Department of Information Technology

Structure & Syllabi

S. Y. B. Tech (2023 Pattern)

w.e.f. Academic Year 2024-2025

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

Department of Information Technology

Vision

"To create quality information technology professionals through superior academic environment."

Mission

- To incorporate the IT fundamentals in students to be successful in their career.
- To motivate students for higher studies, research and entrepreneurship.
- To provide IT services to society.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33	Dr. Rakesh K. Jain Director

Program Outcomes (POs)

Engineering Graduates will be able to:

1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. JSPM's Rajarshi Shahu College of Engineering Department of IT Engineering

7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12.Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Program Specific Outcomes (PSOs):

Upon successful completion of UG course in Information Technology, the students will attain following PSOs:

1. Utilize discrete principles of mathematics along with programming paradigms to expedite solution building in the IT domain.

2. Apply computational techniques using core aspects of network and system programming to deliver secured application in the arena of analytics and computing.

3. Develop team spirit with project management skills to handle multidisciplinary complex tasks proficiently and utilize these skills for entrepreneurship

Highlights of the Syllabus

Curriculum of Information Technology Department is designed in consultation with experts like:


Academic Experts


Industry/Corporate Experts


Distinguished Alumni

Following are the features of the curriculum of the **Information Technology Department is** designed in association with the **Tata Consultancy Services, Pune.**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

Dr. Rakesh K. Jain
Director

Unique features of the curriculum

1. **Curriculum centered at Outcome Based Education:**

   The new Curriculum is based on student-centered instruction models that focus on measuring student performance through outcomes. The outcomes include subject knowledge, industry required skills and attitudes.

2. **Emphasize on Fundamentals:**

   The nature of the new curriculum is rigorous and well prescribed so that the students can spend more time on preparation and self-study. The students have to learn core subjects, solve practical based assignments and must attempt periodical quizzes. This will benefit them to grasp and keep a strong hold on fundamentals of Engineering in the most effective way.

3. **Experiential Learning:**

   The curriculum emphasizes on hands-on sessions along with theoretical information. The new curriculum considers Problem Based Learning (PBL) as a teaching pedagogy and includes different subjects that encourage the students for hands on learning through virtual labs, mini-projects, etc. Accordingly, the curriculum maintains good balance between theory and laboratory credits.

4. **Promote Creativity and Innovation:**

   Along with experiential learning, the curriculum also motivates the students to inculcate creativity and innovation. Apart from conventional lab, the curriculum provides a freedom for students to perform industry assignments, pilot projects, innovative development, etc.

5. **Inculcating Ethics and Values:**

   To improvise student's behavior, the curriculum has included systematic courses on ethics and values. The moral principles can help students to make right decisions, lead their professional lives and become ethical citizen.

6. **Blend of Curricular and Noncurricular Activities**

   The curriculum also gives importance of different activities like co-curricular, extra-curricular, sports, culture, etc. This will help to do all round development of students in all possible ways.

7. **Four Tracks in B-Tech:**

   The curriculum provides four tracks in the curriculum as

   I. Industry Internship
   II. Entrepreneur
   II. Higher Studies and Research
   IV. In house Project

8. **Global Competence:**

   The curriculum provides a unique opportunity for students to learn and engage in open and effective interaction with people from diverse and interconnected world. The combination of foreign languages (German, Japanese, English) and international internships in the curriculum help the students to build a capacity to examine global and intercultural issues and to propose perspectives and views.

9. **Industry Induced Internship Program**

   To support ever demanding industry requirements, the curriculum has included an industry internship with an objective to learn technologies pertaining to their discipline and enhance their technical knowledge with a support of the live platform of Industry.

10. **Motivation for Self Learning:**

    The curriculum also offers a freedom to students to take the initiatives in their learning needs and set the goals with the help of online learning platforms like MOOCs, NPTEL, Swayam, etc.

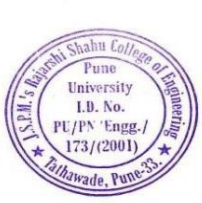
Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Course Type Abbreviations

BSC: Basic Science Course
ESC: Engineering Science Course
PCC: Programme Core Course
PEC: Programme Elective Course
MD M: Multidisciplinary Minor
OE: Open Elective
VSEC: Vocational and Skill Enhancement Course
HSSM: Humanities Social Science and Management
AEC: Ability Enhancement Course
IKS: Indian Knowledge System
VEC: Value Education Course
CEP: Comm. Engg. Project
FP: Field Project
CC: Co-curricular Courses

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics



Dr. Rakesh K. Jain
Director

S. Y. B. Tech (Information Technology)

Academic Year -2024-2025 (Semester –III)

Course	Course Code	Course	Teaching Scheme				Credit	Examination Scheme			Total Marks	Ownership
			L	T	P	Hr	C	ISE	MSE	ESE		
PCC	IT2201T	Computer Organization and Architecture	3	-	-	3	3	20	30	50	100	IT
PCC	IT2202T	Software Engineering and Design	3	-	-	3	3	20	30	50	100	IT
PCC	IT2203T	Fundamentals of Data Structure	3	-	-	3	3	20	30	50	100	IT
PCC	IT2203L	Fundamentals of Data Structure Laboratory	-	-	2	2	1	ISCE: 30		20	50	IT
PCC	IT2204T	Operating Systems	3	-	-	3	3	20	30	50	100	IT
PCC	IT2204L	Operating Systems Laboratory	-	-	2	2	1	ISCE: 30		20	50	IT
HSSM	ES2206T	Environmental Science and Engineering	2	-	-	2	2	20	30	50	100	Humanities
PCC	IT2205L	Programming Lab-I: Python	-	-	4	4	2	ISCE: 60		40	100	IT
PCC	IT2207T	Innovation and Entrepreneurship	2	-	-	2	2	20	30	50	100	IT
CEP	HS2206L	Soft Skills	-	-	2	2	1	ISCE: 30		20	50	Humanities
PCC	IT2206L	Design Thinking	-	-	2	2	1	ISCE: 30		20	50	IT
	Total		16	-	12	28	22	-		-	900	

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

S. Y. B. Tech (Information Technology)

Academic Year -2024-2025 (Semester –IV)

Course	Course Code	Course	Teaching Scheme				Credit	Examination Scheme			Total Marks	Ownership
			L	T	P	Hr	C	ISE	MSE	ESE		
ESC	ES2203T	Calculus and Transforms	3	-	-	3	3	20	30	50	100	Mathematics
PCC	IT2208T	Formal Language and Automata Theory	3	-	-	3	3	20	30	50	100	IT
PCC	IT2209T	Data Structures and Algorithms	3	-	-	3	3	20	30	50	100	IT
Skill Course (VSEC)	IT2209L	Data Structures and Algorithms Laboratory	-	-	2	2	1	ISCE: 30		20	50	IT
PCC	IT2210T	Computer Network	3	-	-	3	3	20	30	50	100	IT
MDM		Multi-Disciplinary Minor-I	3	-	-	3	3	20	30	50	100	Other department
HSSM (VSEC)	HS2203T	Universal Human Values and Ethics	2	-	-	2	2	20	30	50	100	Humanities
HSSM (VEC)	IT2211L	Web Technology Lab	-	-	4	4	2	ISCE: 60		40	100	IT
Skill Course (VSEC)	IT2212L	Programming Lab II: Advanced Python	-	-	2	2	1	ISCE: 30		20	50	IT
CC	IT2213L	Co-curricular Course-II	-	-	2	2	1	ISCE: 30		20	50	IT
	Total		17	-	10	27	22	-		-	850	

Abbreviations:

L – Lecture, T – Tutorial, P – Practical, Hr – Hours, C – Credits, TuT – Tutorial, ISE – In Semester Evaluation, MSE – Mid Semester Evaluation, ESE – End Semester Evaluation

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (ISCE consists of ISE and MSE). The ESE is a separate head of passing.

For Tutorial: Assessment shall be ISE of the respective course.

List of Exit Courses after completion of Semester III and IV

1. Exit option is available for students those who have earned the total 88 credits at the End of fourth Semester.
2. Student who wants to avail the exit option after second year have to earn additional 6-8 credits from the list of courses shown below.
3. These courses student have to complete within summer vacation after 2nd Year.
4. After fulfilment as mentioned in 1 to 3 above, Students can earn **UG-Diploma/ Diploma-Eng** and same will be issued by the Institute.

Sr. No.	Course code	Name	Credits
1.	EX-IT2201	Certified Python Developer	2
2.	EX-IT2202	Certified Network Engineer	2
3.	EX-IT2203	Certified Web Developer	2
4.	EX-IT2204	Certified Data Structure Engineer	2

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2201T]: Computer Organization and Architecture

Teaching Scheme:	**Credits**:	**Examination Scheme:**
TH : 03 Hours/Week	TH : 03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Basic of Electronics Engineering

Course Objectives:

1. To understand the computer evolution and number system with Binary Multiplication/Division using Booths Algorithm.
2. To understand the design of the various functional units and components of the Central processing unit.
3. To acquaint with the design of the various functional units and components of the Control unit.
4. To understand the working and applications of types of memory & Input/output systems and parallel organization of multi-processor systems.

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

CO1: Solve problems based on computer arithmetic.
CO2: Describe processor structure and its functions.
CO3: Analyze the performance of various instruction set architecture of control unit.
CO4: Solve problems based on memory organization and cache mapping techniques.
CO5: Discuss the architectural details of IO modules.
CO6: Illustrate the architecture and memory organization of parallel architecture.

Course Contents

UNIT-I	**Computer Evolution and Number System**	**07 Hours**

A Brief History of Computers, Von Neumann Architecture, Number Systems - Binary, Octal, Hexadecimal, Signed Binary number representation and Arithmetic: Signed, 1's complement, 2's complement representation and arithmetic. Booth's Algorithm for Signed Multiplication, Restoring and Non-Restoring Division Algorithms.

UNIT-II	**The Central Processing Unit**	**07 Hours**

Machine Instruction Characteristics, Types of Operands and Types of Operations, Addressing Modes, Instruction Formats, Instruction Types Processor Structure and Function - Processor Organization, Register Organization of 8086, the Instruction Cycle and Instruction Pipelining.
Case Study Processor: 80386 ,80486 and 80586.

UNIT-III	**The Control Unit**	**07 Hours**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

Micro-Operations-Fetch Cycle, Indirect Cycle, Interrupt Cycle, Execute Cycle ,Instruction Cycle, Control of the Processor-Functional Requirements, Control Signals, A Control Signals Example Internal Processor Organization, Hardwired control unit, Micro-programmed control- micro instructions, Micro programmed Control Unit.

Case Study: Wilke's Control unit

UNIT-IV	Computer Memory System	07 Hours

Characteristics of Memory System, The Memory Hierarchy. Cache Memory- Elements of Cache Design- Cache Address, Size, Cache Mapping Techniques, Case Study: -Intel IV Cache Memory Internal Memory- Semiconductor Main Memory, Advanced DRAM Organization.
Case Study Simulation: Interleaved Memory Simulator.

UNIT-V	Input and Output System	07 Hours

I/O Modules- Module Function and I/O Module Structure, Programmed I/O- Overview, I/O Commands, I/O Instructions, Interrupt Driven I/O- Interrupt Processing, Design Issues, Example:8259A, Direct Memory Access- Drawbacks of Programmed and Interrupt Driven I/O, DMA Functions.
Case Study-Simulate IO system design tool for different IO system.

UNIT-VI	Parallel Organization	07 Hours

Parallel Organization – Multiprocessors, Flynn's Taxonomy for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Cluster Configuration, UMA, NUMA & CC-NUMA, GPU, TPU, Introducing The IA-64 Architecture
Case Study: Simulate vector processor .

Text Books:

T1. W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition, Prentice Hall of India, 2010, ISBN 13: 978-0-13-607373-4

T2. Muhammad Ali Mazidi , Danny Causey, RolinMcKinlay, "PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18", 4th Edition by,Pearson international edition

T3. Andrew N. Sloss, Dominic Symes, Chris Wright, Morgan, "ARM System Developer's Guide Designing and Optimizing System Software", Kaufmann Publishers

T4. "Modern Digital Electronics ", R.P. Jain, 3rd Edition, Tata McGraw-Hill, ISBN: 0–07– 049492–4

Reference Books:

R1. Peatman, John B, "Design with PIC Microcontroller", Pearson Education PTE

R2. Ramesh Gaonkar, "Fundamentals of Microcontrollers and Applications In Embedded Systems (with the PIC18 Microcontroller Family)" Thomson/Delmar Learning; 1 edition (January 8, 2007), ISBN:978-1401879143

R3. Microchip's PIC18FXXX Data Sheet

R4. Muhammad Ali Mazidi, SarmadNaimi,"ARM Assembly Language Programming & Architecture"

R5. A. S. Tanenbaum "Structured Computer Organization", 4th Edition, Prentice Hall of India, 1991 ISBN: 81–203–1553–7

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

S. Y. B. Tech. (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2202T]: Software Engineering and Design

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH: 03 Hours/Week	TH:03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Basic knowledge of problem solving and object-oriented programming, Basic knowledge of Fundamental of data structures.

Course Objectives:

- To understand software development life cycle and their applications in real world projects.
- To explore software requirements analysis and understand for effective design solutions.
- To inculcate effective communication and teamwork through project management techniques.
- To learn advancements in software engineering processes.

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

CO1: Understand software engineering principles and different processes for development.
CO2: Understand requirement engineering tasks and implement project management techniques.
CO3: Analyze various design modeling techniques using UML.
CO4: Analyze advancements in software engineering with agility approaches.

Course Contents

UNIT-I	**Introduction to Software Engineering**	**07 Hours**

Software Engineering Fundamentals- Software Engineering Principles, Software as layered approach, Characteristics, Types of Software, Software Engineering Practice, Software Myths, Software processes: Software Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Concurrent, Specialized Process Models, Personal and Team Process Models.

UNIT-II	**Software Requirements Engineering**	**07 Hours**

Software Requirements Engineering: Requirements Gathering Techniques, Requirements Engineering Tasks, Types of Requirements (functional, product, organizational, external), Developing Use cases, Building requirements models, prioritizing requirements (Kano diagram), Requirements Analysis: basics, scenario based modelling, SRS.

UNIT-III	**Software Project Management**	**07 Hours**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

The Software Project Management Spectrum- 4Ps, Project size estimation: LOC, FP, Project cost estimation: heuristics, analytical, empirical techniques, COCOMO-II, Risk management: Identification, analysis, mitigation technique with RMMM.		
UNIT-IV	**Software Modeling**	**07 Hours**
Introduction to Analysis Modelling, Data modelling, Design Engineering: functional and information modelling, Data flow diagrams, Control and process flow modelling with specification, Introduction to UML tool: Rational Rose, Visual Paradigm, Use case Diagrams using UML.		
UNIT-V	**Design Modelling: UML Models**	**07 Hours**
UML models notations: Structural, Behavioral, Grouping and Annotational, UML Diagrams: Object Diagrams, Class-based Diagrams, behavioral modelling using state diagrams, activity diagrams, Components Diagrams, Sequence Diagrams, Communication Diagrams, Deployment diagrams.		
UNIT-VI	**Software Development with Agility Approach**	**07 Hours**
Agile Development: Agile manifesto, agility and cost of change, agility principles, Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing, Agile Methods: Lean Software Development, DSDM, Extreme Programming and TDD. Agility with SCRUM and Sprint. Introduction to SCM.		

Text Books:

T1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach" (6/e.) McGraw Hill, 2011

T2. James F. Peter, "Software Engineering - An Engineering Approach", John Wiley (2004).

T3. Pankaj Jalote, "Software Engineering: A Precise Approach", Wiley India, 2010.

T4. Ian Sommerville, "Software Engineering", Addison-Wesley Publishing Company, (2006) 8th edition.

T5: Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modelling Language User Guide", Addison-Wesley Publishing Company, (2005) 2nd edition.

Reference Books:

R1. A Shalloway and J Trott, "Design Patterns Explained: A new perspective on object oriented design" (2/e), Pearson, 2004.

R2. Rajib Mall, "Fundamentals of Software Engineering" , PHI Learning Pvt. Ltd 2009

R3. C. Michael Pilato, Ben Collins-Sussman and Brian Fitzpatrick, "Version Control with subversion", O'Relly, Shroff publishers, ISBN: 978-81-8404-728-8.

R4. P.C. Tripathi, P.N. Reddy, "Principles of Management", Tata McGrew Hill Education Private Limited, ISBN: 9780071333337, ISBN: 0071333339

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering, Pune University I.D. No. PU/PN/Engg./173/(2001), Tathawade, Pune-33	Dr. Rakesh K. Jain Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2203T]: Fundamentals of Data Structure

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 03 Hours/Week	TH : 03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Fundamentals of computer programming

Course Objectives:

- To learn the standard and abstract data representation methods.
- To acquaint with the knowledge of space and time complexity.
- To understand various data structures, operations on it and the memory requirements.
- To study various data searching, sorting methods and problem solving
- To understand various link lists for providing solutions to various problems.

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

CO1: Describe different linear and nonlinear abstract data structures.
CO2: Evaluate the time and space complexity of program.
CO3: Use Array data structure for solving various problem.
CO4: Apply different sorting techniques.
CO5: Demonstrate different searching techniques and use algorithmic strategy for problem solving.
CO6: Apply linked list data structures for solving problems.

Course Contents

UNIT-I	**Introduction to Data Structures**	**07 Hours**

Introduction: Concept of Data Type, Data Structures: Data, information, Knowledge, and Data structure, Abstract Data Types(ADT), Data Structure Classification(Linear and Non-linear, Static and Dynamic, Persistent and ephemeral data structures).

UNIT-II	**Complexity of Algorithm**	**06 Hours**

Complexity of Algorithm: Space Complexity, Time Complexity, asymptotic notation- Big-O, Theta and Omega, finding complexity using step count method, Analysis of programming constructs- linear, Quadratic, Cubic, Logarithmic.

UNIT-III	**Array**	**06 Hours**

Overview of Array, Array as an abstract data type, Operations on array, Merging of Two Arrays, storage representation and their address calculation, Row major and column major, Multidimensional Arrays: Two-dimensional arrays, n-dimensional arrays, Concept of Ordered list, Single Variable

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Polynomial: Representation using arrays, Polynomial as array of structure, Polynomial addition, Polynomial multiplication, Sparse Matrix: Sparse Matrix: Sparse Matrix representation using array, Sparse Matrix addition, Transpose of Sparse Matrix- Simple and Fast Transpose, Time and Space trade-off.

UNIT-IV	Sorting Techniques	08 Hours

Sorting: Types of sorting- Internal and External Sorting, General Sort Concept- Sort order, stability, Efficiency, and number of passes, Comparison Based Sorting Methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Shell sort, Non-comparison Based sorting Methods- Radix Sort, Counting sort, and Bucket sort, Comparison of All Sorting Methods and their Complexities.

UNIT-V	Searching Techniques and Problem Solving	08 Hours

Searching: Search Techniques- Sequential search/Linear Search, Variant of Sequential Search- Sentinel Search, Binary search, Fibonacci search, and Indexed Sequential Search.
Algorithms: Problem Solving, Introduction to Algorithm, Characteristics of algorithm, Algorithm design tools: Pseudo-code and flowchart, Algorithmic Strategies: Introduction to algorithm design strategies- divide and Conquer, and greedy strategy.

UNIT-VI	Linked List	07 Hours

Introduction to static and dynamic memory allocation, Linked List: Introduction to Linked List, Realization of linked list using dynamic memory management, operations, linked list as ADT, Types of Linked List: singly Linked List, linear and Circular Linked List, Doubly Linked List, Doubly circular Linked List, primitive operations on Linked List- create, traverse, Search, Insert, delete, sort, concatenate

Text Books:

T5. Horowitz and Sahani, "Fundamentals of Data Structures in C++ " University Press, ISBN: 10:0716782928, ISBN: 13: 9780716782926.

T6. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "data Structures and Algorithms in Python", Wiley Publication, ISBN: 978-1-118-29027-9.

Reference Books:

R6. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.

R7. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.

R8. Fundamentals of Data Structures in C++-By SartajSahani.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2203L]: Fundamentals of Data Structure Lab

Teaching Scheme:	**Credits:**	**Examination Scheme:**
LAB: 02 Hours/Week	LAB: 01	ISCE:30 Marks ESE:20 Marks

Course Prerequisites: Programming fundamentals, Problem solving skills.

Laboratory Objective:

- To understand use of different linear data structures in problem solving
- To learn different sorting techniques
- To learn different searching techniques
- To understand singly link list and doubly link list.

Laboratory Outcomes:

LO1: Use of array data structure to perform operations on matrix.
LO2: Implement various sorting techniques
LO3: Implement different searching technique.
LO4: Create singly and doubly link list and demonstrate its different operations.

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments

1	Write programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers: (i) Linear search, (ii) Binary search
2	Write a program to find sum of two matrix of order 2*2 using multidimensional arrays where, elements of matrix are entered by user.
3	Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

4	Write a program that implements the following i) Insertion sort ii) Merge sort iii)Heap sort.
5	Write a menu-driven program which will accept an array of 10 integer values and sort them with any two sorting algorithms of your choice.
6	Write a program that uses functions to perform the following operations on singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal.
7	Write a program that uses functions to perform the following operations on doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal
8	Write a program to implement all the functions of a dictionary (ADT) using Linked List.

Text Books:

T1. Horowitz and Sahani, "Fundamentals of Data Structures in C++ " University Press, ISBN: 10:0716782928, ISBN: 13: 9780716782926.

T2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "data Structures and Algorithms in Python", Wiley Publication, ISBN: 978-1-118-29027-9

Reference Books:

R1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.

R2. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.

R3. Fundamentals of Data Structures in C++-By Sartaj Sahani.

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2204T]: Operating System

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 03 Hours/Week	TH: 03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Basics of Electronics Engineering

Course Objectives:

1. To introduce basic concepts & function of Operating System.
2. To understand the basic concept of process, scheduling and thread management.
3. To learn the concept of concurrency control with deadlock.
4. To understand various Memory Management techniques.
5. To understand the concept of I/O and File management.
6. To learn recent concepts of advance operating system like Mobile OS

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

CO1: Describe the role of Operating Systems and its types.

CO2: Explore and analyze process scheduling, multithreading

CO3: Apply process synchronization techniques and analyze different deadlock handling methods.

CO4: Apply and evaluate various main and virtual memory management techniques.

CO5: Describe I/O management and File system.

CO6: Explain real time and mobile operating system.

Course Contents

UNIT-I	**Introduction to Operating system**	**06 Hours**
Evolution of operating systems: Batch, timesharing, multiprogramming, multi-tasking and distributed and real time. Operating system components, O.S. Services, Master Boot Record		
UNIT-II	**Process Management and Scheduling**	**07 Hours**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

Dr. Rakesh K. Jain
Director

Process: Concept of a Process, Process States, Process Description, Process Control (Processcreation, waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System.

Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads.
Scheduling: Types of Scheduling, Scheduling Algorithms, and Thread Scheduling.

UNIT-III	Concurrency control	07 Hours

Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors).

Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem Deadlock: Principles of Deadlock, Deadlock Modeling, Strategies to deal with deadlock: The Ostrich Algorithm, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem

UNIT-IV	Memory Management	07 Hours

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation. Virtual Memory: Hardware and Control Structures, Operating System Software

UNIT-V	File Management and Storage Structures	07 Hours

File Organization, Concept of files and directories, System calls for file systems, Space allocation issues, Free space management, Disk layout, Efficiency and performance, Disk Structure, Disk Scheduling.

UNIT-VI	Real time OS and Mobile OS	08 Hours

Characteristics of Real Time operating Systems, Classification of Real Time Operating Systems, Scheduling in RTOS: Clock driven: cyclic, Event driven: EDF and rate monotonic scheduling.

Mobile OS: Architecture, Android OS, iOS, Virtual OS, Cloud OS and their design issues

Text Books:

T1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10: 0-13- 380591-3, ISBN-13: 978-0-13-380591-8, 8th Edition
T2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, WILEY, ISBN 978-1-118-06333-0, 9th Edition
T3. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

Reference Books:

R1. Milan Milenkovic; Operating Systems; Tata McGraw Hill; Second Edition. ISBN: 0-07-044700-4

R2. Maurice J. Bach; The Design of the Unix Operating System; Prentice Hall of India; ISBN: 978-81-203-0516-8

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2204L]: Operating System Laboratory

Teaching Scheme:	**Credits:**	**Examination Scheme:**
LAB: 02 Hours/Week	LAB: 01	ISCE: 30 Marks ESE:20 Marks

Course Prerequisites: Fundamentals of Data Structures, Computer Organization

Laboratory Objective:

- To understand basics of operating system
- To learn /simulate different concepts of operating system function.

Laboratory Outcomes:

LO1: Demonstrate the use of built-in commands of Linux operating system
LO2: Demonstrate different Operating System calls
LO3: Analyze /Simulate OS scheduling algorithms as well as disk scheduling
LO4: Design and develop any application using multithreading.
LO5: Implement the use of semaphore for solving different synchronization problems.
LO6: Simulate memory management techniques and bankers algorithm for deadlock avoidance.

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments

1	**Study Basic utilities /built in commands of Linux OS** Assignment 1 : To study of Basic UNIX Commands 1. Process Related Commands 2. File Related commands 3. Use of Basic utilities like date, echo, lp etc 4. searching patterns using Sed, Grep Assignment 2 : To study the Unix editors vi, ed etc

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

2	**Shell Programming** Write a **shell** program to: Assignment No 1 : Design a basic calculator Assignment No 2 : Use of different loops

	Assignment No 3: Menu driven program for creation of any database
3	**Process Related system Calls** 1. To write C Programs using the following system calls of UNIX operating system fork, getpid, getppid, exit, wait. 2. To write C Programs using the execve system call
4	**Process Scheduling** Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin
5.	**Multithreading** Implement multithreading for Matrix Operations using Pthreads without pointer
6.	**Process Synchronization** Write a C program to simulate producer-consumer problem using Semaphores
6.	**Deadlock** Simulate Bankers Algorithm for Dead Lock Avoidance
7.	**Main Memory Management** Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
8.	**File Management** Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN
9.	**Mini Project** Create your own system call using kernel module programming ,embed it, recompile the kernel ,and write a program to test your system call is configured or not?
Text Books: **T1.** Unix & Shell **Programming**, Sumitabha Das,Tata McGraw Hill Education **T2.** Stalling William; "Operating Systems"; 6th Edition,Pearson Education	
Reference Books: **R1**. Silberschatz A., Galvin P., Gagne G.;"Operating System Concepts" ; 9th Edition; John Wiley and Sons; **R2**. Yashavant Kanetkar; "Unix Shell Programming"; 2nd Edition, BPB Publications	

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[ES2206T]: Environmental Science and Engineering

Teaching Scheme:	Credit	Examination Scheme:
TH: - 2 Hours/Week	TH: 2	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Objectives:

- To understand renewable, non-renewable energy, alternate energy, nonconventional energy resources.
- To understand concept of sustainable development.
- To understand causes and different methods for controlling air pollution.
- To understand importance disaster management.

Course Outcome:

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

CO1: Explain renewable, non-renewable energy sources and alternate energy sources.

CO2: Formulate action plans for sustainable development.

CO3: Suggest different methods for controlling air pollution.

CO4: Demonstrate importance of disaster management.

Course Contents

UNIT-I	Energy Resources	6 Hours

Sources of energy and their classification: Renewable and non-renewable energy sources, Utilization of solar in space heating and water heating. Conversion of solar energy into electricity. Biomass energy resources. Fuel cell (H_2-O_2) and Polymer Electrolyte Membrane Fuel Cell(PEM).

UNIT-II	Introduction to Sustainable Development	6 Hours

Need and concept of sustainability. social, environmental and economic sustainability concept. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators,challenges and strategies for SDGs..Introduction to environmental impact analysis(EIA)-Historical background, Elements of EIA.process. Participants in EIA process. Design of EIA. Concept of 3R (Reduce, Recycle and Reuse)and sustainability; Eco labelling of Environment Friendly –Products.

UNIT-III	Air Pollution Science and Engineering	6 Hours

Composition and structure of atmosphere. Classification of air pollutants and their effects, acid rain, photochemical smog and particulates. Sources, Characteristics and biochemical effects of some important air pollutants. Effects of air pollutants on man and his environment. Air quality standards and monitoring. Atmospheric sampling and analysis. Methods and equipment used to control gaseous

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

pollutants and industrial ion.		
UNIT-IV	**Disaster management**	**6 Hours**
Basic Concepts of Disaster Management: Introduction, necessity of studying Disaster Management (DM); Types of disasters. Vulnerability. Disaster Risk, Assessing Disaster Risk and ways of minimizing disaster risk. Disaster Risk Management (DRM) plan. Natural Hazards Risk management, Climate Disasters & Agriculture. Industrial hazard Risk Management.		
Guidelines for Assessment		
Assessment is a continuous assessment based on submission of the assignments, timely completion, attendance and understanding.		
List of Assignments		
1	Presentation on Fuel Cell	
2	Case study on Sustainable Development	
3	Assignment on Air Pollution	
4	Case study on Disaster Management	
Text Books: T1. A Text book of Environmental Chemistry and Pollution Control – S.S.Dara		
Reference Books: R1. Environmental Pollution: Monitoring and Control-S.M. Khopkar R2. Sustainability Engineering concepts, design and case studies-Allen ,D.T and Shonnard D.R		

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2205L]: Programming Lab-I: Python

Teaching Scheme:	Credits:	Examination Scheme:
LAB: 04 Hours/Week	LAB: 02	Lab Evaluation: 100 Marks ISCE:60 ESE:40

Course Prerequisites: Programming fundamentals, Problem solving skills.

Laboratory Objectives:

- To understand different types of Python in-built data structures, sequences, high-order functions such as lambda, map, its applications, and complexity analysis
- To learn different object-oriented features of Python Programming.

Laboratory Outcomes:

LO1: Implement basic Python programs, utilizing variables, data types, operators, and control structures.

LO2: Implement reusable functions to structure the code effectively.

LO3: Analyze the use of python built-in data structures.

LO4: Implement Python classes, objects, inheritance, and polymorphism to build structured and modular programs.

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for the overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments

1	**Basic Input/Output Programs** Write a **Python** program: 1: Accept numbers from a user 2: Display three string "Name", "Is", "James" as "Name**Is**James" 3: Convert Decimal number to octal using print() output formatting 4: Display float number with 2 decimal places using print() 5: Demonstrate basic data types

	6: Implicit Type Conversion 7: Create a variable inside a function, with the same name as the global variable 8: Swap Two Numbers. 9: Write a program to display the current date and time. 10: Calculate the Area of a circle and triangle
2	**Conditional Statements and Loop Programs** Write a **Python** program to: 1: Demonstrate Python operators 2: Find maximum of two numbers 3: Check if a number is even or odd 4: Count the total number of digits in a number 5: Determine the grade of a student based on their score. 6: Display numbers from -10 to -1 using for loop 7: Use the else block to display a message "Done" after successful execution of for loop 8: Write a program to display all prime numbers within a range 9: Display the Fibonacci series up to 10 terms 10: Find the factorial of a given number 11: Reverse a given integer number 12: Use a loop to display elements from a given list present at odd index positions 13: Calculate the cube of all numbers from 1 to a given number 14: Find the sum of the series upto n terms
3	**Function Programs** Write a **Python** program to: 1: Create a function in Python 2: Create a function with variable length of arguments 3: Return multiple values from a function 4: Create a function with a default argument 5: Create an inner function to calculate the addition in the following way 6: Create a recursive function 7: Assign a different name to function and call it through the new name
4	**String programs** Write a **Python** program to: 1: Create a string made of the first, middle and last character 2: Append new string in the middle of a given string 3: Create a new string made of the first, middle, and last characters of each input string 4: Arrange string characters such that lowercase letters should come first 5: Count all letters, digits, and special symbols from a given string 6: Create a mixed String using the following rules 7: String characters balance Test 8: Find all occurrences of a substring in a given string by ignoring the case 9: Calculate the sum and average of the digits present in a string

	10: Write a program to count occurrences of all characters within a string 11: Reverse a given string 12: Find the last position of a given substring
5.	Write a Python program to create user defined lists and execute operations: **A.** myList= [10, 40, 50, 20, 30,10,40,10] **B.** yourList = ['saw','small','foxes','he','six'] **Use built in methods to perform following operations on the list:** **1)** Append integer 60 into myList **2)** Insert 70 on 2nd Position **3)** Sort myList in ascending and descending order. **4)** Sort yourList in ascending and descending according to length of strings. **5)** Add float value 3.5 into yourList. **6)** Use POP and remove method to remove 3.5 **7)** Create ourList by merging myList and yourList **8)** Find sum of elements in mylist. **9)** Find smallest, largest and second largest number in a myList. **10)** Count occurrences of all element in a list **11)** Perform Data slicing to display string elements from ascending sorted yourList as: - **a.** Display - 'saw','six','small' **b.** Use negative indices to display - . 'six','small', 'foxes' **c.** All elements after mid of the list (In both directions). Alternate elements in both direction middle of list..
6	**Write a Python program to create tuples as** **A.** myTuple= (10, 20, 30) **B.** yourTuple = ("Pune", 'Mumbai', "Delhi") **C.** mixTuple= ('Foo',[1,2,3],'True') **D.** nestedTuple=(('**Wes McKinney**',' **Python for Data Analysis**',' **O'Reilly Media**'), ('**Mark Lutz**',' **Programming Python**',' **O'Reilly Media**'), ('**Charles Severance**',' **Python for Everybody**',' **Blumenberg**')) **Use built in methods to perform following operations on the tuple:** **1)** Merge myTuple and yourTuple into ourTuple. **2)** Convert myTuple into list myList and reverse. **3)** Unpack yourTuple values into three variables - District, State, and National. **4)** Display all elements of mixTuple. **5)** Add 4 into list element of mixTuple **6)** Perform algebraic operations addition and multiplication on myTuple and yourTuple. **7)** Access information from nestedTuple and display the information as:

	Name of Author = ' **Wes McKinney**', Name of Book = ' **Python for Data Analysis**', Name of Publisher= ' **O'Reilly Media**'
7	Write a Python program which read the **Particulars.txt** file contains the elements in the string format. **Particular.txt :** Diary CCards DCards VCards CCards DCards VCards VCards VCards VCards Create a dictionary myWallet by reading the elements and get() method. **myWallet={'Diary': 1, 'CCards': 2, 'DCards': 2, 'VCards': 5}** Perform following operations on myWallet dictionary: **1)** A new credit card is added in myWallet **2)** Check that any Photograph available in myWallet or not in True or False output. **3)** Add four Photographs in myWallet. **4)** Remove Photographs using del() method and pop() method. **5)** Represent the particulars of dictionary in the form of tuple. **6)** Sort the item of myWallet in ascending order based on items. **7)** Sort the items of myWallet in the ascending order based on item quantity
8.	**Write a Python program to construct Python built-in data structure Set.** 1) Create empty set 'Engineers' and 'Managers'. 2) Using input method add elements in 'Engineers' and 'Managers': Engineers={'Jane', 'John', 'Janice', 'Jack'} Managers ={'Jane', 'Jack', 'Susan', 'Zack'} 3) Display all engineers in this format : "Name of Engineer is --- " Jane 4) Copy all managers and construct a tuple myManagers =('Jane', 'Jack', 'Susan', 'Zack') 5) Copy all engineers and construct a list myEngineers ={'Jane', 'John', 'Janice', 'Jack'} 6) Add new manager 'Jenifer' 7) Create a third set Engineer_Manager by merging both Engineers and Managers sets. 8) Display the name of engineers who are not managers 9) Display the name of engineers who also serving as managers. 10) Display the name of person who is either engineer or manager only but not performing both jobs.
9	**File Handling** Programs to demonstrate File handling in Python: 1: Program to read the contents from a text file and display the same on screen. 2: Program to count the number of lines, words and characters from a text file. 3: Program to read first n lines from a text file 4: Program to read lines from a text file and find the length of the longest line. 5: Program to read last n lines of a file 6: Program to count the frequency of words in a file.

	7: Program to count lines starting with a word "The" 8: Program to replaces all special characters by space 9: Program to count occurrences of a word in a file
10	**Object Oriented Programming** Write a Python program to: 1. Exercise 1: Object & Class: Define a BankAccount class with attributes for account holder's name and balance. Implement methods for depositing, withdrawing, and checking the balance. Create objects of the BankAccount class and perform various operations. 2. Exercise 2: Inheritance: Create a base class Employee with attributes for name and ID. Derive classes Manager and Developer from Employee, each with additional attributes and methods. Create objects for each subclass and display their details. 3. Exercise 3: Encapsulation: Define a Student class with private attributes for name and grades. Implement public methods to add grades, calculate the average grade, and display student details. Ensure that grades can only be modified through the methods provided. 4. Exercise 4: Polymorphism: Define a base class Shape with a method area(). Implement derived classes Circle, Rectangle, and Triangle, each overriding the area() method to calculate the area of the respective shape. Create a function that takes a list of shapes and prints the area of each shape. 5. Exercise 5: Method Overriding: Define a base class Payment with a method process_payment(). Create derived classes CreditCardPayment and PayPalPayment that override the process_payment() method with specific implementations. Demonstrate method overriding by processing payments using different methods.
11	**Mini Project** Implement mini project using basic python programming and object-oriented programming concepts learned.

Text Books:

T1. Charles Severance, "Python for Everybody: Exploring Data in Python 3", 2nd Edition, Elliott Hauser, Sue Blumenberg, ISBN 9781530051120, 1530051126

T2. Allen Downey, "Think Python How to Think Like a Computer Scientist ",, 2nd Edition, ISBN 9781491939420, 1491939427

Reference Books:

R1. Wes McKinney —Python for Data Analysis, ISBN: 9781449319793, 1449319793. O'Reilly Media

R2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering, Pune, University I.D. No. PU/PN/Engg./173/(2001), Tathawade, Pune-33	Dr. Rakesh K. Jain Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2207T] Innovation and Entrepreneurship

Teaching Scheme:	Credit	Examination Scheme:
TH: - 2 Hours/Week	TH: 2	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Objectives:

- To understand an entrepreneur through case studies of successful entrepreneurs.
- To select the appropriate Product or Service for a business and Innovate in Global Thrust Areas.
- To understand the pain areas of an entrepreneur and study site selection, market survey, production, Finance, Costing and applied management in Business.
- To understand Business model Canvas and prepare Project Report for the selected business.

Course Outcome:

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

CO1: Understand entrepreneurship and identify product or service for the business.
CO2: Understand Innovation and Ideate in Global Thrust Areas like Agriculture and food processing, Automation, Environment, Health care, Energy, AI & ML.
CO3: Apply the knowledge to start Business (Micro / Small Enterprise)
CO4: Apply the Registration process of an enterprise / Startup.

Course Contents

UNIT-I	To understand Entrepreneur	6 Hours
Who is an Entrepreneur? Case Studies of Successful Entrepreneurs. Business Opportunity Identification. Case study of any two products or services.		
UNIT-II	**Innovation**	**6 Hours**
What is Innovation? Innovation Principles to Ideate. Idea Generation in global Thrust areas.		
UNIT-III	**Procedure for Investment**	**7 Hours**
Planning a Micro, Small Enterprise. Whom to contact for what. Market Survey tools. Return on Investment, Pay back Period, Break Even Analysis, Basics of Costing.		
UNIT-IV	**Registration of Startup**	**7 Hours**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

Business Model Canvas. Startup potential in India. Udyam Registration on Ministry of MSME online. Startup India Registration on Startup India portal.
Text Books: T2. The Dynamics of Entrepreneurship Development and Management by Vasant Desai Himalaya Publishing House. T3. A Manual for Entrepreneurs by Dr. Dinesh Awasthi, Entrepreneurship Development Institute of India, Ahmedabad. T4. Introduction to Entrepreneurship by Dr Santosh Kumar Sahu, Bookscape Publication.
Reference Books: R3. Entrepreneurship 11th Edition by Robert Michael P.,Peters Dean A.,Shephers Sabyasachi Sinha, Publication MC Graw Hill India R2. Project Management and Entrepreneurship by Dr. Vasant Desai, Himalaya Publishing House.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.	Dr. Rakesh K. Jain Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[HS2206L]: Soft Skills

Teaching Scheme:	Credit	Examination Scheme:
PR: - 2 Hours/Week	PR: 1	ISCE:30 ESE:20

Course Objectives:

- To encourage holistic development of students by focusing on soft skills.
- To make students understand the significance of soft skills through instruction, knowledge acquisition, and demonstration.
- To develop & nurture soft skills among students through individual & group activities.

Lab Outcome:

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

- Communicate effectively through verbal communication and an effective listening skill.
- Effective & open participation in group discussions/meetings/ Interviews.
- Improve written communication and technical writing.
- Become a self-motivated individual through effective goal/target-setting, knowledge of teamwork, conflict management, and leadership ability.

Course Contents

UNIT-I	Self-Development	4 Hours

Introduction to soft skills, SWOT analysis, Perception & attitudes, Values & belief systems, Personal success factors, Handling failure, Career Planning, and goal setting, Managing self- emotions, ego, pride, and stress.

UNIT-II	Communication skill- Key to Success	4 Hours

Types of Communication, Effective communication, Verbal & non-verbal communication, speaking skills- Importance of speaking effectively, speech process, message, audience, speech style, feedback, fluency and self-expression, voice quality, correct tone. Group discussion, public speaking, focused group discussion.

Listening skills- Fundamentals of good listening, virtues of listening, Barriers, and filters. Reading skills- Reading comprehension, reading a research paper and summarising, and Communication in the digital world.

UNIT-III	Writing Skills	4 Hours

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

Vocabulary- word substitutes, foreign phrases, Note making, Letter writing, Formal letter writing technical report writing, Notices/ Circular/ Agenda writing, Minutes of meetings, Business Email writing, Employment communication- Job application, cover letter, Resume building. Presentation skills- Preparation, content, and delivery of the presentation.

UNIT-IV	Team Building & Leadership	4 Hours

Leadership concept, Traits, diversity & culture, salient features of corporate leadership, Team building, Types of Teams, Team development stages, Interpersonal meetings, Team goal setting, Team decision-making, conflict resolution, Emotions, empathy, and emotional intelligence.

UNIT-V	Stress & Time Management	4 Hours

Identifying causes of Stress, signs of stress, Eustress & de-stress, Steps taken to combat stress, Open communication among employees, Time management, working towards your goals, Prioritizing tasks, and Decision-making skills.

UNIT-VI	Ethics & Values	4 Hours

Professional ethics & Values, Importance of work ethics, Problems in the absence of work ethics. Technology Etiquette – Etiquette at meeting, Phone etiquette, Email etiquette, social media etiquette, Interview etiquette, Dressing etiquette.

Guidelines for Assessment

Assessment is a continuous assessment based on the submission of the assignments, timely completion, attendance and understanding.

List of Assignments

1	**SWOT Analysis**- Students should do his / her SWOT analysis & submit a report of the same.
2	**Listening skills**- Listen to a short audio clip/ book and make a summary report of it.
3	**Oral Presentation skills**- Prepare a presentation on an eminent personality and speak about him/her for 5 minutes.
4	**Team building**- Create a virtual start-up concept in your team and implementation.
5	**Group Discussion**- Organise Group discussions on a current topic and ask every group to submit minutes of the meeting.
6	**Business etiquette** - Apply to any five internship openings over the internet by writing a professional email with a cover letter to company HR and submitting a hard copy of it.

Text Books :

T1. English for Business Communication: Simon Sweeney, Cambridge University Press.
T2. An Introduction to Professional English & Soft Skills: Das, Cambridge University Press.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -III
[IT2206L]: Design Thinking

Teaching Scheme:	Credit	Examination Scheme:
LAB: 2 Hours/Week	LAB:01	ISCE: 30 ESE: 20

Course Prerequisites: Software Engineering, Problem Solving

Lab Objective:

- To learn the Design thinking basic concepts.
- To identify the opportunities and challenges for design thinking innovation.
- To describe the define and ideate process of design thinking.
- To summarize the prototyping techniques.
- To enlist the activities carried out in Test and reflect phase of design thinking.
- To Interpret Design Thinking in IT.

Lab Outcome:

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

LO1: Define and state the structured approach to solve complex problems.
LO2: Identify and outline user needs, desires and perspective.
LO3: Apply creative mindset by encouraging diverse thinking and exploring ideas.
LO4: Develop skill set to work in collaboration in multi-disciplinary teams.
LO5: Iterate and adapt solutions based on feedback and insights for improvement and optimization of solutions.
LO6: Apply design thinking in daily work and decision making.

Course Contents

UNIT-I INTRODUCTION TO DESIGN THINKING

Introduction to Design and Design Thinking, Need of Design Thinking, Problem Solving and Design, Use of Design Thinking, Design Thinking-Attributes, The Principles of Design Thinking, The Five-step Process of Design Thinking(Empathize, Define, Ideate, Prototype, Test).

UNIT-II EXPLORE AND EMPATHIZE

Explore- STEEP Analysis, Activity Systems, Stakeholder Analysis, Framed Opportunities Empathized- Observation, Problem statement, User Interviews- Interview for Empathy

UNIT-III DEFINE AND IDEATE

Define- Define Point of view, Storytelling, Ideate- Purpose, Methods & Tools, User Experience Journey

UNIT-IV PROTOTYPE

Get Visual, Design Principals, Determine What to Prototype, Storyboard
Critical Experience Prototype (CEP) & Critical Function Prototype (CFP), Prototyping –Types of Paper Prototyping

UNIT-V TEST AND REFLECT

Test- Testing Sheet, Feedback Capture Grid, Solution interview Structured Usability Testing, Design Testing with Users, Usability Testing, Reflect- Road map for implementation, Evolve- Concept Synthesis,

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Viability Analysis(Impact Evaluation)

UNIT-VI Design Thinking in IT

Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Activities to conduct during laboratory

1. **Empathize Stage Activities**

Activity 1: User Interviews

- **Objective**: Understand user needs and challenges.
- **Instructions**:
  - Split students into pairs or small groups.
  - Assign each group a target user profile (e.g., elderly, teenagers, professionals).
  - Have students prepare interview questions and conduct mock interviews.
  - Record and summarize key insights.

Activity 2: Empathy Mapping

- **Objective**: Visualize user experiences and feelings.
- **Instructions**:
  - Provide students with empathy map templates.
  - Using insights from interviews, fill out sections for "Says," "Thinks," "Does," and "Feels."
  - Discuss common themes and patterns.

2. **Define Stage Activities**

Activity 1: Problem Statement Workshop

- **Objective**: Define clear and actionable problem statements.
- **Instructions**:
  - Teach students how to craft problem statements using the format: "User needs a way to [user's need] because [insight]."
  - Have students write and refine problem statements based on their empathy maps.
  - Conduct a peer review session to provide feedback and improvements.

Activity 2: User Personas

- **Objective**: Create detailed user personas.

- **Instructions**:
  - Provide templates for user personas.
  - Based on the gathered data, students create personas that represent their target users.
  - Share and discuss the personas with the class to ensure they are realistic and comprehensive.

3. Ideate Stage Activities

Activity 1: Brainstorming Session

- **Objective**: Generate a wide range of ideas.
- **Instructions**:
  - Teach brainstorming rules: defer judgment, encourage wild ideas, build on others' ideas.
  - Use methods like mind mapping or SCAMPER (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Rearrange).
  - Set a timer and have students rapidly generate ideas.
  - Share and discuss the ideas, grouping similar ones together.

Activity 2: Crazy 8s

- **Objective**: Quickly sketch multiple ideas.
- **Instructions**:
  - Provide students with sheets of paper divided into eight sections.
  - Set a timer for 8 minutes and have them sketch a different idea in each section.
  - Discuss the sketches and select the most promising ones.

4. Prototype Stage Activities

Activity 1: Paper Prototyping

- **Objective**: Create low-fidelity prototypes quickly.
- **Instructions**:
  - Provide materials like paper, markers, and scissors.
  - Students create paper prototypes of their ideas, focusing on key features and user interactions.
  - Share and discuss prototypes, giving feedback on usability and design.

Activity 2: Digital Prototyping

- **Objective**: Develop more detailed prototypes using digital tools.
- **Instructions**:
  - Introduce prototyping tools such as Figma, Sketch, or Adobe XD.
  - Have students translate their paper prototypes into digital versions.
  - Encourage peer reviews to refine and improve the designs.

5. Test Stage Activities

Activity 1: Usability Testing

- **Objective**: Gather user feedback on prototypes.
- **Instructions**:
  - Teach students how to conduct usability tests, focusing on observation and note-taking.
  - Have students recruit peers or volunteers to test their prototypes.
  - Record feedback and identify areas for improvement.

Activity 2: Feedback Loop

- **Objective**: Iterate on designs based on feedback.
- **Instructions**:
  - Students should summarize the feedback received during usability testing.
  - Identify common issues and brainstorm solutions.
  - Make necessary changes to the prototypes and prepare for a second round of testing if time permits.

6. Reflection and Presentation

Activity 1: Reflection Session

- **Objective**: Reflect on the design thinking process and learning outcomes.
- **Instructions**:
  - Have students write a reflection on what they learned at each stage of the process.
  - Discuss challenges faced and how they overcame them.
  - Encourage sharing of personal experiences and insights.

Activity 2: Final Presentation

- **Objective**: Present the final prototype and design thinking journey.
- **Instructions**:
  - Students should prepare presentations detailing their design thinking process, from empathy to testing.
  - Include user personas, problem statements, sketches, prototypes, and user feedback.
  - Present to the class and potentially invite industry professionals for additional feedback.

Text Books:

T1. Michael Lewrick, Patrick Link, Larry Leifer , "The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods", March 2020 edition, ISBN: 978-1-119- 62921-4, WILEY Publication.

T2. Mr Lee Chong Hwa (Lead Facilitator), "The Design Thinking: Guidebook"

Reference Books:

R1. IDEO (Firm), "The Field Guide to Human-centered Design: Design Kit", 1st edition, ISBN-978099140631-9, IDEO 2015.

R2. Russ Unger, Carolyn Chandler, "A Project Guide to UX Design For user experience designers inthe field or in the making (Voices That Matter)", 2nd Edition, ISBN 13: 978-0-321-81538-5

R3. Karl T Ulrich, "Design – Creation of Artifacts in Society", 1st edition, ISBN 978-0-9836487-0-3, University of Pennsylvania.

R4. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", ISBN- 9780061937743, Harper Collins, 2009.

R5. Eli Woolery, "Design Thinking Handbook", In-Vision publisher.

R6. Jeanne Liedtka, Andrew King, Kevin Bennett, "Solving Problems with Design Thinking: TenStories of
What Works", Columbia Business School Publishing, E-ISBN 978-0-231-53605-9

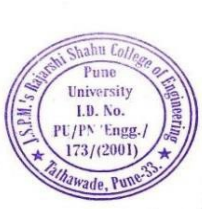
R7. Jake Knapp, John Zeratsky, Braden Kowitz, "Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days", ISBN 9780593076118, Bantam Press, 2016.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering, Pune University, I.D. No. PU/PN/Engg./173/(2001), Tathawade, Pune-33	Dr. Rakesh K. Jain Director

SEMESTER-IV

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics



Dr. Rakesh K. Jain
Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[ES2203T]: Calculus and Transforms

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Lectures: 03 Hrs./Week	Th: 03	In-Sem Evaluation: 20 Marks
		Mid-Sem Exam: 30 Marks
		End-Sem Exam: 50 Marks

Prerequisites: Differentiation & Integration, Multiple integrals and Vector algebra, sequence and series.

Course Objectives:

To familiarize the students with concepts and techniques in Differential calculus, Vector calculus, Ordinary differential equations, Numerical methods, Laplace transform, Fourier transform and Z-transform. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Course Outcome: After completing this course, students will be able to

1. Apply concepts of Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
2. Apply Vector calculus to modernized techniques in various computing systems.
3. Solve Linear differential equations, essential in modelling and design of computer-based systems.
4. Apply concepts of Laplace transform, Fourier transform & Z-transform and its applications to continuous & discrete systems and Image processing.
5. Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

Unit I: Differential Calculus (07 Hours)

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Rolle's Theorem, Mean Value Theorems, Taylor's Series and Maclaurin's Series, Expansion of functions using standard expansions
Unit II: Vector Calculus (07 Hours)
Vector differentiation, Gradient, Divergence and Curl, Directional derivative, Solenoidal and Irrotational fields, Vector identities. Line, Surface and Volume integrals, Green's Lemma, Gauss's Divergence theorem and Stoke's theorem.
Unit III: Ordinary Differential Equations (ODE) (07 Hours)
First Order ODE: Exact DE and equations reducible to Exact form. Linear Differential equations (LDE): LDE of n^{th} order with constant coefficients, Complementary Function, Particular Integral: General method, Short methods, Method of variation of parameters, Cauchy's and Legendre's DE.
Unit IV: Laplace Transform (LT) (07 Hours)
Definition of LT and Inverse LT, Properties & theorems, LT of some special functions viz. Periodic, Unit Step, Unit Impulse. Applications of LT for solving LDE.
Unit V: Fourier Transform (FT) and Z - Transform (ZT) (07 Hours)
Fourier Transform **(FT):** Introduction, Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine and Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses, Discrete Fourier Transform. Z - Transform **(ZT):** Introduction, Definition of ZT and Inverse ZT, Properties & Theorems, Solution of difference equations.
Unit VI: Numerical Methods (07 Hours)
Interpolation: Finite Differences, Newton's and Lagrange's Interpolation formulae, Numerical Differentiation. Numerical Integration: Trapezoidal and Simpson's rules, Bound of truncation error. Solution of Ordinary Differential Equations: Euler's, Modified Euler's, Runge-Kutta 4^{th} order methods and Predictor-Corrector methods
Text Books: 1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill). 2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

Dr. N. M. Ranjan **BoS Chairman**	**Dr. Ram Joshi** **Dean of Academics**	J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.	**Dr. Rakesh K. Jain** **Director**

Reference Books:

1. Advanced Engineering Mathematics, 10e, by Erwin Kreyszig (Wiley India).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).
4. Differential Equations, 3e by S. L. Ross (Wiley India).
5. Introductory Methods of Numerical Analysis, 5e, by S S Sastry (PHI Learning Pvt. Ltd., 2012)
6. Numerical Methods for Scientific and Engineers Computation,5e by M. K. Jain, S. R. K. Iyengar and R. K Jain (New Age international Publishers, Delhi)

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2208T]: Formal Language and Automata Theory

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 03 Hours/Week	TH : 03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: 1.Logic and Set Theory.
2.Computer Programming and Problem Solving

Course Objectives:

1.To understand the basics of automata theory and its operations.
2.To study different types of regular languages and context free grammar.
3. To understand design of Pushdown Automata.
4. To understand construction of Turing Machine.
5.To study the fundamentals of decidability.

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

CO1: Design finite state machines for computing problems.
CO2: Convert regular expressions and Finite Automata into each other for the formal languages.
CO3: Generate the grammar for formal languages.
CO4: Prepare push down automata for regular languages.
CO5: Construct Turing machine for regular languages.
CO6: Solve the decidability and undecidability problems.

Course Contents

UNIT-I	**Finite State Machines (FSM)**	**07 Hours**

Basic Concepts: Symbols, strings, formal and natural languages. FSM without output: definition, Transition Diagram. Transition Table, Acceptance and rejection of String. construction-Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA) with and without epsilon. Minimization of Deterministic Finite Automata, conversion of NFA to DFA. Problems based on DFA and NFA.
Case Study :Recognizing patterns in text or other data.

UNIT-II	**Regular Expressions and Regular Languages**	**07 Hours**

Definition of Regular Expressions (RE), Construction of regular expression of the given language, construction of language from the RE, construction of FA from the given RE using direct method, conversion of FA to RE using Arden's theorem, applications of Regular Expressions. Proving languages to be non-regular -Pumping lemma, applications, Closure properties of regular languages.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

Case Study : Text Search and Manipulation in search Engines		
UNIT-III	**Context Free Grammar and Languages**	**07 Hours**
Introduction, formal definition of grammar, derivation process, Context Free Grammar (CFG),ambiguous CFG, Derivation graphs, removal of ambiguity, simplification of CFG, normal forms(CNF and GNF), Chomsky hierarchy, regular grammar, Problems of CFG and CFL. Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Case Study : Lexical Analyzer.		
UNIT-IV	**Pushdown Automata**	**07 Hours**
Introduction to PDA, formal definition of PDA , different examples of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA Problems. Case Study : Case study of Tower of Hanoi using PDA.		
UNIT-V	**Turing Machines**	**07 Hours**
The basic model for Turing machines (TM),The Church's Turing hypothesis, Mathematical Definition of TM, recognizable(recursively enumerable Languages) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, Universal Turing machine. Case Study : Encryption of data using TM.		
UNIT-VI	**Decidability and Undecidability**	**07 Hours**
Decidability problems, recursive languages and recursively enumerable languages, decidability problems related to regular languages and context free grammar, halting problem of TM, un-decidable problems, post correspondence problem, Rice Theorem, mapping reducibility.		

Text Books:

T1.Introduction to the Theory of Computation by Michael Sipser (CENGAGE Learning, 3e).

T2.Theory of Computation by Vivek Kulkarni (Oxford University Press).

T3. Hopcroft, Ullman, Motwani, Introduction to Automata Theory, Languages, and Computation, Addison Wesley Publication, 2nd Edition, 2001.

Reference Books:

R1. Peter Linz," An introduction to formal languages and automata", Jones & Bartlett Learning

R2. Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.

R3. John C Martin, "Introdution to languages and theory of computation", McGraw Hill.

R4. Anami&Aribasappa , "Formal Languages and Automata Theory", Wiley India.

R5. Theory of Computer Science (Automata, Languages and Computation) by K.L.P Mishra, N. Chandrasekaran(Prentice Hall India, 2e).

R6. Krithivasan Kamala, Introduction to Formal Languages, Automata Theory and Computation, Pearson Education, 1st Edition, 2009.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.	Dr. Rakesh K. Jain Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2209T]: Data Structures and Algorithms

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH: 03 Hours/Week	TH:03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Fundamentals of Data Structure

Course Objectives:

- To Study linear data structures like stack and queue.
- To understand nonlinear data structures like tree and graph.
- To build the logic to use appropriate data structure in logical and computational solutions.
- To understand various file organization methods.

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

CO1: Implement Stack using array and link list data structures
CO2: Create Queue using array and link list data structures
CO3: Implement tree data structure for providing solution to real life problems
CO4: Describe indexing and create multi-way trees
CO5: Implement graph data structure and perform various operations
CO6: Describe various file organization methods

Course Contents

UNIT-I	**Stack**	**07 Hours**

Basic concepts, Stack abstract data types, Representation of stacks using sequential organization, stack operations, Multiple stacks, Application of Stack: Expression Evaluation and conversion, polish notation and expression, need for prefix and postfix expressions, postfix expression evaluation, stack implementation using linked list.

UNIT-II	**Queue**	**07 Hours**

Basic concepts, Queue as Abstract data type, Representation of Queue using sequential organization, Queue operations, Circular queue and its advantages Multi- queues, Linked queue and operations, De-queue- Basic concepts, Types(Input restricted and output restricted), priority queue- Basic concept, types(Ascending and descending).

UNIT-III	**Non-linear Data Structure-Tree**	**07 Hours**

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

Basic Terminology of Trees, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, Splay Tree and Applications of Trees.		
UNIT-IV	**Indexing and Multiway Trees**	**07 Hours**
Indexing, Indexing Techniques- primary, Secondary, Dense, sparse, multiway Search tree, B-Tree and B+ Tree: Insertion, deletion, use of B+ tree in indexing.		
UNIT-V	**Non-linear Data Structure -Graph**	**07 Hours**
Basic Terminology of Graphs ,Directed Graph, Undirected Graph, Various Representations, Operations on Graph (search and traversal algorithms and complexity analysis) & Applications of Graphs.		
UNIT-VI	**File**	**07 Hours**
Introduction to Hashing, Sequential File Organization, Direct File Organization, Indexed Sequential File Organization, Hashed File Organization and various types of accessing schemes.		

Text Books:

T1. Horowitz, Sahani, Dinesh Mehta, "Fundamentals of Data Structures in C++" Galgotia Publisher, ISBN: 8175152788, 9788175152786.

T2. M Folk, B Zoellick, G. riccardi, "File Structures, Pearson Education", ISBN: 81-7758-37-5

T3. Peter Brass, "Advanced Data Structures", Cambridge University Press, ISBN: 978-1-107-43982-5

Reference Books:

R1. A. Aho, J. Hpcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0

R2. Michael J Folk, "File Structures an Object Oriented approach with C++", Pearson education, ISBN:81-7758-373-5

R3. Sartaj Sahani, "Data Structures, Algorithms and Applications in C++", Second Edition, University press, ISBN: 81-7371522 X.

R4. G A V Pai, "Data Structures and Algorithms", McGraw Hill Companies, ISBN-9780070667266

R5. Goodrich, Tamassia, Goldwasser,"Data Structures and Algorithms in Java", Willey Publication, ISBN:9788126551903.

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.	Dr. Rakesh K. Jain Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2209L]: Data Structures and Algorithms Lab

Teaching Scheme:	**Credits:**	**Examination Scheme:**
LAB: 02 Hours/Week	LAB: 01	ISCE: 30 Marks ESE: 20 Marks

Course Prerequisites: Fundamentals of Data Structures

Laboratory Objective:

- To understand use of array and link list to build stack
- To learn queue creation using array and link list
- To understand non linear data structure tree and its applications
- To understand graph data structure and its applications.
- To learn file organizations method

Laboratory Outcomes:

LO1: Demonstrate use of array and link list in building stack and Queue ADT
LO2: Apply stack and Queue data structures to solve real life problems.
LO3: Create tree and demonstrate its traversal techniques.
LO4: Create graph and demonstrate its traversal techniques
LO5: Implement hash file organization method

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments

1	Write a C program to Implement Stack data structure using an Array and Linked list
2	Write a C program to reverse a string using stack
3	Write a C program to Implement Queue data structure using an Array and Linked list

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

4	Create a Binary Search Tree,take input from user and perform following operations on it. a. Insertion of a node in a tree b. Deletion of a node c. Searching of a node d. Display by using any one traversal method
5.	Write a C Program to Implement AVL Tree
6	Write a C program to Implement Adjacency Matrix representation of Graph data structure
7	Write a C Program using Breadth First Traversal for a user defined Graph and Depth First Traversal for a user defined Graph
8.	Write a C program to implement a hash table on names for telephone directory data

Text Books:

T1. Horowitz, Sahani, Dinesh Mehta, "Fundamentals of Data Structures in C++" Galgotia Publisher, ISBN: 8175152788, 9788175152786.

T2. M Folk, B Zoellick, G. riccardi, "File Structures, Pearson Education", ISBN: 81-7758-37-5

T3. Peter Brass, "Advanced Data Structures", Cambridge University Press, ISBN: 978-1-107-43982-5

Reference Books:

R1. A. Aho, J. Hpcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0

R2. Michael J Folk, "File Structures an Object Oriented approach with C++", Pearson education, ISBN:81-7758-373-5

R3. Sartaj Sahani, "Data Structures, Algorithms and Applications in C++", Second Edition, University press, ISBN: 81-7371522 X.

R4. G A V Pai, "Data Structures and Algorithms", McGraw Hill Companies, ISBN- 9780070667266

R5. Goodrich, Tamassia, Goldwasser,"Data Structures and Algorithms in Java", Willey Publication, ISBN:9788126551903.

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2210T]: Computer Networks

Teaching Scheme:	Credits:	Examination Scheme:
TH : 03 Hours/Week	TH : 03	In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks

Course Prerequisites: Basic of Electronics and Computer Organization & Architecture

Course Objectives:

1. To understand the basic concepts of Data communication and digital data transmission.
2. To familiarize students with basic concepts and types of networks.
3. To explore ISO/OSI and TCP/IP model
4. To study data link, network layer of ISO/OSI Model.
5. To learn transport layer and application layer of ISO/OSI Model.
6. To understand concepts of Wireless network.

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

CO1: Describe basics of data communication and computer networks.

CO2: Discuss design issues and flow control mechanisms of Data Link Layer.

CO3: Describe and apply concepts of Logical addressing, subnetting & Routing Mechanism.

CO4: Analyze functionalities of Transport Layer like Port addressing, Connection Management, Error control and Flow control mechanism.

CO5: Distinguish different protocols of Application layer.

CO6: Discuss the key components of the Wireless Networks and its applications.

Course Contents

UNIT-I	Fundamentals of Data Communication	07 Hours

Data Transmission, Communication modes: Simplex, half duplex and full duplex transmission, Analog & Digital transmission, Transmission Impairments: Attenuation, Delay distortion, Channel capacity, Circuit and Packet Switching, Data encoding schemes. Asynchronous and Synchronous Transmission, Introduction to Computer Networks, Applications, Network Components, Categories of Networks, Network Topologies, Need of Layered architecture, Reference models: OSI and TCP/IP reference models.

UNIT-II	Data Link Layer	07 Hours

Design issues of Data link layer, Framing, Flow control: Stop and Wait protocol, Sliding Window protocol: ARQ, Go-back-n and Selective reject Error control Protocols: Parity Check, Hamming

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

Distance, CRC, Multiple access techniques-random access, controlled access & Channelization, protocols: Stop & wait, ARQ, Go-Back –N ARQ, Selective repeat.
Media Access Control: ALOHA, CSMA/CD, CSMA/CA.

UNIT-III	Network Layer	07 Hours

Design Issues in Network Layer, Network Layer protocols: IPv4 ,ARP, IP, ICMP, IGMP, Classful and Classless addressing, Network address translation and Sub netting, Routing algorithms: Static and Dynamic Routing, Shortest path routing algorithm, flooding, Distance vector routing algorithm, LinkState routing algorithm, Internetworking. Interior and exterior routing protocols: RIP, OSPF, BGP.

UNIT-IV	Transport Layer	07 Hours

Transport layer-Process to process delivery, Multiplexing and Demultiplexing, Connection oriented & Connectionless Transport, UDP, TCP, Connection establishment, connection release, Error control, flow control, congestion control and Quality of Service. Socket programming (UDP, TCP).

UNIT-V	Application Layer	07 Hours

Application Layer Protocols: HTTP (Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, Telnet, File transfer protocol, E-Mail (SMTP, MIME, IMAP, POP), DHCP, DNS (Overview, Services Provided by DNS, How DNS Works? DNS Records and Messages), INMP.

UNIT-VI	Introduction of Wireless Networks	07 Hours

Introduction to wireless LAN, Introduction of Adhoc and Infrastructure Network Wireless LANs: Architectural Comparison, Characteristics, Access Control, IEEE 802.11: Applications of Networking, Case studies on Networking, Bluetooth, Satellite Network: Operation, GEO Satellites, MEO Satellites, LEO Satellites.

Text Books:

T1. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill Education, ISBN:78-125-906475-3, 5th Edition.

T2. Andrew S Tanenbaum, David. J. Wetherall, "Computer Networks", Pearson Education, 5th Edition.

T3. Kurose and Ross, Computer Networking- A Top-Down approach, Pearson, 5th edition.

Reference Books:

R1. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652- 1, 4th Edition.

R2. S. Keshav: An Engineering Approach to Computer Networking, Pearson R2. Natalia Olifer& Victor Olifer, ―Computer Networks: Principles, Technologies & Protocols for Network Design‖, Wiley India, 2011.

R3. C. Siva Ram Murthy, B. S. Manoj, Adhoc Wireless Networks: Architecture and Protocols, Pearson Education, ISBN: 978-81-317-0688-6, 1st Edition.

R4. C. K. Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, ISBN: 978- 01324.

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[HS2203T] Universal Human Values and Ethics

Teaching Scheme: TH:- 02	Credit TH:02	Examination Scheme: InSem.Evaluation:20Marks MidSem.Exam:30marks EndSem.Exam:50marks

Course Objectives:

1. To help students to distinguish between values and skills and understand the need, basic guidelines, content and process of value education.
2. To help students to initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students to understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Course Outcome:

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

CO1: Distinguish between skills and values through value education.
CO2: Distinguish between self and body with program to nurture body with self- regulation.
CO3: Recognize the value of harmonious relationship based on naturally accepting values in human – human relationship.
CO4: Describe harmony in society and nature.

Course Contents

UNIT-I	Introduction to value education	6 Hours

Understanding value education, self-exploration as the process for value education, happiness and prosperity, right understanding, relationship and physical facility, happiness and prosperity–current scenario, method to fulfill the basic human aspiration.

UNIT-II	Harmony in human being	6 Hours

Understanding human being as a coexistence of the self and body, understanding the needs of self and body, the body as an instrument of the self, understanding activities of self, understanding harmony in the self, understanding the harmony in self with body, programs to fulfill the self-regulation and health.

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

UNIT-III	Harmony in family and society	6Hours
Harmony in family-a basic unit of human interaction, Human—human relationship, values in relationships, understanding harmony in the society and vision for universal human order.		

UNIT-IV	Harmony in nature	6Hours
Understanding the harmony in society and nature, understanding the four orders of nature, realizing existence as co- existence at all levels.		

Guidelines for Assessment

In semester evaluation shall be based on continuous assessment based on timely submission of assignments.

TextBooks:

T1.Human values and Professional Ethics by RRGaur, RSangal, GPBagaria, Excel Books, New Delhi, 2010

T2.JeevanVidya:EkParichaya,ANagaraj,JeevanVidyaPrakashan,Amarkantak, 1999.

ReferenceBooks:

R1.Manav Vyavhar Darshan,ANagaraj,JeevanVidyaPrakashan,Amarkantak,2001

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2211L] Web Technology Lab

Teaching Scheme:	**Credits:**	**Examination Scheme: [100]**
LAB: 04 Hours/Week	LAB: 02	ISCE:60 Marks ESE:40 Marks

Course Prerequisites: Basic knowledge of C, object-oriented language and database.

Laboratory Objective:

- To learn concepts of designing web pages using HTML, CSS.
- To introduce JSP programming and master database access using PHP, JSP.

Laboratory Outcomes:

LO1: Apply fundamental concepts of HTML, CSS, and JavaScript to design web pages.

LO2: Develop web pages using PHP, XML and DTD.

LO3: Implement security measures in web applications, understanding concepts like data validation, and protection against common web vulnerabilities.

LO4: Create dynamic web applications that interact with databases (MySQL) and handle user requests.

Lab Contents

Guidelines for Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member.

List of Laboratory Assignments/Experiments

1	Design and implement an admission form using following HTML syntax : a) HTML syntax: heading tags, basic tags and attributes, frames, tables, images, lists, links for text and images, forms, Bootstrap, etc. b) GitHub essentials (repository, Commits)

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

2	Design and implement a registration form using Inline CSS/ Internal CSS / External CSS. CSS syntax: colors, containers, panel, effects, border, padding, margin, fonts , Bootstrap etc.
3	Design and implementbasic syntax of Java Script(JS). a) Variables – Implement JS Program for variables (Var, Let, Const), b) Data Types–Implement JS Program using string, number, Bigint, Boolean, undefined, Null, Symbol, Object, Array(search, sort) Functions - Implement JS Program e.g. Temperature conversion, Fibonacci series(using recursion)
4	Design and Implement Conditional statement, loop of Java Script a) Conditional statement - If-else, else-if, and switch statements. b) Loop - for, while, do-while, break statement. Sets, Maps,Typeof, Typeconversion.
5.	Implement any small web application in Java Script using following: Design UI of application using HTML, CSS& JS Apply Java script validation Change color of background at each click of button or refresh of a page-Display calendar for the month and year selected from combo box OnMouse hover event.
6	Implement basic syntax of PHP. a) Build comment system. b) Build rating system. c) Build CV builder system. d) Build QR generator system. e) Build Like and dislike system.
7	Design an authentication system with entries for name, mobile number, email id and login button. a. Validation for correct names. b. Validation for mobile numbers. c. Validation for email id. d. Validation if no entered any value. e. Re-display for wrongly entered values with message. f. Congratulations and welcome page upon successful entries. Using PHP.
8.	Design a weather app using weather map API in PHP.
9	Write an XML file which will display the Book information which includes the following: Title of the book, Author Name, ISBN number, Publisher name, Edition and Price. Validate the above document using DTD and XML Schema.
10	Design a system to perform CRUD operation on Mysql Database using PHP. (Faculty allocate the statement to student).
11	Design a JSP to generate certification system.
12	Mini Project: Implement a personal portfolio onlive webserver/github.
13	Mini Project: Implement a dynamic web application for any business functionality by using

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

	web development technologies that you have learnt in the above given assignments.

Text Books:

T1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035.

T2. Robert W. Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson education, 2008.

T3. Robin Nixon, “Learning PHP, MySQL and JavaScript”, 5th Edition, O`Reilly Media, 2018, ISBN 9781491978917.

T4. Julie C. Meloni and Jennifer Kyenin, "HTML, CSS, and JavaScript All in one ", Third Edition, Pearson Education, 2014, ISBN 978-9389552416.

Reference Books:

R1. Marty Hall, Larry Brown,"Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.

R2. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.

R3. Chris Bates, “Web Programming Building Internet Applications”, 3rd Edition, Wiley India, 2006.

R4.Xue Bai et al, “The web Warrior Guide to Web Programming”, Thomson, 2003.

R5. Thomas A. Powell, "The complete reference HTML & CSS", Fifth Edition, Mc Graw Hill, 2010, ISBN 978-0-07-174170-5.

R6.Laurence Lars Svekis, Rob Percival, and Maaike van Putten, "JavaScript from Beginner to Professional", First Edition, Packt Publishing , 2021, ISBN 978-1-80056-252-3.

Dr. N. M. Ranjan **BoS Chairman**	**Dr. Ram Joshi** **Dean of Academics**	J.S.P.M.'s Rajarshi Shahu College of Engineering, Pune, University I.D. No. PU/PN/Engg./173/(2001), Tathawade, Pune-33.	**Dr. Rakesh K. Jain** **Director**

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2212L]: Programming Lab II: Advanced Python

Teaching Scheme:	**Credits:**	**Examination Scheme:**
Lab : 02 Hours/Week	Lab:01	ISCE: 30 Marks ESE: 20 Marks

Course Prerequisites: Problem solving skills, Python Programming

Laboratory Objectives:

- To understand different built in functions available in libraries like numpy, pandas, sklearn, scikit learn, seaborn, Sci-py.
- To learn different components of Django framework.

Laboratory Outcomes:

LO1: Demonstrate the use of built-in functions available in libraries like Numpy, Pandas, Seaborn, SciPy.
LO2: Implement functions of Scikit and TensorFlow library.
LO3: Design and implement mini projects by using Django framework.

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

PART-A Python Libraries

1	Study and implement functions of Python NumPy library.
2	Study and implement functions of Python Pandas library.
3	Study and implement functions of Python SciPy library.
4	Study and implement functions of Python Matplotlib library
5	Study and implement functions of the Python Seaborn library.

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33

Dr. Rakesh K. Jain
Director

6	Study and implement functions of Scikit learn library.
7	Study and implement functions of the TensorFlow library.
Part B-Django Framework	
9	Blog Application: Create a basic blog application using Django. Include features such as creating, editing, and deleting blog posts.
10	To-Do List: Develop a simple to-do list application where users can add tasks, mark them as completed, and delete them.
11	Mini Project/E-commerce Site: Build a small e-commerce website using Django. Include features such as product listings, user authentication, and a shopping cart.

Text Books:

T1. Charles Severance, "Python for Everybody: Exploring Data in Python 3", 2nd Edition, Elliott Hauser, Sue Blumenberg, ISBN 9781530051120, 1530051126.

T2. Allen Downey, "Think Python How to Think Like a Computer Scientist ",, 2nd Edition, ISBN 9781491939420, 1491939427

T3. José Unpingco, "Python for Probability, Statistics, and Machine Learning", Springer International Publishing Switzerland, ISBN 978-3-319-30715-2, DOI 10.1007/978-3-319-30717- 6, ISBN 978-3-319-30717-6 (eBook)

Reference Books:

R1. Wes McKinney —Python for Data Analysis, ISBN: 9781449319793, 1449319793.O'Reilly Media

R2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010.

R3. Beginning Django: Web Application Development and Deployment with Python, Daniel Rubio, First Edition, APress publication.

S. Y. B. Tech (Department of Information Technology)
Academic Year – 2024-2025 Semester -IV
[IT2213L]: Co-curricular Course-II

Teaching Scheme: 02 hrs/week	Credit 01 each for Semester availed	Examination Scheme: ISCE: 30 ESE:20

Course Objective:

To provide students the opportunity to better explore their interests and to groom overall personality, apart from academic ability.

Course Outcomes:
Students will be able to

- Broaden students' breadth of knowledge and horizons.
- Stimulate out of the box thinking, self-reflection, and self-understanding to promote their individual growth.
- Build solid foundation for "Whole Person Education" which will nurture and foster the holistic development.

Course Contents

List of Extra curricular activities :

1. Leadership Work and Positions
2. Sports and Athletic Participation
3. Academic Clubs and Teams/ Professional student chapters
4. Artistic and Creative Pursuits
5. Volunteering and Community Service
6. Internships

Rules & Regulations:

- All the first year students should enroll in one of the Extra-Curricular Activities

Dr. N. M. Ranjan BoS Chairman	Dr. Ram Joshi Dean of Academics	Dr. Rakesh K. Jain Director

- Students opting for Sports / Games / Yoga / Martial Arts / Dance can continue the same activity in the I/II/III/IV/V/VI/VII/VIII semester or can choose another activity
- Every week, any day last 2 hours are given for Cocurricular activity.
- Minimum of 50% attendance is required for these activities.
- In-charge faculty coordinator monitor the students and take the attendance.
- At the end of the year the attendance is submitted to the Attendance Committee and finally to the Exam Section.
- Students are given grades credits in the final memorandum.
-

Guideline for grading Co/Extra-Curricular Activity

- RSCOE shall organized various competitions through its various clubs(governed by either by Student Affairs pr Department) during the semester and academic year.
- All UG students shall choose at least ONE activity/event from the group of Co-curricular and Extra-curricular activities happening on campus or off campus during the semester. The student shall take active part in the activity, take part in competitions and earn grade points.
- On registering for a particular activity, the performance of a student shall be continuously monitored by the Faculty-in-charge.

RSCOE plans club activities into three categories.

1. Art Club
2. Technical Club
3. Sports and Games
4. SWAYAM

- Art club include various clubs related to liberal arts, music, performing arts etc.
- Technical club include chapters of professional societies like SAE,ASRAE,ISHRAE,CSI,RSI,IEEE, ISTE, IET, Department Associations, Shashwat (socio-technical club),Rotaract, ASCE,ICI etc.
- National Service Scheme (NSS) and Similar activities such as Unnat Bharat, Social Work, Blood donation etc.
- SWAYAM portal offers some self-paced courses related with YOGA such as Physical Activity (YOGA) (योग) or approved by Dean concern.
- Participation in competitions, winning prizes, representing institute on state, national and international level etc shall get weightage as mentioned in the Annexure I and rubrics for same ids designed
- All competition to which Academic credit is concerned, shall have set of guidelines and rubrics defined by the department or Student Affair or concern faculty in charges.
- Few examples of Competition/Activity and is given in Annexure II

Annexure I: Assessment Rubrics:

Table A Rubrics for Assessment for Clubs Sports and cultural events(@UG Level)

Dr. N. M. Ranjan	Dr. Ram Joshi		Dr. Rakesh K. Jain
BoS Chairman	Dean of Academics		Director

		Clubs/Activity				Marks *	Grade point	Letter Grade
	• **Art clubs** • **Technical Clubs** • **Sports** • **Any other competition/activity defined by institute/ department.**	**NSS/NCC/Unnat Bharat Abhiyan**	**Participation in events outside of the institutes**	**SWAYAM Courses(only 4 week course approved Dean concern)**	**Leadership & Management of clubs/activities/ Student Professional Societies/Institute Festival & Technical Events etc**			
Achievement level	I Prize winner, II Prize Winner, III winner	Best NSS/NCC Volunteer Awardee (State/National level) / Participation in Republic Day Parade Camp/International Youth Exchange Programme, Supported by certification	I Prize winner, II Prize Winner, III Prize Winner	As reflected in grade sheet	Top level management	50-45	10	O
	Active Participation (High)	Active Participation (High)	Selection in such events supported By certification		Middle level management	40-35	9	A+
						35-30	8	A
	Active Participation (Medium)	Active Participation (Medium)			Lower-level management	30-25	7	B+
						25-20	6	B
	Active Participation (low)	Active Participation (low)				20-15	5	C
						12	4	P
	Not participate	Not participate	-		-	0	0	F

*Various clubs different marking system, however, it can be scaled down to 50 and assign credit accordingly.

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering, Pune University I.D. No. PU/PN/Engg./173/(2001), Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director

Table B Rubrics for Assessment for Professional Society/Hacathons events (@FY Level)

10 pts=1 credits

Sr No	Category	International			National			State			Inter college	In-house
1	Organizer	8 pts			5 pts			4 pts			3 pts	2 pt
2	Participants	Shortlisted for final round=5	Shortlisted for second round=4	Shortlisted for first round=3	Shortlisted for final round=4	Shortlisted for second round=3	Shortlisted for first round=2	Shortlisted for final round=3	Shortlisted for second round=2	Shortlisted for first round=1	2	1
3	Winner	Rank 1 = 10	Rank 2= 9	Rank 3= 8	Rank 1 = 9	Rank 2= 9	Rank 3= 7	Rank 1 = 8	Rank 2= 7	Rank 3= 6	7,6, 5	7,6,5

Dr. N. M. Ranjan
BoS Chairman

Dr. Ram Joshi
Dean of Academics

J.S.P.M.'s Rajarshi Shahu College of Engineering Pune University I.D. No. PU/PN/Engg./173/(2001) Tathawade, Pune-33.

Dr. Rakesh K. Jain
Director