of-matrices/?ref=asr8 (Matrices)
2. https://math.mit.edu/~gs/linearalgebra/ila5/linearalgebra5_6-1.pdf (Eigen Values and Eigen Vectors)
3. https://www.youtube.com/watch?v=1XlT3Y2oyAU&list=PLU6SqdYcYsfJOGZdxUpDk3w9o-w94-RoG (Vector Spaces)
4. https://www.youtube.com/watch?v=iv-_koxJocg&list=PL8D5taFfp6CwQvDXokBOxb9hzLqZKm6mz (Basis And Dimensions)
5. https://www.youtube.com/watch?v=chZWTsNFFwE&list=PL8D5taFfp6Cyo-JAnqStPkQuVtokBk1o2 (Inner product Space)

Course Outcomes: After completion of the course, the student should be able to

CO 1 : Find the Rank of a matrix, inverse of a matrix and analyse the solution of system of linear equations.

CO 2 : Find the Eigen values and Eigen vectors of a matrix, Diagonalisation of a matrix, verification of Cayley Hamilton theorem and Reduce the quadratic form to canonical form.

CO 3 : Be able to define Linear Transformations and find the find the domain, range, kernel, rank, and nullity of a linear transformation.

CO 4 : Be able to apply vectors, inner products, and linear transformations to real world situations.

CO 5 : Use computational techniques and algebraic skills essential for the study of systems of Linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, Orthogonality and Diagonalisation

CO-PO Mapping (3/2/1 indicates strength of correlation) 3- Strong, 2-Medium, 1-Weak												
COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	2	3	3	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	-	-	3	2	-	-	-	-	-	3	2
CO4	-	2	2	2	3	-	-	-	-	-	2	2
CO5	2	2	2	3	3	-	-	-	-	-	-	2

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - II Sem		
Code: 25DS103	APPLIED DATA STRUCTURES with PYTHON (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 4		3	1	-

Prerequisites: A course on "Programming for Problem Solving "

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

Module-I **[10 Periods]**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

Module-II **[09 Periods]**

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

Module-III **[10 Periods]**

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Definition and example of Red–Black, Splay Trees.

Module-IV **[10 Periods]**

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Max Heap, Min Heap, Heap Sort. External Sorting: Model for external sorting, Merge sort.

Module-V **[09 Periods]**

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer–Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

Text Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C– A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI / Pearson Education.

References:

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F. Gilberg and B.A. Forouzan, Cengage Learning.

E-Resources:

1. http://gvpcse.azurewebsites.net/pdf/data.pdf
2. http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMApVUMmjlExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

Course Outcomes:

At the end of the course, students will be able to

COs	Course Outcome	Bloom's Taxonomy Level
CO1	Ability to select the data structures that efficiently model the information in a problem.	Understand
CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations.	Understand
CO3	Implement and know the application of algorithms for sorting and pattern matching.	Analyze
CO4	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.	Understand

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1_Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	3	2	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	-	2	1
CO4	-	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University			B.Tech. - II Sem
Code: 23CS104	WEB TECHNOLOGIES (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 4		3		-

COURSEOBJECTIVES:

- Translate user requirements into the overall architecture and implementation of newsystems and Manage Project and coordinate with the Client.
- Write backend code in Python/Java, PHP languages and Writing optimized frontend code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code tovalidate the applications against client requirement.
- Monitor the performance of web applications & infrastructure and Troubleshootingweb application with a fast and accurate a resolution.

MODULE– I

Introduction to Modern Java script, Asynchronous Programming Basics. Callback Functions. Callback Hell and Management. Timer Functions (setTimeout, setInterval). Promises: Creating Promises, Consuming Promises, Promise Chaining, Promise.all. Async/Await Syntax. Async/Await Error Handling. Practical API Request Implementation.

MODULE – II

Introduction to Object oriented programming, Introduction to Node & React JS,Installation procedure, File structure of React JS, executing react app with node server,Introduction to JSX, JSX Syntax and Usage, Virtual DOM Concepts, React Developer Tools, Introduction to components, kinds of components, composition,Types of Components: Functional Components, Class Components, Styling React components, React DOM, Props Communication, Hooks Overview, State Management using useState() hook.

MODULE - III

Component Lifecycle Overview: Mounting Phase, Updating Phase, Unmounting Phase. Side Effects Management using useEffect Hook, Cleanup Functions. Handling User Interactions. Event Handling Techniques. Conditional Rendering. Form Handling (Controlled and Uncontrolled Components). Dynamic Lists. Keys for Dynamic Content.

MODULE - IV

React Hooks: use Hook, use Reducer Hook usage and implementation. Creating Custom Hooks. Application Routing with React Router: Route Setup and Implementation, Navigation Components, Route Parameters, Nested Routes, use Params() hook.

MODULE - V

Advanced State Management: Context API for Global State, Reducer Patterns in React. Client-Server Communication. Authentication Flow with JWT: Protected Routes, Token Management. Security Best Practices.

TEXTBOOKS:

1. Git and Github Guide: The Basics, Jerry N. P., Kindle Edition.
2. HTML5 and CSS3, Andy Harris, Wiley Brand, 2014
3. Rediscovering JavaScript, Master ES6, ES7, and ES8, Venkat Subramaniam,Pragmatic Bookshelf, 2018
4. Mastering Bootstrap 4, Benjamin Jakobus, Jason Marah, Packt Publishers, 2019
5. Learning React Functional Web Development with React and Redux, Alex Banks,Eve Porcello Publisher: O'Reilly Media

REFERENCE BOOKS:

1. Jake Spurlock, Bootstrap: Responsive Web Development, Oreilly Publishers,2019
2. Anthony Accomazzo, Nate Murray, Ari Lerner, Clay Allsopp, David Guttman &Tyler McGinnis, Fullstack React, Newline Publications,https://www.newline.co/fullstack-react
3. "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello.
4. "CSS Secrets: Better Solutions to Everyday Web Design Problems" by Lea Verou

Web Link:

1. Swayam NPTEL: https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2. Coursera: https://www.coursera.org/learn/developing-frontend-apps-with-react#modules

COURSE OUTCOMES

At the end of the course, student will be able to

- Understand Git and GitHub environment for project deployment, flexbox and mediaqueries for mobile first application building and responsiveness pages withbootstrap
- Apply Java Script ES6 and JSON for Develop Web Applications
- Create applications using ReactJS with the help of Scripting Languages &Frameworks
- Create apps by rendering data from various file formats.
- Working with the Files in React JS and Constructing Elements with Data

CO-PO,PSOMapping
(3/2/1indicates strength of correlation)3-Strong, 2-Medium,1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	-	-	-	-	1	1	3	3	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	3	-
CO3	2	3	3	3	-	-	-	-	-	-	1	1	3	3	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	3	1	-	-	-	-	-	-	2	1	-	-	-

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. II Semester		
Code: 25O / 101	Cloud Computing Foundations	L	T	P
Credits: 4		3	1	-

Prerequisites

- Basic computer literacy
- No prior knowledge of networking, databases, operating systems, or machine learning is required.

Course Objectives

1. Understand and implement fundamental linear data structures such as linked lists, stacks, and queues using Python.
2. Develop Python programs to perform operations on non-linear data structures including trees and graphs using appropriate traversal techniques.
3. Apply efficient searching, sorting, and pattern matching algorithms to solve computational problems and analyze their performance.
4. Evaluate the time and space complexity of various data structures and algorithms to select suitable solutions for different applications.
5. Develop problem-solving, analytical thinking, and programming skills for designing efficient data structure-based solutions to real-world problems.

MODULE I – Computing Paradigms & Cloud Basics **[10 Periods]**

Overview and comparison of computing paradigms, fundamentals of cloud computing, its evolution, principles, essential characteristics, and deployment models.

MODULE II– Cloud Architecture & Service Models **[10 Periods]**

Cloud versus traditional architecture, IaaS–PaaS–SaaS models, Google Cloud overview, virtual machines, autoscaling, event-driven computing, and container orchestration concepts.

MODULE III – Cloud Storage & Security Fundamentals **[10 Periods]**

Cloud storage models, data types, SQL and NoSQL services, shared responsibility model, IAM basics, and data encryption mechanisms.

MODULE IV – Cloud Networking & Resource Management **[10 Periods]**

Cloud networking fundamentals, IP addressing, VPCs, firewalls, routing, load balancing, infrastructure deployment, and cloud monitoring and management.

MODULE V – Data, AI & Cloud Applications **[10 Periods]**

Big data and cloud analytics overview, managed data and AI services, machine learning in the cloud, AutoML concepts, and industry-oriented cloud case studies.

Course Outcomes (COs)
After completing the course, students will be able to:

1. Implement linear data structures such as singly, doubly, and circular linked lists, stacks, and queues using Python.
2. Develop and analyze efficient sorting, searching, and pattern matching algorithms for solving computational problems.
3. Design and implement tree-based data structures including Binary Search Trees, B-Trees, and B+ Trees, and perform recursive and non-recursive traversals.
4. Implement graph traversal algorithms such as Breadth First Search (BFS) and Depth First Search (DFS) to solve graph-related problems.
5. Apply appropriate data structures and algorithms to design efficient software solutions while evaluating their computational complexity and performance.

TEXT BOOKS:

1. **Rajkumar Buyya, James Broberg, Andrzej Goscinski,** *Cloud Computing, Principles and Paradigms,* Wiley India

2. **Thomas Erl, Ricardo Puttini, Zaigham Mahmood,** *Cloud Computing: Concepts, Technology & Architecture,* Pearson

3. **Ria Singh, Dr. M. P. Singh,** *Introduction to Cloud Computing,* McGraw Hill

REFERENCE BOOKS:

1. **Barrie Sosinsky,** *Cloud Computing Bible,* Wiley

2. **Kai Hwang, Geoffrey Fox, Jack Dongarra,** *Distributed and Cloud Computing: From Parallel Processing to the Internet of Things,* Morgan Kaufmann

3. **Dan C. Marinescu,** *Cloud Computing: Theory and Practice,* Morgan Kaufmann

4. **Nick Antonopoulos, Lee Gillam,** *Cloud Computing: Principles, Systems and Applications,* Springer

Online Learning Resources (Highly Recommended)

1. NPTEL Cloud Computing – Prof. Rajkumar Buyya (IISc Bangalore)
2. Introduction to Cloud Computing – IIT Kharagpur / IIT Madras

Google Cloud

1. **Google Cloud Skills Boost**
2. **Google Cloud Documentation (Beginner Guides)**

CO – PO Mapping Table

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COS	ProgrammeOutcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	-	-	-	-	2	2	1	
CO2	3	3	2	2	3	-	-	-	-	-	-	2	2	1	
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	1	
CO4	3	3	3	3	3	-	-	-	1	-	-	2	2	1	
CO5	3	3	3	3	3	-	-	-	2	1	-	3	2	1	

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - II Sem		
Code: 2505P03	APPLIED DATA STRUCTURES with PYTHON LAB (Common for CSE, IT, CSE-AIML, CSE-CS and CSE-DS)	L	T	P
Credits: 2		-	4	

Prerequisites: A Course on "Programming for problem solving"

Objectives:

- It covers various concepts of C & Python programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Software Requirements: C & Python

List of Programs:

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i)Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i)Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
5. Write a program that implement Linear Queue (its operations) using
   i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Quick sort ii) Heap sort iii) Merge sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees
9. Write a program to implement the graph traversal methods
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

Text Books

1. Fundamentals of data structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

References

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.

Course Outcomes:

At the end of the course, students will be able to

1. Develop C programs for computing and real-life applications using basic elements- control statements, arrays, functions, pointers and strings,
2. Develop data structures like stacks, queues and linked lists.
3. Implement searching and sorting algorithms
4. Implement Tree and Graph algorithms
5. Develop pattern making algorithms

CO-PO Mapping (3/2/1indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	3	-	-	-	2	-	3	3	3	-
CO2	3	3	3	-	-	3	-	-	-	3	-	3	3	3	-
CO3	3	3	3	-	-	2	-	-	-	3	-	2	3	3	-
CO4	3	2	1	-	-	1	-	-	-	1	-	1	-	-	-
CO5	3	1	1	-	-	1	-	-	-	-	-	1	-	-	-

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University			B.Tech. II Sem
Code: 2505P04	WEB TECHNOLOGIES LAB (Common to CSE, IT, CSE-AIML, CSE-CS, CSE-DS)	L	T	P
Credits: 2		-	-	4

COURSEOBJECTIVES:

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Write backend code in Python/Java, PHP languages and Writing optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution.

LIST OF EXPERIMENTS:

1. Build a Quick Commerce Application (Zepto Clone)
   a. Login/Logout Page
   b. Products Page
   c. Product Details Page
   d. Cart Page
2. Build a Task Management Application(Trello Clone)
   a. Login/Signup Page
   b. Task Dashboard
   c. Task Details Page
   d. Add/Edit Task Page
3. Build a Emoji Game using Lists and keys
4. Build a Blog List by using React Router
5. Build a cowinDashboard Page using Third Party Packages
6. Get the popular github repos by using API Requests

TEXTBOOKS:

1. Git and Github Guide: The Basics, Jerry N. P., Kindle Edition.
2. HTML5 and CSS3, Andy Harris, Wiley Brand, 2014
3. Rediscovering JavaScript, Master ES6, ES7, and ES8, Venkat Subramaniam, Pragmatic Bookshelf, 2018
4. Mastering Bootstrap 4, Benjamin Jakobus, Jason Marah, Packt Publishers, 2019
5. Learning React Functional Web Development with React and Redux, Alex Banks, Eve Porcello Publisher: O'Reilly Media

REFERENCE BOOKS:

1. Jake Spurlock, Bootstrap: Responsive Web Development, Oreilly Publishers, 2019
2. Anthony Accomazzo, Nate Murray, Ari Lerner, Clay Allsopp, David Guttman & Tyler McGinnis, Fullstack React, Newline Publications, https://www.newline.co/fullstack-react
3. "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello.
4. "CSS Secrets: Better Solutions to Everyday Web Design Problems" by Lea Verou

Web Link:

1. Swayam NPTEL: https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2. Coursera: https://www.coursera.org/learn/developing-frontend-apps-with-react#modules

COURSE OUTCOMES

At the end of the course, student will be able to

- Understand Git and GitHub environment for project deployment, flexbox and media queries for mobile first application building and responsiveness pages with bootstrap
- Apply Java Script ES6 and JSON for Develop Web Applications
- Create applications using ReactJS with the help of Scripting Languages & Frameworks
- Create apps by rendering data from various file formats.
- Working with the Files in React JS and Constructing Elements with Data

CO-PO Mapping
(3 /2 /1indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	-	-	-	-	1	1	3	3	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	3	-
CO3	2	3	3	3	-	-	-	-	-	-	1	1	3	3	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	3	1	-	-	-	-	-	-	2	1	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - II Sem		
Code: 2500M03	LIFE SKILLS FOR ENGINEERS – II (Numerical Ability) (Common for All)	L	T	P
Credits: Nil		1	1	-

Course objectives:

The Quantitative Aptitude course is designed to equip students with essential mathematical and analytical skills required for various competitive exams, academic pursuits, and real-world problem-solving scenarios. The primary objective of this course is to enhance participants' numerical ability and logical reasoning, enabling them to tackle quantitative questions with confidence and efficiency.

MODULE - I **[8 Periods]**

Quants: Number System (NS)

Number Systems- Factors and Multiples: The H.C.F. of two or more than two numbers; Factorization Method Division Method; Finding the H.C.F. of more than two numbers; product of two numbers = Product of their H.C.F. and L.C.M.; Co-primes; H.C.F. and L.C.M. of Fractions: Comparison of Fractions.

Logical: Calendars

Calendars- Leap year-Non leap year, Odd days, Finding the day from date, Repeated years.

MODULE - II **[6 Periods]**

Quants: Time and Distance, Pipes

Time & Distance- Km/hr to m/sec conversion; m/sec to km/hr conversion; man covers a certain distance at x km/hr and an equal distance at y km/hr.

Logical: Data Interpretation

Data Interpretation- Tables, Pie charts, Bar Graphs, Line graphs

MODULE - III **[6 Periods]**

Quants: Ages, Progression, Logarithms

Ages, Progression-; Arithmetic progression; Arithmetic mean; Geometric progression and mean Logarithms- Why logarithms: Properties of Logarithms: Laws of logarithm: Characteristic of logarithm.

Logical: Data Arrangements

Data Arrangements- Linear Arrangement, Circular Arrangement, Multi-Dimensional Arrangement.

MODULE - IV **[6 Periods]**

Quants: Permutations and Combinations, Probability

Permutations- Factorial Notation: The different arrangements; Number of Permutations: number of all permutations of n things, taken all at a time; n subjects of which p1 are alike of one kind; p2 are alike of another kind; p3 are alike of third kind; Number of Combinations: The number of all combinations of n things, taken r at a time.

Logical: Data Sufficiency

Data Sufficiency- Strategies to solve.

MODULE - V **[6 Periods]**

Quants: Areas and Volumes (Mensuration)

Areas & Volumes- Pythagoras Theorem Results on Quadrilaterals Perimeter; Area of a circle Circumference Length of an arc Area of a sector; Area of a triangle.

Logical: Syllogisms

Syllogisms- Statements and Conclusion, Syllogisms using Venn Diagrams.

Text Books:

Reference Books:

1. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal
2. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma
3. "Fast Track Objective Arithmetic" by Rajesh Verma
4. "Magical Book on Quicker Maths" by M. Tyra
5. "Quantitative Aptitude Quantum CAT" by Sarvesh K. Verma

e-Resources:

1. Khan Academy (https://www.khanacademy.org/):
2. Math Is Fun (https://www.mathsisfun.com/)
3. GMAT Club (https://gmatclub.com/)
4. India BIX (https://www.indiabix.com/)
5. Study tonight (https://www.studytonight.com/)

Course Outcomes:

After completion of the course students will be able to:

1. Apply Mathematics to Numbers in real world Learn to apply quantitative concepts to real-life situations, enhancing practical problem-solving skills and decision-making abilities.
2. Prepare for Competitive Exams: Develop a robust foundation and familiarity with the types of quantitative questions commonly asked in various competitive exams, such as aptitude tests, bank exams, GRE, GMAT, and others.

3. Boost Confidence on Ages and numericals: Gain the confidence to tackle quantitative challenges effectively, overcoming fear or anxiety associated with math-related problem-solving.
4. Foster a Growth in counting : Cultivate a positive attitude towards learning and continuous improvement, motivating students to persistently enhance their quantitative abilities.
5. Facilitate Self-Assessment on Area and volumes: Engage in regular assessments and quizzes to gauge progress, identify areas of improvement, and refine problem-solving techniques accordingly.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO3	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO4	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-
CO5	1	2	2	-	-	-	-	-	-	2	-	-	-	-	-

2025-26 Onwards	MALLA REDDY (MR) Deemed to be University	B.Tech. - II Sem		
Code: 25OEM04	UNIVERSAL HUMAN VALUES (Common for All)	L	T	P
Credits: 0		-	1	1

UNIVERSAL HUMAN VALUES

Course Objectives:

1. To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence
2. To understand (or developing clarity) the harmony in the human being, family, society and nature/existence
3. To strengthen self-reflection
4. To develop commitment and courage to act

MODULE I: COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION [09 Periods]

Purpose and motivation for the course, recapitulation from Universal Human Values-I

1. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration
2. Continuous Happiness and Prosperity- A look at basic Human Aspirations
3. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
4. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
5. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

MODULE II: UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF! [09 Periods]

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Health.

Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

MODULE III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP [09 Periods]

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

MODULE IV: UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE [09 Periods]

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence.

Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE V: IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS [09 Periods]

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
7. Sum up.

Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXT /REFERENCE BOOKS

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj – PanditSunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

Course Outcomes:

On completion of the course, the student are expected

1. To become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind
3. To have better critical ability
4. To become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
5. To apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1- Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	3	-	-	-	-	3	-	-	-
CO2	3	2	2	-	-	-	3	-	-	-	-	2	-	-	-
CO3	3	2	2	-	-	-	3	-	-	-	-	3	-	-	-
CO4	3	2	2	-	-	-	3	-	-	-	-	3	-	-	-
CO5	3	3	2	-	-	-	2	-	-	-	-	3	-	-	-

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B. Tech. III Semester		
Code: 2505T05	Statistical Foundation for Computer Science	L	T	P
Credits: 4		3	1	-

Course Objectives: To learn

1. The basic concepts of number theory and probability.
2. Random variables, probability distributions and moment generating functions.
3. Sampling distributions and testing of hypothesis for large samples.
4. t-distribution, F-distribution, chi square distribution and testing of hypothesis for small samples.
5. Correlation, rank correlation, regression, and multiple regressions.

MODULE I: Number Theory and Probability [12 Periods]

Greatest Common Divisors and prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and The Fermat numbers. Congruences: Introduction to congruences, linear congruences, systems of linear congruences.
Probability: Introduction, probability, conditional probability, Addition theorem, Multiplication theorem, Bayes Theorem

MODULE II: Random variables [11 Periods]

Random variable, Discrete and continuous Random variables, Probability mass function, Probability density function, probability distribution functions, Expectation.
Discrete Probability distributions: Bernoulli, Binomial, Poisson, Geometric distributions of their mean and variance, Moment generating function.
Continuous probability distributions: Rectangular Distribution, Exponential Distribution, Normal distribution and properties, Moment generating function.

MODULE III: Sampling Distributions and Testing of Hypothesis (Large sample)[11Periods]

Sampling Distributions: Definition of population-sample-sampling-statistic, parameter. Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of mean and variance. Parameter estimations– likelihood estimate, point estimation and interval estimation, Unbiased estimator. Central Limit theorem (Without proof).
Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, two-sided test.
Large sample tests:(i)Test of significance for single mean (ii) Test of significance for difference of means(iii) Test of significance for single proportion (iv) Test of significance for difference of proportions

MODULE IV: Small Sample tests [9 Periods]

Student t-distribution, its properties and its assumptions, one sample t-Test, two sample t-test, paired t-test. Snedecor's, F- distribution and its properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit.

MODULE V: Correlation and Regression [5 Periods]

Scatter plot, Correlation, Coefficient of correlation, The Rank Correlation, Regression, Regression Coefficient, The lines of regression: simple regression.

TEXT BOOKS:

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Mayer Introductory Probability and Statistical Applications, John Wiley Publications.
3. Montgomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

4. Kenneth H.Rosen, Elementary number theory & its applications, sixth edition, Addison – Wesley, ISBN 978-321`-50031-1

REFERENCES:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2. W. Feller, An Introduction to Probability Theory and its Applications, Vol.1, 3rd Ed., Wiley, 1968.

E – RESOURCES

a)Concerned Website links:

1. https://www.math.brown.edu/johsilve/frintch1ch6.pdf (Number Theory)
2. https://www.cuemath.com/data/probability/ (Probability)
3. https://online.stat.psu.edu/stat500/lesson/3/3.1 (Random Variables)
4. https://www.geeksforgeeks.org/understanding-hypothesis-testing/ (Testing of Hypothesis)
5. https://egyankosh.ac.in/bitstream/123456789/20554/1/Unit-11.pdf (Small sample tests)
6. https://www.cuemath.com/data/correlation-and-regression/(Correlationand Regression)
7. https://corporatefinanceinstitute.com/resources/data-science/sampling-distribution/(Sampling Distribution)
8. https://www.knime.com/blog/continuous-probability-distribution(Continuous Probability Distribution)

b) NPTEL Videos:

1. https://www.youtube.com/watch?v=PgVV1e4_XLo&list=PLFW6lRTa1g82gyMcQGXl3dpWelEyMLxRH&index=3 (Number Theory)
2. https://www.youtube.com/watch?v=POv_YgCqAv8&list=PLbMVogVj5nJQWowhOG0-K-yI-bwRRmm3C&index=2 (Probability)
3. https://www.youtube.com/watch?v=UftY0e2ilM4 (Random Variables)
4. https://www.youtube.com/watch?v=6x1pL9Yov1k (Probability Distributions)
5. https://www.youtube.com/watch?v=0WYhD2r9-u8 Sampling Distributions)
6. https://www.youtube.com/watch?v=OQV8WmUdeIo&list=PLbMVogVj5nJSpj5sl-8tdKARg1lw2wEa- (Regression Analysis)

Course Outcomes: After Completing this course, the student must be able to

1. Understand Euclidean algorithm,fundamental theorem of arithmetic, congruence's and probability.
2. Solve problems with random variables, identify a suitable distribution for solving problems in a certain realistic situation, and find a moment generating function.
3. Understand sampling distribution and apply suitable test for testingof hypothesis for large samples of a single mean, a single proportion, a difference of means, and a difference ofproportions.
4. Analyse thet-test, F-test and chi square test, and then apply a suitable test for testing of hypothesis on the provided data.
5. Find the correlation coefficient, rank correlation coefficient, regression coefficient and regressionlines.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	1								1	1	
CO2	3	3	2	2	2							1	1	1	

CO3	3	3	3	3	2							1	1	1	
CO4	3	3	2	3	2								1	1	
CO5	3	3	2	3	2								1	1	

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University		B.Tech. III Semester	
Code: 2506T01	Artificial Intelligence: Concepts and Techniques	L	T	P
Credits: 3		3	-	-

Course Objectives: The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problemformalization

MODULE – I **[10 Periods]**

Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

MODULE – II **[10 Periods]**

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem

Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

MODULE – III **[9 Periods]**

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

MODULE – IV **[9 Periods]**

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR Advanced knowledge representation techniques: Introduction, conceptual dependencytheory, script structure.

MODULE – V **[10 Periods]**

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

TEXT BOOK:

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

REFERENCE BOOKS:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer 3. ArtificialIntelligence, A new Synthesis, Nils J Nilsson, Elsevier

Course Outcomes: At the end of the course, student will be able to

1. Understand the fundamental concepts in Artificial Intelligence
2. Analyze the applications of search strategies and problem reductions
3. Apply the mathematical logic concepts.
4. Develop the Knowledge representations in Artificial Intelligence.
5. Explain the Fuzzy logic systems.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2507T02	Cloud Cyber Security	L	T	P
Credits: 4		3	1	-

Course Objectives:

- Understand the basics of cloud cybersecurity concepts and principles.
- Learn common security threats and risks in cloud environments.
- Study authentication, access control, and data protection techniques in the cloud.
- Gain knowledge of cloud security tools, policies, and best practices.
- Understand security management in public, private, and hybrid cloud environments

MODULE – I: Introduction to Cloud Cybersecurity

Basics of Cloud Computing - Need for Cloud Security - Types of Cloud Services: IaaS, PaaS, SaaS - Cloud Deployment Models: Public, Private, Hybrid - Security Challenges in Cloud Computing - Shared Responsibility Model

MODULE – II: Cloud Threats and Vulnerabilities

Common Cloud Security Threats - Data Breaches and Data Loss - Malware and Ransomware Attacks - Insider Threats - Denial of Service (DoS) Attacks - Risk Management in Cloud Environments.

MODULE – III: Identity and Access Management

Authentication and Authorization - Multi-Factor Authentication (MFA) - Identity and Access Management (IAM) - Role-Based Access Control (RBAC) - Password Policies and Security - Secure User Management

MODULE – IV: Data and Network Security in Cloud

Data Encryption Techniques - Data Backup and Recovery - Secure Data Storage - Firewalls and Virtual Private Networks (VPNs) - Network Security in Cloud - Security Monitoring and Logging

MODULE – V: Cloud Security Best Practices

Security Policies and Compliance - Cloud Security Standards - Incident Response and Disaster Recovery - Security Auditing and Monitoring - Introduction to Cloud Security Tools - Future Trends in Cloud Cybersecurity

Text Books:

1. Ronald L. Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley.
2. Vic (J.R.) Winkler, Securing the Cloud, Elsevier.
3. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy, O'Reilly Media

Reference Books:

1. Rajkumar Buyya, Mastering Cloud Computing, McGraw-Hill Education.
2. Chris Dotson, Practical Cloud Security, O'Reilly Media.
3. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson Education

Course Outcomes:

At the end of the course, students are able to

1. Understand fundamental concepts of cloud cybersecurity.
2. Identify common threats and vulnerabilities in cloud systems.

3. Apply identity and access management techniques for cloud security.
4. Analyze data and network protection mechanisms in cloud environments.
5. Implement security best practices and compliance measures in cloud platforms.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2505T07	Operating System Fundamentals	L	T	P
Credits: 3		3	-	-

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

MODULE I: **[10 Periods]**

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time- shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

MODULE II: **[9 Periods]**

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

MODULE III: **[10 Periods]**

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

MODULE IV: **[10 Periods]**

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

MODULE V: **[08 Periods]**

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCES:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition– 2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI

4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

Course outcomes

1. Will be able to control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computers and their respective roles in computing.
3. Ability to recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		1									2	1		2
CO2	2	2										2	1		
CO3	2														
CO4	2	2	1										2		
CO5	2	2	1										1		

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B. Tech. III Semester		
Code: 2505T08	Object Oriented Programming through Java	L	T	P
Credits: 4		3	1	-

Course Objectives:

- To understand the basic object-oriented programming concepts and apply them in problem solving.
- To illustrate inheritance concepts for reusing the program.
- To demonstrate multitasking by using multiple threads and event handling
- To develop data-centric applications using JDBC.
- To understand the basics of java console and GUI based programming

MODULE-I: **[10 Periods]**

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

Module II: **[10 Periods]**

Inheritance and Packages– Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

MODULE III: **[09 Periods]**

Interfaces - Defining an interface, differences between classes and interfaces, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

MODULE IV: **[10 Periods]**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

MODULE V: **[09 Periods]**

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons,

Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach"s Beginning Java2 JDK 5, SPD.

E-RESOURCES:

1. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-RPf64_TFk2i4LJhgQFPQ WAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi_mMQ
2. https://ndl.iitkgp.ac.in/result?q={"t":"search","k":"object%20oriented%20programming", "s":["type=\"video\""],"b":{"filters":[]}}
3. http://www.rehancodes.com/files/oop-using-c++-by-joyce-farrell.pdf
4. http://www.nptel.ac.in/courses/106103115/36

Course Outcomes: At the end of the course, students will be able to

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Understand the process of graphical user interface design and implementation using AWT or swings.
5. Develop applets that interact abundantly with the client environment and deploy on the server.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3			3			2			2	3	3
CO2	3	3		1	3		3			2			3	3	3
CO3	3	3		3			3			3			3	3	3
CO4	2	1					3			3			2		
CO5	2						3			1					

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2505P06	Operating Systems Lab	L	T	P
Credits: 1.5		-	-	3

Course Objectives:

- To provide an understanding of the design aspects of operating system concepts throughsimulation
- Introduce basic Unix commands, system call interface for process management, interprocesscommunication and I/O in Unix

Software Requirements: UNIX/LINUX Operating System, Windows and Turbo C / C++

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) RoundRobin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close,fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores usingUNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs
6. Write C programs to illustrate the following IPC mechanisms a) Message Queues b) Shared Memory
7. Write C programs to simulate the following memory management techniques a) Paging b)Segmentation
8. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

Course Outcomes:

1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition,John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1									2	1		
CO2	2	2										2	2		
CO3	1	2										1	1		

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University		B.Tech. III Semester	
Code: 2505P07	Object Oriented Programming through Java Lab	L	T	P
Credits: 1.5		-	-	3

Course Objectives:
This course will make students able to learn and understand the concepts and features of object-oriented programming and the object-oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java's exception handling mechanism, multithreading.

Software Requirements: JDK

List of Programs:

1. Write a JAVA program to display default value of all primitive data type of JAVA.
2. Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
3. Write a Java Program to implement
    a) Default Constructor
    b) Parameterized constructor
4. Write a Java Program to implement
    a) Method overloading
    b) Method overriding
5. Write a Java program to implement
    a) Single Inheritance
    b) Multilevel Inheritance
    c) Hierarchical Inheritance
6. Write Java programs that uses the following keywords…
    a) this
    b) super
7. Write Java programs that uses the following keywords…
    a) static
    b) final
8. Write a Java program to implement
    a) abstract method
    b) Interfaces
9. Write a Java program to create user defined packages.
10. Write a Java program to implement Exception Handling using
    a) try-catch clause
    b) Multiple Catch clauses
11. Write a Java program that
    a) create user defined Thread by extending Thread class.
    b) create user defined Thread by implementing Runnable Interface
12. Write a Java program
    a) checks whether a given string is a palindrome or not.
    b) for sorting a given list of names in ascending order.

TEXT BOOKS:

1. Herbert Schildt, "Java The complete reference", TMH, 8th edition, 2011.
2. T. Budd, "Understanding OOP with Java", Pearson Education, updated edition, 1998.

REFERENCES:

1. P.J. Deitel and H.M. Deitel, "Java for Programmers", Pearson education.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press.
3. Bruce Eckel," Programming in Java", Pearson Education.
4. S. Malhotra and S. Choudhary," Programming in Java", Oxford Univ. Press.

Course Outcomes: At the end of the course, students will be able to

1. Differentiate structured programming and object-oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object-oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and exploring strings.
4. Develop applications for concurrent processing using Thread Concept.
5. Capable of handling IO operations using Files.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO, PSO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	**ProgrammeOutcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2505IN1	Internship-1	L	T	P
Credits: 1		-	-	2

https://internship.aicte-india.org/fetch_city.php?city=U2FuZ2FyZWRkeQ==

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2500M05	Environmental Science	L	T	P
Credits: NIL		1	1	-

Course Objectives:

- An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

Module I: Ecosystems **[5 Periods]**

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.
Activity: Plantation.

Module II: Natural resources, Biodiversity and Biotic resources:

A: Natural Resources: **[5 Periods]**

Classification of Resources: Living and Non-Living resources, Renewable and non- renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs, introduction to renewable and non renewable energy
sources.

B: Biodiversity and Biotic resources: **[4 Periods]**

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),
Activity: case studies.

Module III: ENVIRONMENTAL POLLUTION AND CONTROL: **[7 Periods]**

A: Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.
B: Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping ofhazardous waste, Coastal pollution due to sewage and marine disposal of industrialeffluents.
E-waste and its management. Activity: Field visit.

Module IV: Global Environmental Problems and Global effects: **[6 Periods]**

Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.
Activity: Poster Making.

Module V: Towards sustainable future: **[5 Periods]**

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development,

Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable CommModuleies, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

Course Outcomes: After completion of the course, students will be able to:

1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national and international level.
5. To know more sustainable way of living

Text Books:

1. R. Rajagopalan, "Environmental Studies from crisis to cure", Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P. Kaushik, "Environmental studies" New age International Publishers,4th Edition,2012

Reference Books:

1. Erach Bharucha, "Environmental studies" University Grants Commission, and University Press, I Edition, 2005.
2. M. Anji Reddy "Text book of Environmental Science and Technology" 3rd Edition, 2007
3. Richard T. Wright, "Environmental Science: towards a sustainable future" PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P. Ela, "Environmental Engineering and science",3rd Edition, PHI Learning Pvt. Ltd.,2008.

E-Resources:

1. http://www.gdrc.org/uem/ait-terms.html (Glossary of Environmental terms).
2. http://www.environmentalscience.org/ (Environmental sciences Lectures series).
3. Journal of earth science and climatic change (OMICS International Journal).
4. Journal of pollution effects & control (OMICS International Journal).
5. nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
6. http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html (NPTEL online video courses IIT lectures).

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COS	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		1		1	2	1						2	1	
CO2	2	3	2	3	1	3		2					2	1	
CO3	3	3	2	3	2	2		1					2	1	
CO4	3	2	2	1	2	1							2	1	
CO5	2	1	1			1	3	3					2	1	

2025-26 Onwards (MRDU)	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2505SD1	Skill Development Certificate-1 (Common for All)	L	T	P
Credits: 1		-	-	2

List of Course Links:

1. https://www.mygreatlearning.com/skill-development/free-courses
2. https://www.skillindiadigital.gov.in/courses?PageNumber=1&PageSize=12
3. https://skillsbuild.org/learners
4. https://www.nielit.gov.in/calicut/content/smart-lab-free-courses

Course Name with Link list:

1. Course Name: AI in Manufacturing - Mechanical
   https://www.skillindiadigital.gov.in/courses/detail/9d06b657-f597-4cd0-8de5-78d1c698d9dc

2. Course Name: AI in Healthcare - Multidisciplinary
   https://www.skillindiadigital.gov.in/courses/detail/9f478445-145b-496d-8886-25a0ddaffe96

3. Course Name: Market Research
   https://www.skillindiadigital.gov.in/courses/detail/f7ff7290-ff19-4d2c-9699-d298ed48235a

4. Course Name: SOAR - AI for Educators
   https://www.skillindiadigital.gov.in/courses/detail/5192acd2-1a98-42cd-b14a-b0ef22b688d4

Skill Development Certificate Courses

Course Name	No .of Hours	Source
Real Time Operating Systems	4 Weeks	NPTEL
Fundamental Algorithm Design and Analysis	4 Weeks	NPTEL
Python for Data Science	67 hours	Skill India
Information Security	46 hours	Skill India
Building with Artificial Intelligence	48 hours	Skill India
Demystifying Networking	4 Weeks	NPTEL
Linux Programming & Scripting	4 Weeks	NPTEL
Research Writing	4 Weeks	NPTEL
*Approved &Identify list of SKDC at the time of Courses Published by NPTEL, Skill India Digital, etc..		

Any other skill development course certifications as per the need of the course curriculum

2025-26 Onwards	MALLA REDDY(MR) Deemed to be University	B.Tech. III Semester		
Code: 2505SD1	Skill Development Certificate-2 (Common for All)	L	T	P
Credits: 1		-	-	2

List of Course Links:

5. https://www.mygreatlearning.com/skill-development/free-courses
6. https://www.skillindiadigital.gov.in/courses?PageNumber=1&PageSize=12
7. https://skillsbuild.org/learners
8. https://www.nielit.gov.in/calicut/content/smart-lab-free-courses

Course Name with Link list:

5. Course Name: AI in Manufacturing - Mechanical
   https://www.skillindiadigital.gov.in/courses/detail/9d06b657-f597-4cd0-8de5-78d1c698d9dc

6. Course Name: AI in Healthcare - Multidisciplinary
   https://www.skillindiadigital.gov.in/courses/detail/9f478445-145b-496d-8886-25a0ddaffe96

7. Course Name: Market Research
   https://www.skillindiadigital.gov.in/courses/detail/f7ff7290-ff19-4d2c-9699-d298ed48235a

8. Course Name: SOAR - AI for Educators
   https://www.skillindiadigital.gov.in/courses/detail/5192acd2-1a98-42cd-b14a-b0ef22b688d4

Skill Development Certificate Courses

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Linux Programming & Scripting	4 Weeks	NPTEL
Research Writing	4 Weeks	NPTEL
*Approved &Identify list of SKDC at the time of Courses Published by NPTEL, Skill India Digital, etc..		

Any other skill development course certifications as per the need of the course curriculum

Course Structure

Department of Computer Science and Engineering-(Data Science)

B.Tech. Computer Science and Engineering -(Data Science) Programme
(MRDU Regulation 2025-26 Admitted Batch)

II B. Tech I Semester			**Hours**			**Credits**	**Marks**		
Category	**Course Code**	**Subject**	**L**	**T**	**P**		**CIE**	**SEE**	**TOT**
BSC	250BT05	Statistical Foundation for Computer Science	3	1	-	4	50	50	100
PCC	2504T06	Artificial Intelligence: Concepts and Techniques	3	-	-	3	50	50	100
PCC	2505T06	Cloud Cybersecurity	3	1	-	4	50	50	100
PCC	2505T07	Operating System Fundamentals	3	-	-	3	50	50	100
PCC	2505T08	Object Oriented Programming through Java	3	1	-	4	50	50	100
PCC	2505P06	Operating System Lab	-	-	2	1	50	50	100
PCC	2505P07	Object Oriented Programming through Java Lab	-	-	2	1	50	50	100
PCC		Internship/Project	-	-	2	2	50	50	100
PCC		*Skill Development Certificate- 1	-	-	2	1	100	-	100
PCC		*Skill Development Certificate- 2	-	-	2	1	100	-	100
MC	2500M05	Environmental Science	1	1	-	-	100	-	100
		Total	**16**	**4**	**10**	**24**	700	400	**1100**

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B. Tech. III Semester		
Code: 250BT05	Statistical Foundation for Computer Science (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 4		3	1	-

Prerequisites: NIL

Course Objectives: To learn

1. The basic concepts of number theory and probability.
2. Random variables, probability distributions and moment generating functions.
3. Sampling distributions and testing of hypothesis for large samples.
4. t-distribution, F-distribution, chi square distribution and Testing of hypothesis for small samples.
5. Correlation, rank correlation, regression, and multiple regressions.

MODULE I: Number Theory and Probability [12 Periods]

Greatest Common Divisors and prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and The Fermat numbers.

Congruences: Introduction to congruences, linear congruences, systems of linear congruences.

Probability: Introduction, probability, conditional probability, Addition theorem, Multiplication theorem, Bayes Theorem

MODULE II: Random variables [11 Periods]

Random variable, Discrete and continuous Random variables, Probability mass function, Probability density function, probability distribution functions, Expectation.

Discrete Probability distributions: Bernoulli, Binomial, Poisson, Geometric distributions of their mean and variance, Moment generating function.

Continuous probability distributions: Rectangular Distribution, Exponential Distribution, Normal distribution and properties, Moment generating function.

MODULE III: Sampling Distributions and Testing of Hypothesis (Large sample) [11 Periods]

Sampling Distributions: Definition of population-sample-sampling-statistic, parameter. Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of mean and variance. Parameter estimations– likelihood estimate, point estimation and interval estimation, Unbiased estimator. Central Limit theorem (Without proof).

Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, two-sided test.

Large sample tests :(i)Test of significance for single mean (ii) Test of significance for difference of means(iii) Test of significance for single proportion (iv) Test of significance for difference of proportions

MODULE IV: Small Sample tests **[9 Periods]**

Student t-distribution, its properties and its assumptions, one sample t-Test, two sample t-test, paired t-test. Snedecor's, F- distribution and its properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit.

MODULE V: Correlation and Regression: **[5 Periods]**

Scatter plot, Correlation, Coefficient of correlation, The Rank Correlation, Regression, Regression Coefficient, The lines of regression: simple regression.

TEXT BOOKS:

1) Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2) Paul A Mayer Introductory Probability and Statistical Applications, John Wiley Publications.
3) Montgomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.
4) Kenneth H.Rosen, Elementary number theory & its applications, sixth edition, Addison –Wesley,
   ISBN 978-321`-50031-1

REFERENCES:

1) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2) W. Feller, An Introduction to Probability Theory and its Applications, Vol.1, 3rd Ed., Wiley, 1968.

E – RESOURCES

a) Concerned Website links:

1) https://www.math.brown.edu/johsilve/frintch1ch6.pdf (Number Theory)
2) https://www.cuemath.com/data/probability/ (Probability)
3) https://online.stat.psu.edu/stat500/lesson/3/3.1 (Random Variables)
4) https://www.geeksforgeeks.org/understanding-hypothesis-testing/ (Testing of Hypothesis)
5) https://egyankosh.ac.in/bitstream/123456789/20554/1/Unit-11.pdf (Small sample tests)
6) https://www.cuemath.com/data/correlation-and-regression/ (Correlation and Regression)
7) https://corporatefinanceinstitute.com/resources/data-science/sampling-distribution/ (Sampling Distribution)
8) https://www.knime.com/blog/continuous-probability-distribution (Continuous Probability Distribution)

b) NPTEL Videos:

1) **https://www.youtube.com/watch?v=PgVV1e4_XLo&list=PLFW6lRTa1g82gyMcQGXl3dpWelEyMLxRH&index=3** (Number Theory)
2) https://www.youtube.com/watch?v=POv_YgCqAv8&list=PLbMVogVj5nJQWowhOG0-K-yI-bwRRmm3C&index=2 (Probability)
3) https://www.youtube.com/watch?v=UftY0e2ilM4 (Random Variables)
4) https://www.youtube.com/watch?v=6x1pL9Yov1k (Probability Distributions)
5) https://www.youtube.com/watch?v=0WYhD2r9-u8 Sampling Distributions)

6) https://www.youtube.com/watch?v=OQV8WmUdeIo&list=PLbMVogVj5nJSpj5sl-8tdKARg1lw2wEa-

(Regression Analysis)

Course Outcomes: After Completing this course, the student must be able to

1) Understand Euclidean algorithm,fundamental theorem of arithmetic, congruence's and probability.
2) Solve problems with random variables, identify a suitable distribution for solving problems in a certain realistic situation, and find a moment generating function.
3) Understand sampling distribution and apply suitable test for testingof hypothesis for large samples of a single mean, a single proportion, a difference of means, and a difference ofproportions.
4) Analyse thet-test, F-test and chi square test, and then apply a suitable test for testing of hypothesis on the provided data.
5) Find the correlation coefficient, rank correlation coefficient, regression coefficient and regression lines.

COURSE ARTICULATION MATRIX:

Correlation of course outcomes with program outcomes and program specific outcomes

CO-PO Mapping (3/2/1 indicates strength of correlation) 3- Strong, 2-Medium, 1-Weak													**PSOs**		
COs	Program Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1								1	1	
CO2	3	3	2	2	2							1	1	1	
CO3	3	3	3	3	2							1	1	1	
CO4	3	3	2	3	2								1	1	
CO5	3	3	2	3	2								1	1	

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2504T06	Artificial Intelligence: Concepts and Techniques (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 3		3	-	-

Prerequisites:

1. Programming for problem solving, Data Structures.

Course Objectives:

The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

MODULE – I **[10 Periods]**

Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

MODULE – II **[10 Periods]**

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem

Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

MODULE – III **[9 Periods]**

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

MODULE – IV **[9 Periods]**

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR

Advanced knowledge representation techniques:

Introduction, conceptual dependency theory,
script structure.

MODULE – V **[10 Periods]**

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Course Outcomes:

At the end of the course, student will be able to

- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

TEXT BOOK:

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

REFERENCE BOOKS:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer 3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2505T06	Cloud Cybersecurity (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 3		3	-	-

Pre-requisites: Cloud computing fundamentals

Course Objectives

- Understand the basics of cloud cybersecurity concepts and principles.
- Learn common security threats and risks in cloud environments.
- Study authentication, access control, and data protection techniques in the cloud.
- Gain knowledge of cloud security tools, policies, and best practices.
- Understand security management in public, private, and hybrid cloud environments.

MODULE – I: Introduction to Cloud Cybersecurity

- Basics of Cloud Computing
- Need for Cloud Security
- Types of Cloud Services: IaaS, PaaS, SaaS
- Cloud Deployment Models: Public, Private, Hybrid
- Security Challenges in Cloud Computing
- Shared Responsibility Model

MODULE – II: Cloud Threats and Vulnerabilities

- Common Cloud Security Threats
- Data Breaches and Data Loss
- Malware and Ransomware Attacks
- Insider Threats
- Denial of Service (DoS) Attacks
- Risk Management in Cloud Environments

MODULE – III: Identity and Access Management

- Authentication and Authorization
- Multi-Factor Authentication (MFA)
- Identity and Access Management (IAM)
- Role-Based Access Control (RBAC)
- Password Policies and Security
- Secure User Management

MODULE – IV: Data and Network Security in Cloud

- Data Encryption Techniques
- Data Backup and Recovery

- Secure Data Storage
- Firewalls and Virtual Private Networks (VPNs)
- Network Security in Cloud
- Security Monitoring and Logging

MODULE – V: Cloud Security Best Practices

- Security Policies and Compliance
- Cloud Security Standards
- Incident Response and Disaster Recovery
- Security Auditing and Monitoring
- Introduction to Cloud Security Tools
- Future Trends in Cloud Cybersecurity

Course Outcomes

After completion of the course, students will be able to:

1. Understand fundamental concepts of cloud cybersecurity.
2. Identify common threats and vulnerabilities in cloud systems.
3. Apply identity and access management techniques for cloud security.
4. Analyze data and network protection mechanisms in cloud environments.
5. Implement security best practices and compliance measures in cloud platforms.

Text Books

1. Ronald L. Krutz and Russell Dean Vines, *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*, Wiley.
2. Vic (J.R.) Winkler, *Securing the Cloud*, Elsevier.
3. Tim Mather, Subra Kumaraswamy, and Shahed Latif, *Cloud Security and Privacy*, O'Reilly Media.

Reference Books

1. Rajkumar Buyya, *Mastering Cloud Computing*, McGraw-Hill Education.
2. Chris Dotson, *Practical Cloud Security*, O'Reilly Media.
3. Thomas Erl, *Cloud Computing: Concepts, Technology & Architecture*, Pearson Education.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2505T07	Operating System Fundamentals (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 3		3	-	-

Prerequisites:

A course on "Computer Programming and Data Structures".

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

MODULE I: **[10 Periods]**

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time- shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

MODULE II: **[9 Periods]**

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple - Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec **Deadlocks -** System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

MODULE III: **[10 Periods]**

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical **Regions, Monitors Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

MODULE IV **[10 Periods]**

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

MODULE V: **[08 Periods]**

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

Course outcomes

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCES:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition– 2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO12**	**PSO1**	**PSO 2**	**PSO3**
CO1	3		1									2	1		2
CO2	2	2										2	1		
CO3	2														
CO4	2	2	1										2		
CO5	2	2	1										1		

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B. Tech. III Semester		
Code: 2505T08	Object Oriented Programming through Java (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 4		3	1	-

Prerequisites: Computer Programming

Course Objectives:

- To understand the basic object-oriented programming concepts and apply them in problem solving.
- To illustrate inheritance concepts for reusing the program.
- To demonstrate multitasking by using multiple threads and event handling
- To develop data-centric applications using JDBC.
- To understand the basics of java console and GUI based programming

MODULE-I: **[10 Periods]**

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

Module II: **[10 Periods]**

Inheritance and Packages– Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

MODULE III: **[09 Periods]**

Interfaces - Defining an interface, differences between classes and interfaces, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating

own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

MODULE IV: **[10 Periods]**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

MODULE V: **[09 Periods]**

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

Course Outcomes:

At the end of the course, students will be able to

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

TEXT BOOKS:

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.

4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach"s Beginning Java2 JDK 5, SPD.

E-RESOURCES:

1. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-RPf64_TFk2i4LJhgQFPQWAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi_mMQ
2. https://ndl.iitkgp.ac.in/result?q={"t":"search","k":"object%20oriented%20programming", "s":["type=\"video\""],"b":{"filters":[]}}
3. http://www.rehancodes.com/files/oop-using-c++-by-joyce-farrell.pdf
4. http://www.nptel.ac.in/courses/106103115/36

COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3			3			2			2	3	3
CO2	3	3		1	3		3			2			3	3	3
CO3	3	3		3			3			3			3	3	3
CO4	2	1					3			3			2		
CO5	2						3			1					

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2505P06	Operating Systems Lab (Common for CSE, IT, CSE (AIML), CSE (CS), CSE (DS), CSE (IOT), AI and CSIT)	L	T	P
Credits: 1		-	-	2

Prerequisites: A course on "Programming for Problem Solving", A course on "Computer Organizationand Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:

- To provide an understanding of the design aspects of operating system concepts throughsimulation
- Introduce basic Unix commands, system call interface for process management, interprocesscommunication and I/O in Unix

Software Requirements: UNIX/LINUX Operating System, Windows and Turbo C /

C++ List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) RoundRobin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close,fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores usingUNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs

6. Write C programs to illustrate the following IPC mechanisms a) Message Queues
   b) Shared Memory

7. Write C programs to simulate the following memory management techniques a) Paging b)Segmentation

8. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

Course Outcomes:

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition,John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005,Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	1									2	1		
CO2	2	2										2	2		
CO3	1	2										1	1		

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2505P07	Object Oriented Programming through Java Lab (Common for CE, EEE, ME, EEE, ECE, MiE)	L	T	P
Credits: 1		-	-	2

Prerequisites:
NIL Course
Objectives:
This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java"s exception handling mechanism, multithreading.

Software Requirements: JDK

List of Programs:

1. Write a JAVA program to display default value of all primitive data type of JAVA.
2. Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
3. Write a Java Program to implement
   a) Default Constructor
   b) Parameterized constructor
4. Write a Java Program to implement
   a) Method overloading
   b) Method overriding
5. Write a Java program to implement
   a) Single Inheritance
   b) Multilevel Inheritance
   c) Hierarchical Inheritance
6. Write Java programs that uses the following keywords…
   a) this
   b) super
7. Write Java programs that uses the following keywords…
   a) static
   b) final
8. Write a Java program to implement
   a) abstract method
   b) Interfaces
9. Write a Java program to create user defined packages.
10. Write a Java program to implement Exception Handling using
    a) try-catch clause
    b) Multiple Catch clauses
11. Write a Java program that
    a) create user defined Thread by extending Thread class.
    b) create user defined Thread by implementing Runnable Interface
12. Write a Java program

a) checks whether a given string is a palindrome or not.

b) for sorting a given list of names in ascending order.

Course Outcomes:

At the end of the course, students will be able to

1. Differentiate structured programming and object oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and exploring strings.
4. Develop applications for concurrent processing using Thread Concept.
5. Capable of handling IO operations using Files.

TEXT BOOKS:

1. Herbert Schildt, "**Java The complete reference**", TMH, 8th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.

REFERENCES:

1. P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.
2. P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.
3. Bruce Eckel," **Programming in Java**", Pearson Education.
4. S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: SKDC	Internship/Project (Common for All)	L	T	P
Credits: 2			1	2

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: 2500M05	Environmental Science (Common for All)	L	T	P
Credits: NIL		1	1	-

Pre-Requisites: NIL

Objectives

An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

Module I: Ecosystems **[5 Periods]**

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.
Activity: Plantation.

Module II: Natural resources, Biodiversity and Biotic resources:

A: Natural Resources: **[5 Periods]**

Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs, introduction to renewable and non renewable energy sources.

B: Biodiversity and Biotic resources: **[4 Periods]**

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

[7 Periods]

Module III: ENVIRONMENTAL POLLUTION AND CONTROL:

A: Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

B: Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents.

E-waste and its management. Activity: Field visit.

Module IV: Global Environmental Problems and Global effects: **[6 Periods]**

Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

Activity: Poster Making.

Module V: Towards sustainable future: **[5 Periods]**

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable CommModuleies, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

Course Outcomes:

After completion of the course, students will be able to:

1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national and international level.
5. To know more sustainable way of living

Text Books:

1. R. Rajagopalan, **"Environmental Studies from crisis to cure"**, Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P. Kaushik, **"Environmental studies"** New age International Publishers,4th Edition,2012

Reference Books:

1. Erach Bharucha, "Environmental studies" University Grants Commission, and University Press, I Edition, 2005.
2. M. Anji Reddy "Text book of Environmental Science and Technology" 3rd Edition, 2007
3. Richard T. Wright, "Environmental Science: towards a sustainable future" PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P. Ela, "Environmental Engineering and science",3rd Edition, PHI Learning Pvt. Ltd.,2008**.**

E-Resources:

1. http://www.gdrc.org/uem/ait-terms.html (Glossary of Environmental terms).
2. http://www.environmentalscience.org/ (Environmental sciences Lectures series).
3. Journal of earth science and climatic change (OMICS International Journal).
4. Journal of pollution effects & control (OMICS International Journal).
6. nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
7. http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html (NPTEL online video courses IIT lectures).

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak		
	Programme Outcomes (POs)	**PSOs**

S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3		1		1	2	1								
CO2	2	3	2	3	1	3		2							
CO3	3	3	2	3	2	2		1							
CO4	3	2	2	1	2	1									
CO5	2	1	1			1	3	3							

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: SKDC	Skill Development Certificate-1 (Common for All)	L	T	P
Credits: 1		-	-	2

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. III Semester		
Code: SKDC	Skill Development Certificate-2 (Common for All)	L	T	P
Credits: 1		-	-	2

Skill Development Certificate Courses Syllabus

1. Real Time Operating Systems

Week 1: Introduction
Week 2: Characteristics of real-time systems
Week 3: Modelling time constraints
Week 4: Basic concepts in real-time operating systems

2. Fundamental Algorithm Design and Analysis

Week 1: Insertion Sort, Asymptotic Notation, Merge Sort, QuickSort, Divide and Conquer
Week 2: Heap Sort, Linear-time Sorting, Order Statistics
Week 3: Hashing, BST Sort, Augmenting Data Structures, Dynamic Programming
Week 4: Graphs : BFS, DFS, Prim's, Shortest Paths

3. Python for Data Science

Certification Type - Certificate of

Participation Assessment Mode - Self-

Pace Assessment Credits Assigned - No

Credit Available Duration -65hours

Learning Outcomes

Use Google Colaboratory notebooks to implement and test Python programs;,-explain how Python programming is relevant to data science;,-construct and operate on arrays using the numpy module;,-apply Python modules for basic statistical computation;,-construct and operate on dataframes using the pandas module;,-apply the pandas module to interact with spreadsheet software;,-implement Python scripts for visualization using arrays and dataframes;,-apply the scikit-learn module to perform data mining;,-explain techniques for supervised and unsupervised

learning;,-apply supervised learning techniques;,-apply unsupervised learning techniques;,-apply the scikit-learn module to build statistical models;,-implement Python scripts to perform regression analyses;,-apply the statsmodels module to build and analyze models for time series analysis;,-explain similarities and differences between AR, MA, and ARIMA models**.**

Topics

- What is Data Science?
- Python for Data Science
- The numpy Module
- Applied Statistics in Python
- The pandas Module
- Visualization
- Data Mining I – Supervised Learning
- Data Mining II – Clustering Techniques
- Data Mining III - Statistical Modeling
- Time Series Analysis

4. Information Security

Certification Type - Certificate of Participation
Assessment Mode - Self-Pace Assessment
Credits Assigned - No Credit Available
Duration -45hours

Learning Outcomes

Explain the fundamental principles of information security;,-identify major information security threats and their modes of attack;,-describe cryptographic models and how they are used to provide security;,-explain the principles of access control models such as discretionary, mandatory, role, and rule-based;,-illustrate methods of identification and authentication such as passwords, pins, biometrics, and tokens;,-describe network security methods including network designs, firewalls, wireless encryption methods, tunneling, and network protection tools;,-describe operating system (OS) hardening, malware protection, firewalls, and security tools;,-explain intrusion detection systems (IDS) and intrusion prevention systems (IPS), and the advantages and disadvantages of each system; and,-synthesize current privacy laws and the implications of

violations on organizations.

Topics

Introduction to Information Security

Threats and Attack Modes

Cryptographic Models

Access Control

Identification and

Authentication Network

Security

Operating System (OS) Security

Intrusion Detection and Prevention Systems

Privacy Laws, Penalties, and Privacy Issues

5. Building with Artificial Intelligence

Certification Type - Certificate of Participation
Assessment Mode - Self-Pace Assessment
Credits Assigned - No Credit Available
Duration -48hours

Learning Outcomes

Analyze the definition of 'intelligence', from the Turing test to the four basic orientations of modern AI;,-Analyze the concept of 'agents' in contemporary AI business solutions;,-Analyze the different types of 'agents' and their capabilities;,-Describe the different kinds of machine learning algorithms and their significance in

building AI business solutions;,-Apply supervised machine learning algorithms and contemporary libraries to build AI business solutions;,-Explain the principles of unsupervised machine learning and reinforcement learning models;,-Apply general AI-based problem-solving methods and their computational characteristics;,-Apply heuristically based search algorithms to improve their optimality;,-Apply natural language processing concepts and techniques with existing libraries for analysis and generative applications;,-Discuss the principles of logical reasoning and reasoning under uncertainty;,-Explain the basics of two-person, adversarial game-playing;-,-Throughout this course, you will also see learning outcomes in each unit to help organize your studies and gauge your progress.

Topics

- What Is Artificial Intelligence
- Agent-Based Approach to AI
- Machine Learning and Its Importance
- Machine Learning Algorithms
- Problem-Solving Methods in AI
- Search Algorithms
- Iterative Improvement Algorithms
- Game-Playing Models
- Natural Language Processing
- Reasoning Agents

Malla Reddy (MR)
Deemed to be University
Maisammaguda (H), Medchal - Malkajgiri District, Hyderabad– 500100

Course Structure
Department of Computer Science and Engineering
B.Tech. Computer Science and Engineering Programme
(MRDU Regulation 2025-26 Admitted Batch)

Syllabus
(For IV Semester)

IV SEMESTER -MR25 REGULATIONS (MRDU)											
S. No	**Category**	**Exam mode**	**Course Code**	**Course Details**	**L**	**T**	**P**	**Credits**	**CIE**	**SEE**	**Total**
1	PCC	NPTEL/ Descriptive	2505T09	Data Communications and Computer Networks	3	-	-	3	50	50	100
2	PCC	Descriptive	2505T10	Database Management System	3	1	-	4	50	50	100
3	PCC	Descriptive	2507T03	Cloud Data Analytics	3	1	-	4	50	50	100
4	PCC	NPTEL/ Descriptive	2505T11	Design and Analysis of Algorithms	3	1	-	4	50	50	100
5	PCC	Descriptive	2505T12	Software Engineering & Modeling	3	-	-	3	50	50	100
6	PCC	Practicals	2505P10	Database Management Systems Lab	-	-	3	1.5	50	50	100
7	PCC	Practicals	2505P10	Software Engineering & Modeling Lab	-	-	3	1.5	50	50	100
8	PCC	Internship	2505IN2	Internship -2	-	-	2	1	50		50
9	PCC	SKD	2505SD3	Skill Development Course -3		-	2	1	50		50
10	PCC	SKD	2505SD4	Skill Development Course -4		-	2	1	50		50
11	MC	CBT	2500M06	Gender Sensitization Lab	-	1	1	-	100		100
				Total	**15**	**4**	**13**	**24**	**600**	**350**	**950**

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505T09	DATA COMMUNICATIONS AND COMPUTER NETWORKS	L	T	P
Credits: 3		3	-	-

Course Objectives

- Understand the fundamental concepts of data communications, network components, network topologies, protocols, standards, and network architectures, including the OSI and TCP/IP models.
- Explain the functions of the physical and data link layers, including transmission media, multiplexing, framing, error detection and correction, flow control, and error control techniques.
- Study various medium access control protocols and LAN technologies, including ALOHA, CSMA/CD, Ethernet, and IEEE 802.11 wireless networks.
- Understand network layer functionalities, including logical addressing, internetworking, tunneling, address mapping, packet forwarding, and unicast and multicast routing protocols.
- Familiarize with transport and application layer protocols, including TCP, UDP, congestion control, Quality of Service (QoS), DNS, electronic mail, FTP, WWW, and HTTP.

MODULE-I: Data Communications

- Components,
- Direction of Data flow,
- Networks, – Types Topologies
- Protocols and Standards – ISO / OSI model,
- TCP/IP Protocol suite.
- **Physical layer**: Multiplexing, Transmission Media.

MODULE-II: Data link layer

- Introduction
- Framing and Error Detection and Correction,
- Parity – CRC,
- Flow and Error Control,
- Noiseless Channels,
- Noisy Channels,
- HDLC, Point-to-Point Protocols.

Medium Access sublayer:

- ALOHA
- CSMA/CD
- LAN–Ethernet IEEE802.11.

MODULE-III:

- **Network layer:** Logical Addressing
- Internetworking
- Tunneling
- Address mapping
- Forwarding, Uni- Cast Routing Protocols,
- Multicast Routing Protocols.

MODULE-IV:

- **Transport Layer:** Process-to-process delivery
- UDP and TCP protocols
- Data Traffic, Congestion Control
- Quality of Service
- Integrated Services
- Differentiated Services

MODULE-V:

- **Application Layer:** Domain name space
- DNS in Internet Electronic Mail
- FTP, WWW, HTTP

Course Outcomes

1. Explain the fundamental concepts of data communications, network components, topologies, protocols, standards, OSI and TCP/IP models, and physical layer transmission techniques.
2. Apply data link layer techniques, including framing, error detection and correction, flow control, and error control mechanisms for reliable data transmission.
3. Analyze medium access control protocols and LAN technologies, including ALOHA, CSMA/CD, Ethernet, and IEEE 802.11 wireless networks.
4. Analyze network layer functionalities, including logical addressing, internetworking, tunneling, address mapping, packet forwarding, and unicast and multicast routing protocols.
5. Explain transport and application layer protocols, including TCP, UDP, congestion control, Quality of Service (QoS), DNS, electronic mail, FTP, WWW, and HTTP.

Text Book:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, TMH

Reference Books:

1. Computer Networks, Andrew S. Tanenbaum, 6th Edition. Pearson Education.
2. Computer Networking: A Top-Down Approach Featuring the Internet. James Kurose & Keith. Ross,3rd Edition, Pearson Education
3. Data Communications and Computer Networks, P.C. Gupta, PHI.
4. An Engineering Approach to Computer Networks, S. Keshav,2nd Edition, Pearson Education

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	–	1	–	–	–	–	–	1	2	2	2
CO-2	3	3	2	1	2	–	–	–	–	–	1	3	2	2
CO-3	3	3	2	1	2	–	–	–	–	–	1	3	3	2
CO-4	3	3	2	2	3	1	–	–	–	–	1	3	3	2
CO-5	3	2	1	1	2	1	–	–	–	–	2	2	2	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505T10	DATABASE MANAGEMENT SYSTEM	L	T	P
Credits: 4		3	1	-

Course Objectives

- To understand fundamental database concepts, database architectures and data models.
- To learn relational database design, keys, constraints and normalization techniques.
- To develop SQL queries and database applications using SQL programming concepts.
- To understand transaction management, concurrency control and database recovery techniques.
- To study database security, distributed databases and emerging database technologies.

MODULE – I: Introduction to Databases

- Database System Concepts and Characteristics
- Advantages and Disadvantages of DBMS
- File System vs. Database System
- Data Models: Hierarchical, Network, Relational and Object-Oriented Models
- DBMS Architecture: One-Tier, Two-Tier and Three-Tier Architecture
- Three-Schema Architecture
- Data Independence: Logical and Physical
- Entity-Relationship (ER) Model
- Extended ER (EER) Model
- Relational Model and Relational Integrity Constraints

MODULE – II: Relational Database Design

- Relational Database Concepts
- Keys: Super Key, Candidate Key, Primary Key, Alternate Key and Foreign Key
- Integrity Constraints
- Relational Algebra: Selection, Projection, Union, Set Difference, Cartesian Product and Joins
- Functional Dependencies
- Attribute Closure and Armstrong's Axioms
- Database Normalization
- First Normal Form (1NF)
- Second Normal Form (2NF)
- Third Normal Form (3NF)
- Boyce-Codd Normal Form (BCNF)
- Fourth Normal Form (4NF) and Fifth Normal Form (5NF)
- Lossless and Dependency-Preserving Decomposition
- Relational Schema Design

MODULE – III: SQL Programming

- Introduction to SQL and SQL Data Types
- Data Definition Language (DDL) Commands
- Data Manipulation Language (DML) Commands
- Data Control Language (DCL) Commands
- Transaction Control Language (TCL) Commands

- Constraints: NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK and DEFAULT
- SQL Operators and Expressions
- Aggregate Functions and String, Date and Numeric Functions
- GROUP BY and HAVING Clauses
- Joins: Inner, Outer, Cross and Self Joins
- Nested Queries and Subqueries
- Set Operations: UNION, INTERSECT and MINUS
- Views and Indexes
- Stored Procedures and Functions
- Triggers and Cursors
- Common Table Expressions (CTEs) and Window Functions

MODULE – IV: Transaction Management and Query Processing

- Transaction Concepts and States
- ACID Properties of Transactions
- Transaction Schedules
- Serializability: Conflict and View Serializability
- Concurrency Control Techniques
- Lock-Based Protocols and Two-Phase Locking (2PL)
- Timestamp-Based Concurrency Control
- Deadlocks: Detection, Prevention and Recovery
- Database Recovery Techniques
- Log-Based Recovery and Checkpointing
- Query Processing and Query Optimization
- Indexing Techniques and Query Execution Plans

MODULE – V: Database Security and Emerging Trends

- Database Security Concepts and Threats
- Database Authentication and Authorization
- Access Control Mechanisms and Role-Based Access Control (RBAC)
- Database Auditing and Data Privacy
- Database Backup and Restore
- Distributed Database Concepts and Architecture
- Data Replication and Sharding
- NoSQL Databases: Concepts and Types
- MongoDB Fundamentals and CRUD Operations
- CAP Theorem
- Cloud Databases and Database as a Service (DBaaS)
- NewSQL Databases and Emerging Database Technologies

Course Outcomes

After successful completion of the course, students will be able to:

1 Explain fundamental database concepts, architectures and relational data models.

2 Design relational database schemas using keys, constraints and normalization techniques.

3 Develop SQL queries and database applications using advanced SQL programming concepts.

4 Apply transaction management, concurrency control and database recovery techniques.

5 Analyze database security mechanisms and emerging technologies such as NoSQL, distributed and cloud databases.

Textbooks

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw-Hill.
2. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson.
3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill.

Reference Books

1. C. J. Date, An Introduction to Database Systems, Pearson.
2. Peter Rob and Carlos Coronel, Database Systems: Design, Implementation, and Management, Cengage Learning.
3. Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, Database Systems: The Complete Book, Pearson.
4. Thomas Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, Pearson.

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	–	1	–	–	–	–	–	1	2	1	2
CO-2	3	3	3	1	2	–	–	–	–	–	1	3	2	2
CO-3	3	2	3	1	3	–	–	–	–	–	2	3	3	3
CO-4	3	3	2	2	2	1	–	–	–	1	2	3	2	2
CO-5	3	2	2	1	3	2	2	–	–	1	3	2	2	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2507T03	CLOUD DATA ANALYTICS	L	T	P
Credits: 4		3	1	-

Course Objectives

- To understand cloud computing concepts and data analytics fundamentals.
- To study cloud-based data storage and processing frameworks.
- To analyze big data using cloud analytics tools.
- To understand data visualization and machine learning in cloud platforms.
- To develop cloud-based analytical solutions for real-world applications.

MODULE – I: Introduction to Cloud Data Analytics

- Basics of Cloud Computing
- Cloud Service Models
- Introduction to Data Analytics
- Big Data Concepts
- Cloud Analytics Applications

MODULE – II: Cloud Storage and Processing

- Distributed File Systems
- Hadoop and HDFS
- MapReduce Concepts
- Cloud Databases
- Data Warehousing in Cloud

MODULE – III: Data Analytics Techniques

- Data Preprocessing
- Data Mining Concepts
- Predictive Analytics
- Statistical Analysis
- Data Visualization Basics

MODULE – IV: Machine Learning in Cloud

- Introduction to Machine Learning
- Supervised and Unsupervised Learning
- Cloud ML Platforms
- Model Training and Evaluation
- Real-Time Analytics

MODULE – V: Security and Applications

- Cloud Security Basics
- Privacy Issues in Analytics
- IoT and Cloud Analytics
- Business Intelligence Applications
- Future Trends in Cloud Analytics

Course Outcomes

1. Understand cloud computing and data analytics concepts.
2. Apply cloud-based storage and processing frameworks.
3. Analyze data using analytics and visualization techniques.
4. Implement machine learning concepts in cloud environments.
5. Develop secure cloud-based analytical applications.

Text Books

1. Rajkumar Buyya, Mastering Cloud Computing, McGraw-Hill.
2. Tom White, Hadoop: The Definitive Guide, O'Reilly.
3. Seema Acharya and Subhasini Chellappan, Big Data Analytics, Wiley.

Reference Books

1. Michael Minelli, Big Data, Big Analytics, Wiley.
2. Foster Provost and Tom Fawcett, Data Science for Business.
3. Ethem Alpaydin, Introduction to Machine Learning.

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	–	2	–	–	–	–	–	2	2	2	2
CO-2	3	3	2	1	3	1	–	–	–	1	2	3	3	2
CO-3	3	3	2	3	3	1	–	–	–	–	2	3	2	3
CO-4	3	3	2	2	3	1	–	–	–	1	3	3	3	3
CO-5	3	3	3	2	3	2	2	–	1	2	3	3	3	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505T11	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P
Credits: 4		3	1	-

Course Objectives

- To understand the fundamentals of algorithms, algorithm specification, performance analysis, time and space complexity, and asymptotic notations.
- To study and apply algorithm design techniques such as Divide and Conquer and Greedy Method to solve computational problems efficiently.
- To understand Dynamic Programming techniques and apply them to optimization problems such as matrix chain multiplication, knapsack, and shortest path problems.
- To analyze and implement Backtracking and Branch and Bound techniques for solving combinatorial and constraint satisfaction problems.
- To understand the concepts of NP-Hard and NP-Complete problems, non-deterministic algorithms, and computational complexity.

MODULE-I: Introduction

Introduction to Algorithms: Algorithm, Algorithm Specification, Performance Analysis – Space Complexity, Time Complexity, Best-Case, Average-Case and Worst-Case Analysis, Asymptotic Notations, Probabilistic Analysis.
Sets and Disjoint Set Union: Introduction, Union and Find Operations.

MODULE-II: Divide and Conquer and Greedy Method

Divide and Conquer: General Method, Binary Search, Quicksort, Merge Sort, Strassen's Matrix Multiplication.
Greedy Method: General Method, 0/1 Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees – Prim's Algorithm and Kruskal's Algorithm, Single Source Shortest Paths – Dijkstra's Algorithm.

MODULE-III: Dynamic Programming and Backtracking

Dynamic Programming: General Method, Matrix Chain Multiplication, All-Pairs Shortest Path, Optimal Binary Search Trees, 0/1 Knapsack Problem, Reliability Design, Travelling Salesperson Problem.
Backtracking: General Method, State Space Tree, Promising and Non-Promising Nodes, 8-Queens Problem, Sum of Subsets Problem, Graph Coloring Problem, Hamiltonian Cycle Problem.

MODULE-IV: Branch and Bound

Branch and Bound: Introduction and General Method of Branch and Bound, State Space Tree, Live Nodes, E-Nodes and Dead Nodes, Bounding Functions – Upper Bound and Lower Bound, FIFO Branch and Bound, Least Cost (LC) Branch and Bound, 0/1 Knapsack Problem using LC Branch and Bound, 0/1 Knapsack Problem using FIFO Branch and Bound, Travelling Salesperson Problem using Branch and Bound.

MODULE-V: NP-Hard and NP-Complete Problems

NP-Hard and NP-Complete Problems: Basic Concepts, Deterministic and Non-Deterministic Algorithms, Polynomial-Time Algorithms and Verification, Complexity Classes P and NP, NP-Hard and NP-Complete Problems, Cook's Theorem.

Course Outcomes

After successful completion of the course, students will be able to:

1. Analyze algorithms using time and space complexity, asymptotic notations, probabilistic analysis, and

randomized algorithms.

2. Apply Divide and Conquer and Greedy algorithm techniques to solve searching, sorting, optimization, and graph-related problems.
3. Design and analyze Dynamic Programming algorithms for solving optimization problems such as matrix chain multiplication, knapsack, shortest paths, and Travelling Salesperson problems.
4. Apply Backtracking and Branch and Bound techniques to solve combinatorial problems such as N-Queens, graph coloring, Hamiltonian cycles, and subset sum.
5. Analyze computational complexity and classify problems into NP, NP-Hard, and NP-Complete categories using concepts such as non-deterministic algorithms and Cook's theorem.

TEXT BOOK:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekharam,"Fundamentals of Computer Algorithms", 2nd Edition, Univesity Press, 2008.

REFERENCES:

1. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein "Introductionto Algorithms", 3rd Edition, PHI / Pearson Education, 2009.
2. R.C.T.Lee, S.S.Tseng, R.C.ChangandT.Tsai, "Introduction to Design and Analysis of Algorithms A strategic approach", 2nd Edition, Tata McGrawHill, 2009.
3. Allen Weiss, "Data structures and Algorithm Analysis in C++", 2nd Edition, Pearson Education, 2009.
4. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", 3rd Edition, Pearson Education, 2008.

WEB REFERENCE:

http://nptel.iitm.ac.in/courses/106101060/

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	2	–	–	–	–	–	2	3	1	2
CO-2	3	3	3	2	3	–	–	–	–	–	2	3	2	3
CO-3	3	3	3	3	3	–	–	–	–	–	2	3	2	3
CO-4	3	3	3	2	3	–	–	–	–	–	2	3	2	3
CO-5	3	3	2	3	2	–	1	–	–	–	3	3	1	2

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505T12	SOFTWARE ENGINEERING & MODELING	L	T	P
Credits: 4		3	1	-

Course Objectives

- To understand software engineering principles and software development life cycle models.
- To study requirements engineering and software design techniques.
- To learn UML modeling for software systems.
- To understand software testing and quality assurance.
- To develop software project management and maintenance skills**.**

MODULE – I: Introduction to Software Engineering

- Software Engineering Fundamentals
- Software Development Life Cycle
- Process Models
- Agile Development
- Software Project Planning

MODULE – II: Requirements Engineering

- Requirements Analysis
- Functional and Non-functional Requirements
- Feasibility Study
- Software Requirement Specification
- Requirement Validation

MODULE – III: Software Design and Modeling

- Software Design Principles
- UML Diagrams
- Use Case Modeling
- Class and Sequence Diagrams
- Architectural Design

MODULE – IV: Software Testing and Quality

- Software Testing Concepts
- Unit and Integration Testing
- Validation and Verification
- Software Quality Assurance
- Software Metrics

MODULE – V: Software Maintenance and Project Management

- Software Maintenance
- Risk Management
- Cost Estimation
- Configuration Management
- CASE Tools

Course Outcomes

1. Understand software engineering principles and SDLC models.
2. Analyze and document software requirements.
3. Design software systems using UML modeling techniques.
4. Apply software testing and quality assurance methods.
5. Manage software projects and maintenance activities.

Text Books

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill.
2. Ian Sommerville, Software Engineering, Pearson.
3. Grady Booch, Object-Oriented Analysis and Design with Applications.

Reference Books

1. Pankaj Jalote, An Integrated Approach to Software Engineering.
2. Rajib Mall, Fundamentals of Software Engineering.
3. Ali Bahrami, Object-Oriented Systems Development.

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	–	1	–	–	–	–	1	2	2	1	2
CO-2	3	3	2	2	2	1	–	–	2	–	2	3	2	2
CO-3	3	3	3	2	3	1	–	1	2	1	2	3	3	3
CO-4	3	3	2	3	3	1	2	–	1	–	2	3	2	2
CO-5	3	2	3	2	2	2	2	2	2	3	3	3	2	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505P10	DATABASE MANAGEMENT SYSTEM LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives

- To provide practical knowledge of relational database management systems.
- To develop SQL programming and query processing skills.
- To implement normalization and database design techniques.
- To perform transaction management and database operations.
- To develop database applications using DBMS tools.

List of Experiments

1. **Student Information Management System:** Design an Entity-Relationship (ER) diagram and develop a relational database for managing student details, departments, courses, faculty and student enrolments. Create tables using appropriate data types, primary keys, foreign keys and integrity constraints.

2. **Online Shopping Database Management:** Create and manipulate database tables for customers, products, orders and payments using Data Definition Language (DDL) and Data Manipulation Language (DML) commands such as CREATE, ALTER, DROP, INSERT, UPDATE, DELETE and SELECT.

3. **Banking Database Query Processing:** Develop SQL queries for customer accounts, bank branches, loans and transactions using relational operations, different types of joins, nested queries, subqueries and set operations.

4. **Hospital Management Database Normalization:** Design and normalize hospital database schemas containing patient details, doctor information, appointments, prescriptions and billing records up to First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF) and Boyce-Codd Normal Form (BCNF).

5. **Employee Payroll Management System:** Create and manipulate views and indexes for employee, department, attendance and salary records. Implement triggers for automatic salary updates, audit logging and validation of employee payroll information.

6. **Bank Account Management Using Stored Procedures and Functions:** Develop stored procedures, user-defined functions and cursors for banking operations such as account balance enquiry, deposit, withdrawal, interest calculation and customer transaction processing.

7. **Online Banking Transaction Management:** Implement transaction control commands such as COMMIT, ROLLBACK and SAVEPOINT for fund transfers between bank accounts. Demonstrate transaction management and ACID properties to maintain data consistency.

8. **University Admission Database Management:** Design and implement database constraints, primary keys, foreign keys, unique constraints, check constraints, default values and referential integrity for student admissions, departments, programmes and course registrations.

9. **Retail Sales Analysis and Reporting:** Perform aggregate operations using GROUP BY, HAVING and built-in SQL functions. Generate sales reports using SUM, AVG, COUNT, MAX, MIN, string functions, date functions and window functions.

10. **College Database Security and Access Control:** Implement database security using user account creation, authentication, authorization, GRANT and REVOKE commands. Demonstrate role-based access control and database auditing.

11. **E-Commerce Database Backup, Recovery and Query Optimization:** Perform database backup and recovery operations. Implement indexing techniques and analyze SQL query execution plans to improve database performance.

12. **Mini Project – Real-Time Database Application Development:** Design and develop a database application using a DBMS tool for real-time applications such as Hospital Management, Library Management, Student Information Management, Banking, Online Shopping or Hotel Reservation Management. Implement database design, SQL queries, constraints, joins, views, triggers, stored procedures, transaction management and security features.

Course Outcomes

1. Design and create relational databases.
2. Execute SQL queries for database operations.
3. Apply normalization techniques.
4. Implement transaction and security concepts.
5. Develop simple database applications.

Text Books

1. Korth, Silberschatz and Sudarshan, Database System Concepts.
2. Elmasri and Navathe, Fundamentals of Database Systems.

Reference Books

1.C. J. Date, An Introduction to Database Systems.
2. Raghu Ramakrishnan, Database Management Systems.

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	1	2	–	–	–	–	–	1	3	2	2
CO-2	3	3	2	2	3	–	–	–	–	–	1	3	2	3
CO-3	3	3	3	2	2	–	–	–	–	–	1	3	2	2
CO-4	3	3	2	2	3	1	1	–	–	1	2	3	2	2
CO-5	3	2	3	2	3	1	1	2	2	2	3	3	3	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505P10	SOFTWARE ENGINEERING & MODELING LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives

1. To understand practical aspects of software engineering and modeling.
2. To develop software requirement and design documents.
3. To practice UML modeling techniques.
4. To implement software testing and debugging methods.
5. To use CASE tools for software development.

List of Experiments

1. **Software Requirement Specification (SRS) for a Real-Time Application:** Identify and analyze functional and non-functional requirements, conduct feasibility studies and prepare a Software Requirement Specification (SRS) document for applications such as Hospital Management, Library Management or Online Shopping Systems.

2. **Use Case Modeling Using UML:** Identify actors, use cases and system functionalities for a given software application and develop Use Case Diagrams using UML modeling tools.

3. **Class and Sequence Diagram Development:** Identify classes, attributes, methods and relationships, and develop Class and Sequence Diagrams to represent the structural and behavioral aspects of a software system.

4. **Activity and State Chart Diagram Development:** Develop Activity Diagrams and State Machine Diagrams to represent workflow activities, decision-making processes, system states and transitions for a real-time application.

5. **Software Design and Architectural Documentation:** Prepare software design documentation covering design principles, architectural design, module decomposition, component identification and interface specifications for a given application.

6. **Software Testing and Test Case Design:** Design and execute test cases using black-box and white-box testing techniques. Perform boundary value analysis, equivalence partitioning and validation testing for a given software application.

7. **Software Project Planning and Scheduling Using CASE Tools:** Prepare a software project plan by identifying project activities, task dependencies, resource allocation and milestones. Develop project schedules using suitable CASE and project management tools.

8. **Data Flow Diagram (DFD) and Entity Relationship (ER) Diagram Development:** Analyze system requirements and develop context-level and leveled Data Flow Diagrams (DFDs) and Entity Relationship (ER) Diagrams for a real-time software application.

9. **Implementation of Unit Testing and Integration Testing:** Develop and execute unit test cases for individual software modules and perform integration testing to verify interactions and data flow between integrated modules.

10. **Software Cost Estimation Using COCOMO Model:** Estimate software development effort, development time, staffing requirements and project cost using the Constructive Cost Model (COCOMO) based on estimated software size.

11. **Software Risk Analysis and Configuration Management**: Identify and analyze potential software project risks, prepare risk assessment and mitigation plans, and implement software configuration management activities such as version control, change management and baseline management using suitable tools.

12. **Mini Project – Software Development and Documentation:** Develop a real-time software application following an appropriate Software Development Life Cycle (SDLC) model. Prepare SRS, feasibility study, UML diagrams, software design documentation, project plan, test cases, testing reports and project documentation.

Course Outcomes

1. Analyze software requirements and specifications.
2. Develop UML models for software systems.
3. Apply software design and testing techniques.
4. Use CASE tools for software development.
5. Prepare software project documentation.

Text Books

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach.
2. Ian Sommerville, Software Engineering.

Reference Books

1. Rajib Mall, Fundamentals of Software Engineering.
2. Grady Booch, Object-Oriented Analysis and Design

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	2	3	1	2	1	–	–	–	2	–	1	3	1	2
CO-2	2	3	3	2	2	–	–	–	3	–	1	3	2	2
CO-3	3	3	3	2	3	–	–	–	2	–	2	3	3	2
CO-4	2	2	2	2	3	–	1	–	1	1	3	2	2	3
CO-5	2	2	2	1	2	–	1	2	3	3	2	2	2	3

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505IN2	Internship – II	L	T	P
Credits: 1		-	-	2

Objective: To provide students with practical industrial exposure, workplace experience, and opportunities to apply theoretical knowledge to real-world engineering problems.

Recommended guidelines:

1. Students shall undergo an internship in an industry, research organization, startup, government organization, or an approved technical institution.
2. The internship must be relevant to the student's branch of engineering.
3. The department shall approve the internship organization and proposed activities before commencement.
4. Students shall work under an industry mentor or designated supervisor.
5. Students must maintain an internship diary or weekly progress report.
6. Students shall submit an internship completion certificate issued by the organization.
7. A comprehensive internship report shall be submitted to the department.
8. Students shall present their internship experience before an evaluation committee.
9. The department shall verify the authenticity of the internship and submitted documents.

Suggested evaluation scheme (50):

Assessment component	Marks
Industry mentor evaluation	20
Internship attendance and progress	10
Internship report	20
Total	50

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505SD3	Skill Development Course – III	L	T	P
Credits: 1		-	-	2

Objective: To enhance students' technical competencies, practical skills, and professional capabilities through structured, hands-on learning activities.

Recommended guidelines:

1. The course shall focus on a specific technical or professional skill relevant to the student's engineering discipline.
2. The course content shall emphasize practical learning rather than theoretical instruction.
3. The department may offer skill-based training in emerging technologies and industry-relevant tools.
4. Students shall complete prescribed practical exercises, assignments, and mini-projects.
5. The course may be delivered through:
    - Hands-on laboratory sessions.
    - Industry-oriented training.
    - Certification programmes.
    - Online learning platforms such as NPTEL, SWAYAM, Coursera, or approved platforms.
    - Practical workshops and technical boot camps.
6. Students shall maintain evidence of completed activities, practical work, and learning outcomes.
7. A final practical assessment or demonstration shall be conducted by the department.

Suggested evaluation scheme:

Assessment component	Marks
Practical exercises / assignments	20
Skill demonstration / mini-project	20
Continuous assessment / participation	10
Total	50

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2505SD4	Skill Development Course – IV	L	T	P
Credits: 1		-	-	2

Objective: To develop advanced technical, analytical, problem-solving, and employability skills through practical and application-oriented learning.

Recommended guidelines:

1. The course shall focus on advanced or specialized skills beyond those covered in SKD-III.
2. The course content should be aligned with current industry requirements and emerging technologies.
3. Students shall undertake an individual or team-based practical project.
4. The department may introduce industry-recognized certifications or specialized technical training.
5. Students shall demonstrate the ability to apply acquired skills to solve practical engineering problems.
6. Assessment shall be based on practical implementation, project execution, technical documentation, and demonstration.
7. Students shall submit a portfolio containing evidence of their learning and completed activities.

Suggested evaluation scheme:

Assessment component	Marks
Practical exercises / assignments	20
Skill demonstration / mini-project	20
Continuous assessment / participation	10
Total	50

2025-26 Onwards (MRDU)	Malla Reddy (MR) Deemed to be University	B.Tech. IV Semester		
Code: 2500M06	GENDER SENSITIZATION LAB	L	T	P
Credits: -		-	1	1

Course Objectives

1. To create awareness about gender equality and gender sensitization in society.
2. To understand social, cultural, and legal perspectives related to gender issues.
3. To promote respect, empathy, and inclusive behavior among students.
4. To develop communication and interpersonal skills for maintaining gender harmony.
5. To encourage ethical values and social responsibility towards gender justice.

MODULE – I: Introduction to Gender Sensitization

- Concept of Gender and Sex
- Gender Roles and Stereotypes
- Gender Equality and Equity
- Importance of Gender Sensitization
- Gender Issues in Society

MODULE – II: Women Empowerment and Rights

- Women Empowerment Concepts
- Constitutional Rights of Women
- Legal Protection and Safety Measures
- Women and Education
- Women in Leadership and Employment

MODULE – III: Social and Cultural Perspectives

- Gender Discrimination
- Socialization and Media Influence
- Workplace Ethics and Gender Respect
- Prevention of Harassment
- Inclusive Society and Diversity

MODULE – IV: Communication and Interpersonal Skills

- Effective Communication
- Respectful Behavior and Teamwork
- Conflict Resolution
- Emotional Intelligence
- Building Positive Relationships

MODULE – V: Case Studies and Activities

- Case Studies on Gender Issues
- Group Discussions and Role Plays
- Awareness Programs
- Ethical and Professional Practices
- Community Participation Activities

Course Outcomes

After completion of the course, students will be able to:

1. Understand the concepts of gender equality and gender sensitization.
2. Identify social and cultural issues related to gender discrimination.
3. Demonstrate respectful and inclusive behavior in academic and professional environments.
4. Apply legal and ethical knowledge related to gender rights and safety.
5. Participate effectively in awareness and social responsibility activities.

Text Books

1. N. Jayapalan, *Women Studies*, Atlantic Publishers.
2. S. Khanna, *Gender Equality and Women Empowerment*, Academic Publications.
3. Government of India, *Handbook on Gender Sensitization*.

Reference Books

1. Kamla Bhasin, *Understanding Gender*.
2. Judith Lorber, *Gender Inequality: Feminist Theories and Politics*.
3. UNESCO Publications on Gender Equality and Inclusion.

COURSE ARTICULATION MATRIX (CO–PO–PSO)

(Correlation levels: 1 – Slight, 2 – Moderate, 3 – Substantial, – – No Correlation)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO-1	1	2	–	–	–	2	2	1	1	–	2	2	1	1
CO-2	1	3	–	2	–	3	2	1	2	–	2	3	1	2
CO-3	1	2	1	–	–	3	3	3	3	1	2	2	2	2
CO-4	1	2	–	1	–	3	3	2	3	1	2	2	1	2
CO-5	1	2	1	2	–	3	3	3	3	2	3	3	2	2