Faculty of Science & Technology

Savitribai Phule Pune University, Pune

Syllabus
for
Second Year
Bachelor of Information Technology
(2019 Course)
(With effect from AY 2020-21)

Savitribai Phule Pune University, Pune
Bachelor of Information Technology

Program Educational Objectives

PEO1	Possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.
PEO2	Possess knowledge and skills in the field of Computer Science and Information Technology for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.
PEO3	Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science and Information Technology.
PEO4	Have commitment to ethical practices, societal contributions through communities and life-long learning.
PEO 5	Possess better communication, presentation, time management and team work skills leading to responsible & competent professionals and will be able to address challenges in the field of IT at global level.

Program Outcomes

Students are expected to know and be able to–		
PO1	**Engineering knowledge**	An ability to apply knowledge of mathematics, computing, science, engineering and technology;
PO2	**Problem analysis**	An ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data;
PO3	**Design / Development of Solutions**	An ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints;
PO4	**Conduct Investigations of Complex Problems**	An ability to identify, formulate, and provide systematic solutions to complex engineering/Technology problems;
PO5	**Modern Tool Usage**	An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional;
PO6	**The Engineer and Society**	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems with necessary constraints and assumptions;
PO7	**Environment and Sustainability**	An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society;
PO8	**Ethics**	An ability to understand professional, ethical, legal, security and social issues and responsibilities;
PO9	**Individual and Team Work**	An ability to function effectively as an individual or as a team member to accomplish a desired goal(s);

PO10	**Communication Skills**	An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of electives, professional organizations and extra-curricular activities;
PO11	**Project Management and Finance**	An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations;
PO12	**Life-long Learning**	An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice;

Program Specific Outcomes (PSO)	
A graduate of the Information Technology Program will demonstrate-	
PSO 1	An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applications also in the interdisciplinary domain.
PSO 2	An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large scale computing systems.
PSO 3	An understanding of professional, business and business processes, ethical, legal, security and social issues and responsibilities. At times technical decisions are influenced by the needs of the business and its processes like quality control processes. An IT graduate should be able to deal with that.
PSO 4	Practice communication and decision making skills through the use of appropriate technology and be ready for industry culture

Savitribai Phule Pune University, Pune
SE (Information Technology Engineering) 2019 Course
(With effect from Academic Year 2020-21)

Semester-III

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
214441	Discrete Mathematics	03	-	01	30	70	25	-	-	125	03	--	01	04
214442	Computer Organization and Logic Design	03	-	-	30	70	-	-	-	100	03	-	-	03
214443	Data Structures and Algorithms	03	-	-	30	70	-	-	-	100	03	-	-	03
214444	Object Oriented Programming	03	-	-	30	70	-	-	-	100	03	-	-	03
214445	Basics of Computer Network	03	-	-	30	70	-	-	-	100	03	-	-	03
214446	Computer Organization and Logic Design Lab	-	02	-	-	-	25	25	-	50	-	01	-	01
214447	Data Structures and Algorithms Lab	-	04	-	-	-	25	25	-	50	-	02	-	02
214448	Object Oriented Programming Lab	-	04	-	-	-	25	25	-	50	-	02	-	02
214449	Soft Skill Lab	-	02	-	-	-	25	-	-	25	-	01	-	01
214450	Mandatory Audit Course 3	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		15	12	01	150	350	125	75	--	700	**15**	**06**	**01**	**22**

Abbreviations:

TH: Theory TW: Term Work PR: Practical

OR: Oral TUT: Tutorial

Note: Students of S.E. (Information Technology) can opt any one of the audit course from the list of audit courses prescribed by BoS (Information Technology Engineering)

***Mandatory Audit Course 3:**

214450 A- Ethics and values in IT

214450 B- Quantitative Aptitude and Logical Reasoning

214450 C- Language Study- Japanese- Module I

214450 D - Cyber Security and Low

Savitribai Phule Pune University, Pune
SE (Information Technology Engineering) 2019 Course
(With effect from Academic Year 2020-21)

Semester-IV

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
207003	Engineering Mathematics-III	03	-	01	30	70	25	-	-	125	03	--	01	04
214451	Processor Architecture	03	-	-	30	70	-	-	-	100	03	-	-	03
214452	Database Management System	03	-	-	30	70	-	-	-	100	03	-	-	03
214453	Computer Graphics	03	-	-	30	70	-	-	-	100	03	-	-	03
214454	Software Engineering	03	-	-	30	70	-	-	-	100	03	-	-	03
214455	Programming Skill Development Lab	-	02	-	-	-	25	25	-	50	-	01	-	01
214456	Database Management System Lab	-	04	-	-	-	25	25		50	-	02	-	02
214457	Computer Graphics Lab	-	02	-	-	-	-	25	-	25	-	01	-	01
214458	Project Based Learning	-	04	-	-	-	50	-	-	50	-	02	-	02
214459	Mandatory Audit Course 4#	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		15	12	01	150	350	125	75	-	700	**15**	**06**	**01**	**22**

Abbreviations:

TH: Theory TW: Term Work PR: Practical

OR: Oral TUT: Tutorial

Note: Students of S.E. (Information Technology) can opt any one of the audit course from the list of audit courses prescribed by BoS (Information Technology Engineering)

#Mandatory Audit Course 4:

214459 A - Water Supply and Treatment

214459 B - Language Study- Japanese- Module II

214459 C - Waste Management and Pollution Control

214459 D - Intellectual Property Rights

Instructions:

- Practical or Tutorial must be conducted in batches and number of batches per division should be as per guidelines from regulatory bodies.
- Required Minimum number of Experiments/ Assignments in Practical/ Tutorial shall be carried out as mentioned in the syllabi of respective subjects from the set of prescribed Experiments/Assignments.
- In addition to the prescribed list, the instructor for Practical/ Tutorial may design one or two additional experiments/Assignments relating to the subject covering some of the research/application areas of the concepts from syllabi.
- For each experiment/ assignment in a practical/ tutorial subject, the instructor must ask students to prepare a write-up with explanation/ applicability/ flow charts/ algorithms/ problems incurred/ problems addressed etc. in related experiments/ assignment.
- Assessment of tutorial work has to be carried out as term-work examination. Term-work Examination at second year of engineering course **shall be internal continuous assessment only.**
- Project based learning (PBL) requires mentoring and internal continuous assessment by faculty throughout the semester for successful completion of the tasks assigned to the students. A teaching workload of four Hours/week/batch is associated with PBL subject and it is to be allocated to the faculty conducting PBL mentoring and internal continuous assessment. The Batch shall contain sub-groups each comprising 5 to 6 students for easing the process of internal continuous assessment. Assignments / activities / models / projects etc. completed under project-based learning will be considered for internal continuous assessment, evaluation, and award of credits for PBL subjects.
- Audit course is a mandatory non-credit course. Systematic assessment has to be conducted at the end of semester for Semester III & IV respectively for award of grade at college level.
- The course objectives, course outcomes and CO-PO mapping table are provided for reference; the course instructor is requested to modify as per his perspective
- Case Studies may be assigned as self-study to students and to be excluded from theory examinations.
- The CO-PO mapping table at end of course contents, indicates the correlation levels of 3, 2, 1 and '- 'The notation of 3, 2 and 1 denotes (high), moderately (medium) and slightly (low) mapping level respectively. The meaning of '-'is no correlation between CO and PO.
- All the rules, regulations and guidelines issued by regulatory authorities from time to time for effective conduction of curriculum, assessment and evaluation are to be strictly followed.

SEMESTER - I

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214441: Discrete Mathematics

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 hr/week Tutorial: 01 hr/week	03 01	Mid Semester: 30Marks End Semester: 70Marks TW : 25Marks

Prerequisite Courses, if any: Basic Mathematics

Companion Course, if any:

Course Objectives:

1. Gain sound knowledge to formulate and solve problems with sets and propositions.
2. To understand and solve counting problems by applying elementary counting techniques to solve problems of discrete probability.
3. To understand Graph and Tree terminologies and models to be applied in real life problems.
4. To recognize types of relation, formulate and solve problems with relations and functions.
5. To understand basics of number theory and its applications.
6. To understand the various types' algebraic structures and its applications.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Formulate, apply formal proof techniques and solve the problems with logical reasoning.
CO2: Analyze and evaluate the combinatorial problems by using probability theory.
CO3: Apply the concepts of graph theory to devise mathematical models.
CO4: Analyze types of relations and functions to provide solution to computational problems.
CO5: Identify techniques of number theory and its application.
CO6: Identify fundamental algebraic structures.

COURSE CONTENTS

Unit I	Sets And Propositions	(06 Hrs + 2hrs Tutorial)

Sets: Sets, Combinations of Sets, Venn Diagram, Finite and Infinite Sets, Countable Sets, Multisets, Principle of Inclusion and Exclusion, Mathematical Induction.

Propositions: Propositions, Logical Connectives, Conditional and Bi-conditional Propositions, Logical Equivalence, Validity of Arguments by using Truth Tables, Predicates and Quantifiers, Normal forms. Applications of Sets and Propositions**.**

Case Studies	Discuss logical paradoxes
Mapping of Course Outcomes for Unit I	CO1

Unit II	Combinatorics And Discrete Probability	(06 Hrs + 2hrs Tutorial)

Combinatorics: Rules of Sum and Product, Permutations, Combinations.

Discrete Probability: Discrete Probability, Conditional Probability, Bayes Theorem, Information and Mutual Information. Applications of Combinatorics and Discrete Probability.

Case Studies	**Discuss telephone numbering plan**
Mapping of Course Outcomes for Unit II	**CO2**

Unit III	**Graph Theory**	**(06 Hrs + 2hrs Tutorial)**

Graphs: Basic Terminologies, Multi-Graphs, Weighted Graphs, Sub Graphs, Isomorphic graphs, Complete Graphs, Regular Graphs, Bipartite Graphs, Operations on Graphs, Paths, Circuits, Hamiltonian and Eulerian graphs, Travelling Salesman Problem, Factors of Graphs, Planar Graphs, Graph Colouring.

Trees: Tree Terminologies, Rooted Trees, Path Length in Rooted Trees, Prefix Codes, Spanning Trees, Fundamental Cut Sets and Circuits, Max flow –Min Cut Theorem (Transport Network).
Applications of Graph Theory.

Case Studies	**Investigate the properties of web graph**
Mapping of Course Outcomes for Unit III	**CO3**

Unit IV	**Relations And Functions**	**(06 Hrs + 2hrs Tutorial)**

Relations: Properties of Binary Relations, Closure of Relations, Warshall's Algorithm, Equivalence Relations, Partitions, Partial Ordering Relations, Lattices, Chains and Anti Chains.
Functions: Functions, Composition of Functions, Invertible Functions, Pigeonhole Principle, Discrete Numeric Functions.
Recurrence Relations: Recurrence Relation, Linear Recurrence Relations with Constant Coefficients, Total Solutions.Applications of Relations and Functions.

Case Studies	**Describe basic principles of relational databases**
Mapping of Course Outcomes for Unit IV	**CO4**

Unit V	**Introduction To Number Theory**	**(06 Hrs + 2hrs Tutorial)**

Divisibility of Integers: Properties of Divisibility, Division Algorithm, Greatest Common Divisor GCD and its Properties, Euclidean Algorithm, Extended Euclidean Algorithm, Prime Factorization Theorem, Congruence Relation, Modular Arithmetic, Euler Phi Function, Euler's Theorem, Fermat's Little Theorem, Additive and Multiplicative Inverses, Chinese Remainder Theorem.

Case Studies	**Number theoretic concepts public keys and private keys**
Mapping of Course Outcomes for Unit V	**CO5**

Unit VI	Algebraic Structures	(06 Hrs + 2hrs Tutorial)

Algebraic Structures :, Introduction Semigroup, Monoid, Group, Abelian Group, Permutation Groups, Cosets, Normal Subgroup, Codes and Group Codes, Ring, Integral Domain, Field.
Applications of Algebraic Structures.

Case Studies	**Correlate the properties of binary operation**
Mapping of Course Outcomes for Unit VI	**CO6**

Books & Other Resources:

Text Books:

1. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", & 7th edition, McGraw-Hill.

Reference Books:

1. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, "Discrete mathematical structures", 6th edition, Prentice Hall of India.
2. Edgar G. Goodaire, Michael M. Parmenter, "Discrete Mathematics with Graph Theory", 3rd Edition, Pearson Education.
3. Tremblay J. S., "Discrete mathematical structures with application", 3rdEdition, Tata McGraw Hill.
4. Lipschutz Seymour, "Discrete mathematics", 4th Edition, Tata McGraw-Hill.
5. Johnsonbaugh Richard, "Discrete Mathematics", 7th edition, Pearson.
6. Biggs Norman L, "Discrete mathematics", 6th edition, Oxford.
7. David M. Burton, "Elementory Number Theory", &7th Edition, McGraw-Hill.

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	-	-	-	1	-	2
CO2	2	3	1	1	1	1	-	-	-	1	-	2
CO3	3	3	2	2	1	1	-	-	-	2	-	2
CO4	3	2	1	2	1	1	-	-	-	2	-	2
CO5	2	2	2	2	1	2	-	-	-	1	-	2
CO6	2	3	2	1	1	1	-	-	-	1	-	2

Guidelines for Tutorial and Term Work

- Tutorial shall be engaged in four batches (batch size of 20 students maximum) per division.
- Term work shall be based on continuous assessment of six assignments (one per each performance in internal tests.

Examples on various topics of respective unit will be covered in tutorial sessions on the basis of following,

1. **Problems for deep understanding of concepts.**
2. **Identify applications and device mathematical models for real time problems.**

Sr. No.	Name of the Tutorial	Description	Applicable CO
1	Introduction to Set Theory	Formulate problems to illustrate 1. Sets, universal sets, multisets, and operations on sets such as union, intersection, complement and set difference. 2. Introduce sets as mathematical model to classify data sets.	CO1
2	Propositional Logic	Formulate problems that comprises 1. Translation of English sentences into logical propositions by using logical connectives. 2. Proof for logical equivalences by using truth table analysis. 3. Propositions by using Predicates and Quantifiers. 4. Conjunctive and Disjunctive Normal Forms. 5. Proof by using Mathematical Induction	CO1
3	Combinatorics	Design problems to illustrate counting techniques by using 1. Permutation and Combinations 2. Permutation with repetition 3. Properties of *nCr and nPr* 4. Addition and Multiplication Principle	CO2
4	Discrete Probability	Formulate problems for better understanding of 1. Discrete Probability 2. Conditional Probability and Bay's theorem Identify applications of probability to Computer Science	CO2
5	Graph Theory	Design problems to study 1. Graph properties and operations on graphs 2. Connectedness, Hamiltonian and Eulerian graphs. 3. Introduce graph as a mathematical model to understand transport, communication, and social networks.	CO3
6	Tree	Problems to be formulated on 1. Prefix codes, Huffman codes 2. Fundamental cut sets and Fundamental circuits 3. Transport network by using Maximum Flow Minimum cut Theorem 4. Identify applications of tree for Searching Algorithms,	CO3

		Polish notation	
7	Relations and Functions	Problems to understand 1. Types of Relations 2. Equivalence relation and Equivalence classes 3. Transitive closure by using Warshall's Algorithm. 4. Injective, Surjective and Bijective Functions. 5. Pigeonhole principle and its applications	CO4
8	Recurrence Relation	Problems based on 1. Formation of recurrence relation 2. Solving homogeneous recurrence relation with constant coefficients 3. Solving non homogeneous recurrence relations to find total solution. 4. Identify applications of recurrence relation in counting.	CO4
9	Introduction to Number Theory	Problems to illustrate concepts such as- 1. Divisibility and its properties 2. Greatest common divisor and its properties 3. Prime numbers and prime factorization theorem to find GCD and LCM of two numbers	CO5
10	Modular Arithmetic	Problems to demonstrate applications of- 1. Euler's theorem and Fermat's theorem in counting remainders 2. Linear congruences 3. Chinese Remainder Theorem 4. Applications of Modular arithmetic to Cryptography and Security	CO5
11	Algebraic Structures-I	Problems to be formulated to illustrate 1. Concept of algebraic structure 2. Examples of semigroup, monoid, group and abelian group 3. Generating group codes by using normal subgroups 4. Application of Algebraic Structure in operator overloading.	CO6
12	Algebraic Structures-II	Problems to illustrate 1. Definition and examples of Ring, types of Ring 2. Zero divisors and Integral domain 3. Multiplicative inverses in different rings, and Field 4. Identify Applications of Ring and Field in Coding Theory	CO6

* Subject Teacher is free to give different tasks to students as per the above stated guidelines.
* Ideas of the students as per above stated guidelines can also be accepted.

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214442:Computer Organization & Logic Design

Teaching Scheme:	Credit	Examination Scheme:
TH:03hr/week	3	Mid semester: 30 marks End semester: 70 marks

Prerequisite Courses, if any: Basics of electronics engineering

Companion Course, if any:

Course Objectives:

1. To make undergraduates, aware of different levels of abstraction of computer systems from hardware perspective.
2. To make undergraduates, understand the functions, characteristics of various components of Computer& in particular processor & memory.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Perform basic binary arithmetic & simplify logic expressions.
CO2: Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
CO3: Comprehend the operations of basic memory cell types and Implement sequential logic Functions using ICs.
CO4:Elucidate the functions & organization of various blocks of CPU.
CO5: Understand CPU instruction characteristics, enhancement features of CPU.
CO6: Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.

COURSE CONTENTS

Unit 1	Introduction To Digital Electronics	06 Hrs

Digital Logic families: Digital IC Characteristics; **TTL:** Standard TTL characteristics, Operation of TTL NAND gate; **CMOS:** Standard CMOS characteristics, operation of CMOS NAND gate; Comparison of TTL & CMOS.

Signed Binary number representation and Arithmetic: Sign Magnitude, 1's complement & 2's complement representation, unsigned Binary arithmetic (addition, subtraction, multiplication, and division), subtraction using 2's complement; IEEE Standard 754 Floating point number representations.

Codes: Binary , BCD, octal , hexadecimal , Excess-3 , Gray code & their conversions

Logic minimization: Representation of logic function: logic statement, truth-table, SOP form, POS form; Simplification of logical functions using K-Maps up to 4 variables.

Case Study : 1) CMOS 4000 series ICs 2) practical applications of various codes in computers 3) four basic arithmetic operations using floating point numbers in a calculator.

Mapping of Course Outcomes for Unit I: CO1

Unit 2	Combinational Logic Design	06 Hrs

Design using SSI chips: Code converters, Half- Adder, Full Adder, Half Subtractor, Full Subtractor, n bit Binary adder.

Introduction to MSI chips: Multiplexer (IC 74153), Demultiplexer (IC 74138), Decoder (74238) Encoder (IC 74147), Binary adder (IC 7483)

Design using MSI chips: BCD adder & subtractor using IC 7483, Implementation of logic functions using IC 74153 & 74138.

Case Study : Use of combinational logic design in 7 segment display interface

Mapping of Course Outcomes for Unit II:CO2

Unit 3	Sequential Logic Design	06 Hrs

Introduction to sequential circuits: Difference between combinational circuits and sequential circuits; Memory element-latch & Flip-Flop**.**

Flip- Flops: Logic diagram, truth table & excitation table of SR, JK, D, T flip flops; Conversion from one FF to another , Study of flip flops with regard to asynchronous and synchronous, Preset & Clear, Master Slave configuration ; Study of 7474, 7476 flip flop ICs.

Application of flip-flops: Counters- asynchronous, synchronous and modulo n counters, study of 7490 modulus n counter ICs & their applications to implement mod counters; Registers- shift register types (SISO, SIPO, PISO &PIPO)& applications.

Case Study : Use of sequential logic design in a simple traffic light controller

Mapping of Course Outcomes for Unit III:CO3

Unit 4	Computer Organization & Processor	06 Hrs

Computer organization & computer architecture: organization &functions of computer units- CPU, Memory, IO & system bus; Von Neumann & Harvard architecture, Instruction cycle

Processor: Single bus organization of CPU, organization & functions of: ALU, Register(general purpose, address registers, data registers, flags, PC, MAR, MBR, IR)& control unit,

Control Signal examples with Micro Operations and Register Transfer.

Control unit: Basic concepts of functional organization of Hardwired & Micro-Programmed Control unit

Case Study : IAS computer

Mapping of Course Outcomes for Unit 4: CO4

Unit 5	Processor Instructions & Processor Enhancements	06 Hrs

Instruction : Opcode& mnemonics, Instruction Format & 0-1-2-3 address formats, Types of operands Addressing modes, Instruction types. RISC& CISC characteristics, Interrupt, instruction pipelining Multiprocessor systems & multicore processor.

Case Study : Intel Core i7 Processor

Mapping of Course Outcomes for Unit 5: CO5

Unit 6	Memory & Input / Output Systems	06 Hrs

Memory Systems: Characteristics of Memory Systems, Internal & external memory: types &

characteristics, Memory Hierarchy, signals to connect memory to processor, internal organization of memory chips, cell structure & characteristics of semiconductor memory: SRAM, DRAM &ROM, Cache **Memory –** Principle of Locality, Organization, Mapping functions, write policies, Replacement policies, Multilevel Caches, Cache Coherence, MESI Protocol,

Input / Output Systems: I/O Modules, Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA).

Case Study : USB flash drive (block diagram and interface

Mapping of Course Outcomes for Unit 6 : CO6

Text Books:

1."Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, Third Edition

2."Computer organization and architecture, designing for performance" by William Stallings , Prentice Hall ,Eighth edition

Reference Books:

1."Digital Design", M Morris Mano, Prentice Hall, Third Edition.

2. "Computer organization" , Hamacher and Zaky, Fifth Edition

3. "Computer Organization and Design: The Hardware Software Interface" D. Patterson, J. Hennessy, Fourth Edition, Morgan Kaufmann.

4. " Microprocessors and interfacing-programming and hardware" Douglas V. Hall and SSSP Rao, McGraw-Hill ,Third Edition

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	1	3	3	1	1	-	-	-	-	-	-	-	-
CO3	1	3	3	1	1	-	-	-	-	-	-	-	-
CO4	-	-	-	3	1	-	-	-	-	-	-	-	-
CO5	-	-	-	1	-	-	-	-	-	1	-	-	-
CO6	-	-	-	-	2	-	-	-	-	-	-	-	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214443 :Data Structure & Algorithms

Teaching Scheme:	Credit	Examination Scheme:
TH: 03hr/week	03	Mid Semester: 30Marks End Semester: 70Marks

Prerequisite Courses, if any: Fundamental knowledge of programming language and basics of algorithms

Companion Course, if any: Discrete Structures/Discrete Mathematics

Course Objectives:

1. To study data structures and their implementations and applications.
2. To learn different searching and sorting techniques
3. To study some advanced data structures such as trees, graphs and tables.
4. To learn different file organizations.
5. To learn algorithm development and analysis of algorithms.

Course Outcomes:

CO1: Analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2: Understand different advanced abstract data type (ADT) and data structures and their implementations.
CO3: Understand different algorithm design techniques (brute -force, divide and conquer, greedy, etc.) and their implementation.
CO4: Apply and implement learned algorithm design techniques and data structures to solve problems.
CO5: Perform basic analysis of algorithms with respect to time and space complexity.
CO6: Use algorithmic foundations for solving problems and programming.

COURSE CONTENT

Unit- I	Introduction	(06 Hrs)

Introduction to Data Structures: Concept of data, Data object, Data structure, Concept of Primitive and non-primitive, linear and Nonlinear, static and dynamic, persistent and ephemeral data structures, **Definition of ADT, Array:** Single and multidimensional array address calculation, recursion.
Searching and sorting: Need of searching and sorting, Concept of internal and external sorting, sort stability, Searching methods: Linear and binary search algorithms, Fibonacci Series.
Sorting methods: Bubble, insertion, Quick, Merge, shell and comparison of all sorting methods.

Case Studies	**Set Operation, String Operation**
Mapping of Course Outcomes for Unit I	**CO1, CO2, CO3, CO5**

Unit- II	Stack &Queue	(06 Hrs)

Linked Organization: Concept of linked organization, Singly Linked List, Doubly Linked List, Circular Linked List as an ADT (Operations: Create, Display, Search, Insert, Delete).

Stack: Concept of stack, Concept of implicit and explicit stack, stack as an ADT using sequential and linked organization, Applications of stack: converting expressions from infix to postfix or prefix form, evaluating postfix or prefix form. **Queue:** Concept of queues as ADT, Implementation of queue using array and linked organization, Concept of circular queue, double ended queue , Applications of queue: priority queue.		
Case Studies	**Reversing a string, balanced parentheses in algebraic expressions, Towers of Hanoi problem, double ended queue as Stack and Queue.**	
Mapping of Course Outcomes for Unit II	**CO1, CO2, CO3, CO5**	
Unit- III	**Trees**	**(06 Hrs)**
Tree : Trees and binary trees-concept and terminology, Expression tree, Binary tree as an ADT, Recursive and Non recursive algorithms for binary tree traversals, Binary search trees, Binary search tree as ADT. **Threaded binary tree:** Concept of threaded binary tree (inorder, preorder and postorder). Preorder and In-order traversals of in-order threaded binary tree, Applications of trees.		
Case Studies	**Construction of BST from pre and postorder traversal, Expression Tree construction**	
Mapping of Course Outcomes for Unit III	**CO1, CO2, CO3,CO5**	
Unit- IV	**Graph**	**(06 Hrs)**
Graph -Concept and terminologies, Graph as an ADT, Representation of graphs using adjacency matrix and adjacency list, Breadth First Search traversal, Depth First Search traversal, Prim's and Kruskal's algorithms for minimum spanning tree, Shortest path using Warshall's algorithm, Shortest path using Dijkstra's algorithm, topological sorting.		
Case Studies	**Consider a network of computers connected to each other. The connection has various parameters associated with it as distance, propagation delay, bandwidth (capacity of carrying data), etc. Based on these parameters, decide which path should be chosen to send data from one computer to every other on the network.**	
Mapping of Course Outcomes for Unit IV	**CO1, CO2, CO3, CO5**	
Unit- V	**Symbol Table &Heap**	**(06 Hrs)**
Symbol Table: Notion of Symbol Table, OBST, AVL Trees Heap: Heap data structure, Min and Max Heap, Heap sort implementation, applications of heap **Hashing:** Hash tables and scattered tables: Basic concepts, hash function, characteristics of good hash function, Different key-to-address transformations techniques, synonyms or collisions, collision resolution techniques- linear probing, quadratic probing, rehashing, chaining with and without replacement.		
Case Studies	**In a system, jobs are submitted for execution at different times. If the**	

	system is idle, the job is taken for execution immediately. If there is a job in execution, the newly submitted job has to be put in a queue. The jobs are assigned a number which tells the priority of the jobs. The system must take high priority jobs first for execution. Implement the above said system using heap data structure.	
Mapping of Course Outcomes for Unit V	**CO1, CO2, CO4, CO6**	
Unit- VI	**Analysis Of Algorithms &File Organization**	**(06 Hrs)**
Analysis of algorithm: Frequency count and its importance in analysis of an algorithm,Time complexity & Space complexity of an algorithm Big 'O', 'Ω' and 'Θ' notations,Analyze Insertion sort, Quick Sort, binary search, hashing for Best, Worst and Average case. **File :**Concept of File, File types and file organization (sequential, index sequential and DirectAccess), Comparison of different file organizations.		
Case Studies	**Best case, Average case and Worst case analysis of Merge and Quick sort.**	
Mapping of Course Outcomes for Unit VI	**CO1, CO3,CO5, CO6**	

Text Books:

1. R. Gilberg, B. Forouzan, "Data Structures: A pseudo Code Approach with C++", Cengage Learning, ISBN 9788131503140.
2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928

Reference Books:

1. Bruno R Preiss, "Data Structures and Algorithms with Object-Oriented Design Patterns in C++", Wiley India Edition
2. G. A.V, PAI , "Data Structures and Algorithms ", McGraw Hill, ISBN -13: 978-0-07-066726-6
3. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.
4. A. Tharp ,"File Organization and Processing", 2008 ,Willey India edition, 9788126518685
5. J. Tremblay, P. Soresan, "An Introduction to Data Structures with Applications", 2nd edition, Tata McGraw Hill International Editions, 1984, ISBN-0-07-462471-7.
6. M. Folk, B. Zoellick, G. Riccardi, "File Structure An Object Oriented Approach with C++", Pearson Education, 2002, ISBN 81 - 7808 - 131 - 8.
7. M. Welss, "Data Structures and Algorithm Analysis in C++", 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0

The CO-PO mapping for the course												
PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	3	-	3	-	-	-	-	-	-
CO2	1	3	3	3	-	3	-	-	-	-	-	-
CO3	2	1	2	3	-	3	-	-	-	-	-	-
CO4	2	3	3	3	-	3	-	-	-	-	-	-
CO5	3	3	2	3	-	3	-	-	-	-	-	-
CO6	1	3	3	3	-	3	-	-	-	-	-	-

Home

Savitribai Phule Pune University Second Year Information Technology (2019 Course) 214444: Object Oriented Programming		
Teaching Scheme	**Credit**	**Examination Scheme**
TH: 03Hrs/Week	**03**	**Mid Semester: 30 Marks** **End Semester: 70 Marks**

Prerequisites: Principles of Programming Languages

Course Objectives:

1. Apply concepts of object oriented paradigm.
2. Design and implement models for real life problems by using object oriented programming.
3. Develop object oriented programming skills.

Course Outcomes:

CO1: Differentiate various programming paradigms and apply basic concepts of OOP.

CO2: Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems.

CO3: Identify relationship among objects using inheritance and polymorphism.

CO4: Handle different types of exceptions and perform generic programming.

CO5: Use file handling for real world application.

CO6: Apply appropriate design patterns to provide object-oriented solutions.

COURSE CONTENT

Unit I	**Foundations of Object Oriented Programming**	**(06 hrs)**

Introduction OOP : Software Evolution, Introduction to Procedural, Modular, Object-Oriented and Generic Programming Techniques, Limitations of Procedural Programming, Need of Object-Oriented Programming, Fundamentals of Object-Oriented Programming: Objects, Classes, Data Members, Methods, Messages, Data Encapsulation, Data Abstraction and Information Hiding, Inheritance, Polymorphism, Static and Dynamic Binding, Message Passing.

Case Studies	**Model a real world scenario (vehicle class, fruit class, student management in university etc.) using Object Oriented Paradigm**
Mapping Course Outcomes for Unit 1	**CO1**

Unit II	**Classes, Objects and Methods**	**(06 hrs)**

Class : Creating a Class, Visibility/Access Modifiers, Encapsulation, Methods: Adding a Method to Class, Returning a Value, Adding a Method That Takes Parameters, The 'this' Keyword, Method Overloading, Object Creation, Using Object as a Parameters, Returning Object, Array of Objects, Memory Allocation: 'new', Memory Recovery: 'delete', Static Data Members, Static Methods, Forward Declaration, Class as Abstract Data Types (ADTs), Classes as Objects.

Case Study	**Represent a vector using class and include appropriate methods to perform various tasks.**
Mapping of Course Outcomes for Unit II	**CO2**

Unit III	Constructors and Destructors	(06 hrs)
Constructors: Introduction, Use of Constructor, Characteristics of Constructors, Types of Constructor, Constructor Overloading, Constructor with Default Arguments, Symbolic Constants, Garbage Collection: Destructors and Finalizers.		
Case Study	**A book shop inventory**	
Mapping of Course Outcomes for Unit III	**CO2**	
Unit IV	**Inheritance and Polymorphism**	**(06 hrs)**
Inheritance: Introduction, Need of Inheritance, Types of Inheritance, Benefits of Inheritance, Cost of Inheritance, Constructors in derived Classes, Method Overriding, Abstract Classes and Interfaces. Polymorphism and Software Reuse: Introduction, Types of Polymorphism (Compile Time and Run Time Polymorphism), Mechanisms for Software Reuse, Efficiency and Polymorphism		
Case Study	**A bank account system**	
Mapping of Course Outcomes for Unit IV	**CO3**	
Unit V	**Exception Handling and Generic Programming**	**(06 hrs)**
Exception: Errors, Types of Errors, Exception and its Types, Exception-Handling Fundamentals, Uncaught Exception, Using try and Catch, Multiple Catch Clauses, Nested Try Statements, User Define Exception using Throw. **Generics:** What are Generics? Introduction to Language Specific Collection Interface: List Interface and Set Interface, Collection Classes: ArrayList Class and LinkedList Class.		
Case Study	**Exception handling and generic programming using array list (ArrayList class).**	
Mapping of Course Outcomes for Unit V	**CO4**	
Unit VI	**File Handling and Design Patterns**	**(06 hrs)**
File Handling: Introduction, Concepts of Stream, Stream Classes, Byte Stream Classes, Character Stream, Classes, Using Stream, Other Useful I/O Classes, Using the File Class, Input/output Exceptions, Creation of Files, Reading/Writing Character, Reading/Writing Bytes, Handling Primitive Data Types, Concatenating and Buffering Files, Random Access Files. **Design Patterns:** Introduction, Types of Design Patterns, Adapter, Singleton, Iterator		
Case Study	**Student Management System**	
Mapping of Course Outcomes for Unit VI	**CO5 and CO6**	
Text Book:		
1. An Introduction to Object Oriented Programming (3rd Ed), by Timothy A. Budd, published by Addison-Wesley,2002 2. E. Balaguruswamy, “Object Oriented Programming Using C++ and Java”, Tata McGrawHill		

Reference Books:

1. Object-Oriented Programming and Java by Danny Poo (Author), Derek Kiong (Author), Swarnalatha Ashok (Author)Springer; 2nd ed. 2008 edition (12 October 2007), ISBN-10: 1846289629, ISBN-13: 978-1846289620,2007
2. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
3. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094. 4. UML for Java Programmers by Robert C. Martin, Prentice Hall, ISBN 0131428489,2003.

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	2	-	-	2	-	2
CO2	3	3	3	3	2	3	3	1	-	2	-	2
CO3	3	3	3	3	2	3	3	1	-	2	-	2
CO4	3	3	3	3	2	3	3	1	-	2	-	2
CO5	3	3	3	3	2	2	2	-	-	2	-	-
CO6	3	3	3	3	2	2	2	-	-	2	-	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214445: Basics of Computer Network

Teaching Scheme:	Credit	Examination Scheme:
TH: 03hr/week	03	Mid Semester: 30Marks End Semester: 70Marks

Prerequisite Courses, if any: Basics of communication

Course Objectives:

1. To understand the fundamentals of communication system.
2. To understand the basics of internetworking.
3. To understand services and protocols used at Physical, Data Link, Network, Transport Layer.

Course Outcomes:

CO1: Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
CO2: Analyze data link layer services, error detection and correction, linear block codes, cyclic codes, framing and flow control protocols.
CO3: Compare different access techniques, channelization and Ethernet standards.
CO4: Apply the skills of subnetting, supernetting and routing mechanisms.
CO5: Compare IPv4 and IPv6
CO6: Understand services and protocols used at transport layer.

COURSE CONTENT

Unit I	Introduction	(06 Hrs)

Introduction to communication Theory - Basics of data communication, Types of Signals, A/D, D/A, A/A, D/D Signal Conversion Methods, Bandwidth Utilization and Data Rate Limits, Multiplexing Techniques, Data rate limits, Topologies, Noise, types of noise, Shannon Hartley Theorem, Channel capacity, Nyquist and Shannon Theorem, Bandwidth S/N trade off.

Network Models And addressing - OSI Model TCP/IP Model (Data Format, Addressing Mechanisms, Devices)

Case Studies	**Study of Physical layer components such as Cable, NIC, hub, etc. available in the computers /laboratories of your department**
Mapping of Course Outcomes for Unit I	**CO1**

Unit II	Data Link Layer Part- I	(06 Hrs)

Data Link Layer: Data Link Layer Services, Error Detection and Correction: Introduction, Error Detection, Error Correction. Linear Block Codes: hamming code, Hamming Distance, parity check code. Cyclic Codes: CRC (Polynomials), Advantages of Cyclic Codes, Other Cyclic Codes (Examples: CHECKSUM: One's Complement, Internet Checksum). Framing: fixed-size framing, variable size framing. Flow control: flow control protocols. Noiseless channels: simplest protocol, stop-and-wait protocol.

Noisy channels: stop-and-wait Automatic Repeat Request (ARQ), go-back-n ARQ, Selective repeat

ARQ, piggybacking.		
Case Studies	**Draw PPPoE connection diagram with multiple devices**	
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**Data Link Layer Part- II**	**(06 Hrs)**
Random Access Techniques: CSMA, CSMA/CD, CSMA/CA, Controlled Access Techniques: Reservation, Polling, Token Passing, Channelization: FDMA, TDMA, CDMA, SDMA, PDMA, PAMA Ethernet: IEEE Standards- 802.3, 802.4, 802.5, 802.6 Comparison of Standard Ethernet, Fast Ethernet, Gigabit Ethernet with reference to MAC layer and Physical Layer (Wired Network Only)		
Case Studies	**Campus network design case study**	
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**Network Link Layer Part- I IP Addressing**	**(06 Hrs)**
Network Layer : Network Layer Services, IPv4 Addresses: Classful and Classless Addressing, Special Addresses, NAT, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, Structure of Router, IPv4: Datagrams, Fragmentation, Options, Checksum, Security, IPsec, IPv6Addressing: Notations, Address Space, Packet Format, Transition from Ipv4 to IPv6		
Case Studies	**Visit server room of campus and understand how IP addressing is done for your respective campus →Institute→Department**	
Mapping of Course Outcomes for Unit IV	**CO4, CO5**	
Unit V	**Network Link Layer Part- II Routing Algorithms**	**(06 Hrs)**
Routing: Metric, Static vs Dynamic Routing Tables, Routing Protocol, Unicast Routing Protocols - Optimality Principle, Intra and Inter Domain Routing, Shortest Path Routing, Flooding, Distant Vector Routing, Link State Routing, Path Vector Routing Interior Gateway Routing Protocol- OSPF, EIGRP, RIP, Exterior Gateway Routing Protocol– BGP		
Case Studies	**Case study on network simulation tools such as Packet tracer**	
Mapping of Course Outcomes for Unit V	**CO4**	
Unit VI	**TRANSPORT LAYER - SERVICES AND PROTOCOLS**	**(06 Hrs)**
Transport layer : Transport layer services(Duties), TCP: COTS, TCP header, Services, Segments, Connection Establishment, Flow control, Congestion Control, Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS, Timers, UDP: CLTS, UDP header, Datagram, Services, Applications, Socket: Primitives, TCP & UDP Sockets.		
Case Studies	**Case study on Client server model using simple socket programming, Case Study on Transport Layer Security - Firewall (Stateless (Packet Filtering), Stateful, Application**	
Mapping of Course	**CO6**	

Outcomes for Unit VI	

Text Books:

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652-1, 4th Edition.
2. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3.

Reference Books:

1. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878-1.
2. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill Education, ISBN: 978-1-25-906475-3, 5th Edition.
3. Mayank Dave, Computer Network, Cengage Learning, ISBN: 978-81-315-0986-9.

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	-	-	-	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-	-	-	-	-	1	-
CO3	-	-	-	-	3	-	1	-	-	-	-	2	-
CO4	-	3	3	-	-	-	-	-	-	-	-	2	-
CO5	-	-	-	-	2	3	-	-	-	-	-	3	-
CO6	-	-	2	-	-	-	-	2	-	-	-	3	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214446: Computer Organization & Logic Design Lab

Teaching Scheme:	Credit	Examination Scheme
PR: 02Hr/week	01	PR : 25Marks TW : 25Marks

Prerequisites: Basic Electronics Engineering

Course Objectives :

1. To design & implement combinational and sequential circuits.
2. To manage and access computer system.
3. To learn to simulate digital system.

Course Outcomes :

CO1: Use logic function representation for simplification with K-Maps and design Combinational logic circuits using SSI & MSI chips.

CO2: Design Sequential Logic circuits: MOD counters using synchronous counters.

CO3: Apply the basics of system management to access the resources of computer system.

CO4: Apply the basics of simulator tool & to simulate simple ALU / CPU.

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to Students and laboratory instructor/Assistant. The instructor's manual should include prologue, university syllabus, conduction & Assessment guidelines, topics under consideration concept, objectives, outcomes, algorithms, sample test cases, data sheets of various elements of computer system, ICs, tools and references.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal. The Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept, circuit diagram, pin configuration, conclusion/analysis,
2. Printouts of the output using coding standards, sample test cases etc.)
3. Practical Examination will be based on the term work.
4. Candidate is expected to know the theory involved in the experiment.
5. The practical examination should be conducted if the journal of the student is completed in all respects and certified by concerned faculty and head of the department.
6. All the assignment mentioned in the syllabus must be conducted.

Guidelines for Lab /TW 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 necessary tools software and hardware such as ICs, memory elements, digital trainer kits, IC tester should be checked by the faculty member.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The instructor may set multiple sets ofassignments and distribute among batches of students. It is appreciated if the assignments are basedon real world problems/applications. Use of open source software is encouraged. The guidelines published by BOS time to time regarding conduction of laboratory assignments andPractical/Oral examination is mandatory.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements for practical examination. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to judge the student ‘s understanding of the fundamentals, effective and efficient implementation. The evaluation should be done by both external and internal examiners.

Suggested List of Laboratory Assignments

Group A

Combinational Logic Design

1. Design (using truth table, K-map) and implementation of 4-bitBCD to Excess-3 and Excess-3 to BCD Code converters.
2. Design (using truth table, K-map) and implementation of 4 bit BCD adder &subtractor usingIC7483.
3. Implementation of logic functions using multiplexer IC 74153 & decoder IC 74138.

(Verification, cascading & logic function implementation)

Group B

Sequential Logic Design

1. Design (State diagram, state table & K map) and implementation of 3 bit Up and Down Asynchronous and Synchronous Counter using master slave JK flip-flop IC 7476.
2. Design and implementation of Modulo ‘n’ counter with IC7490.

Group C

Computer system management and access based

1. Study of i7 motherboard (CPU, Chipset, RAM, SATA HDD, Ports, PCI Bus and BIOS).
2. Study of Linux OS architecture (BIOS, Kernel, Shell) Using Linux Virtual Machine.
3. Study of Linux Partitions and Boot Loader.
4. Study Linux File System-(extended ver/3).

5. Learn file management commands like-Is, mkdir, cd, mv, rm, chmod, grep, pipes and filters.

Group D

Computer organization

1. Find various specifications of PC using window/Linux commands & CPU-Z software: CPU specifications, clockrate, main memory, cache memory.
2. Design& simulate anyone using virtual lab simulator:i) ALU or ii) CPU design .

Student should submit term work in the form of a journal based on the above assignments.

Practical examination will be based on the term work.

Questions will be asked during the examination to judge the understanding of the practical performed in the examination.

Candidate is expected to know the theory involved in the experiment.

Note - Instructor should take care that datasheets of all the required ICs are available in thelaboratory& students are verifying the functionality of ICs being used.

Reference Books:

1. R.P. Jain, "Modern Digital Electronics", 3rd Edition,Tata McGraw-Hill, ISBN: 0-07-049492-4
2. Datasheets of digital IC's.
3. Peter Abel, Niyaz Nizamuddin, "IBM PC Assembly Language and Programming", Pearson Education
4. Ray Duncan, "Advanced MS DOS Programming", 2nd edition, BPB Publications
5. Intel 8086 Microprocessor manual.
6. Virtual Lab simulator Link http://vlabs.iitkgp.ac.in/coa/

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	1	1	1	-	-	-	-	-	-	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214447: Data Structure & Algorithms Lab

Teaching Scheme	Credit	Examination Scheme
PR : 04 hr/week	02	TW: 25 Marks PR: 25Marks

Prerequisite Courses, if any: Fundamental knowledge of programming language and basics of algorithms

Course Objectives:

1. To study data structures and their implementations and applications.
2. To learn different searching and sorting techniques.
3. To study some advanced data structures such as trees, graphs and tables.
4. To learn different file organizations.
5. To learn algorithm development and analysis of algorithms.

Course Outcomes:

CO1: Analyze algorithms and to determine algorithm correctness and time efficiency class.

CO2:Understand different advanced abstract data type (ADT) and data structures and their implementations.

CO3: Understand different algorithm design techniques (brute -force, divide and conquer, greedy, etc.) and their implementation.

CO4:Apply and implement learned algorithm design techniques and data structures to solve problems.

CO5:Perform basic analysis of algorithms with respect to time and space complexity.

CO6: Use algorithmic foundations for solving problems and programming.

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

The instructor's manual should include prologue, university syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, algorithm written in pseudo language, sample test cases and references.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by students in the form of journals. The Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept, algorithms, printouts of the code written using coding standards, sample test cases etc.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if the journal of the candidate is completed in all respects and certified by concerned faculty and head of the department.
5. All the assignment mentioned in the syllabus must be conducted.

Guidelines for Lab /TW Assessment

6. 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.
7. 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.
8. Appropriate knowledge of usage of software and hardware such as compiler, debugger, coding standards, algorithm to be implemented etc. should be checked by the concerned faculty member(s).

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

The guidelines published by BoS time to time regarding conduction of laboratory assignments and Practical/Oral examination is mandatory. All the assignments should be conducted on multicore hardware and 64-bit open-source software.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements for practical examination. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to judge the student ‘s understanding of the fundamentals, effective and efficient implementation. The evaluation should be done by both external and internal examiners.

List of Assignments

1. Searching and Sorting – CO1, CO2, CO3, CO5

Consider a student database of SEIT class. Database contains different fields of every student like Roll No, Name and SGPA.

a. Design a roll call list, arrange list of students according to roll numbers in ascending order (Use Bubble Sort)
b. Arrange list of students according to name. (Use Insertion sort)
c. Arrange list of students to find out first ten toppers from a class. (Use Quick sort)
d. Search students according to SGPA. If more than one student having same SGPA, then print list of all students having same SGPA.
e. Search a particular student according to name using binary search without recursion. (Students having same name should be displayed)

(Note: Implement either Bubble sort or Insertion Sort.)

2. Stack – CO1, CO2, CO3, CO5

Implement stack as an abstract data type using singly linked list and use this ADT for conversion of infix expression to postfix, prefix and evaluation of postfix and prefix expression.

3. Circular Queue – CO1, CO2, CO3, CO5

Implement Circular Queue using Circular Linked List. Perform following operations on it.

a) Insertion (Enqueue)
b) Deletion (Dequeue)
c) Display

(Note: Handle queue full condition by considering a fixed size of a queue.)

4. Expression Tree – CO1, CO2, CO3, CO5

Construct an Expression Tree from postfix and prefix expression. Perform recursive and non- recursive In-order, pre-order and post-order traversals.

5. Binary Search Tree – CO1, CO2, CO3, CO5

Implement binary search tree and perform following operations:

a) Insert (Handle insertion of duplicate entry)
b) Delete
c) Search
d) Display tree (Traversal)
e) Display - Depth of tree
f) Display - Mirror image
g) Create a copy
h) Display all parent nodes with their child nodes
i) Display leaf nodes
j) Display tree level wise

(Note: Insertion, Deletion, Search and Traversal are compulsory, from rest of operations, perform Any three)

6. Threaded Binary Tree – CO1, CO2, CO3, CO5

Implement In-order Threaded Binary Tree and traverse it in In-order and Pre-order.

7. Graph: Minimum Spanning Tree – CO1, CO2, CO3, CO5

Represent a graph of your college campus using adjacency list /adjacency matrix. Nodes should represent the various departments/institutes and links should represent the distance between them. Find minimum spanning tree using

a) Using Kruskal's algorithm.
b) Using Prim's algorithm.

8. Graph: Shortest Path Algorithm – CO1, CO2, CO3, CO5

Represent a graph of city using adjacency matrix /adjacency list. Nodes should represent the various landmarks and links should represent the distance between them. Find the shortest path using Dijkstra's algorithm from single source to all destination.

9. Heap Sort - – CO1, CO2, CO4, CO6

Implement Heap sort to sort given set of values using max or min heap.

10. FILE Handling – CO1, CO3, CO5, CO6

Department maintains student's database. The file contains roll number, name, division and address. Write a program to create a sequential file to store and maintain student data. It should allow the user to add, delete information of student. Display information of particular student. If record of student does not exist an appropriate message is displayed. If student record is found it should display the student details.

Text Books

1. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach using C++", Cengage Learning, 5th Edition, ISBN 978-8131504925
2. Mark Allen Weiss, "Data structures and Algorithm Analysis in C++ ", Pearson Education India, 3 edition (2007), ISBN 978-8131714744
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", University Press (2008), ISBN 978-8173716065

Reference Books

1. Hemant Jain, "Problem Solving in Data Structures & Algorithms using C++", CreateSpace Independent Publishing Platform (2017), ISBN 978-1542396479.
2. G A V PAI, "DATA STRUCTURES and Algorithms Concepts, Techniques and Applications", McGraw Hill (2017), ISBN 978-0070667266
3. Michael T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++ ", Wiley (2007), ISBN 978-8126512607
4. E Balagurusamy, "Object-Oriented Programming with C++", McGraw Hill Education; Seventh edition (2017), ISBN 978-9352607990.

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	3	-	-	-	-	-	-
CO2	1	3	3	3	-	3	-	-	-	-	-	-
CO3	2	1	2	3	-	3	-	-	-	-	-	-
CO4	2	3	3	3	-	3	-	-	-	-	-	-
CO5	3	3	2	3	-	3	-	-	-	-	-	-
CO6	1	3	3	3	-	3	-	-	-	-	-	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214448: Object Oriented Programming Lab

Teaching Scheme	Credit	Examination Scheme
PR : 04 hr/week	02	PR: 25 Marks TW: 25 Marks

Prerequisites: Student should have knowledge of programming language.

Course Objectives:

1. Apply concepts of object oriented paradigm.
2. Design and implement models for real life problems by using object oriented programming.
   Develop object oriented programming skills.

Course Outcomes:

CO1: Differentiate various programming paradigms and apply basic concepts of OOP.
CO2: Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems.
CO3: Identify relationship among objects using inheritance and polymorphism.
CO4: Handle different types of exceptions and perform generic programming.
CO5: Use file handling for real world application.
CO6: Apply appropriate design patterns to provide object-oriented solutions.

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc.), University syllabus, conduction & Assessment guidelines, topics under consideration concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal.
2. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- OOP feature/Concept in brief, algorithm, flowchart, test cases, conclusion/analysis.
3. Program codes with sample output of all performed assignments are to be submitted as hardcopy.
4. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.
5. Use of DVD containing students programs maintained by lab In-charge is highly encouraged.
6. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Lab /TW Assessment

1. Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student.
2. Each lab assignment assessment will assign grade/marks based on parameters with appropriate

weightage.

3. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments without changing its complexity level and distribute among batches of students. Encourage students for the use of industry coding standards such as appropriate use of Hungarian notation, Indentation and comments. Use of open source software is encouraged. Set of suggested assignment list is provided.
Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - JAVA IDE

List of Assignments

1.Classes and object - CO1 and CO2

Design a class 'Complex 'with data members for real and imaginary part. Provide default andParameterized constructors. Write a program to perform arithmetic operations of two complex numbers.

2. Polymorphism - CO3

Identify commonalities and differences between Publication, Book and Magazine classes. Title, Price, Copies are common instance variables and saleCopy is common method. The differences are, Bookclass has author and order Copies(). Magazine Class has orderQty, Currentissue, reciveissue().Write a program to find how many copies of the given books are ordered and display total sale of publication.

3.Inheritance - CO3

Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable. Employee class with Emp_name, Emp_id, Address, Mail_id, and Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4.Dynamic Binding - CO3

Design a base class shape with two double type values and member functions to input the data and

compute_area() for calculating area of figure. Derive two classes' triangle and rectangle. Make compute_area() as abstract function and redefine this function in the derived class to suit their requirements. Write a program that accepts dimensions of triangle/rectangle and display calculated area. Implement dynamic binding for given case study.

5.Interface – CO1, CO3

Design and develop a context for given case study and implement an interface for Vehicles Consider the example of vehicles like bicycle, car, and bike. All Vehicles have common functionalities such as Gear Change, Speed up and apply breaks .Make an interface and put all these common functionalities. Bicycle, Bike, Car classes should be implemented for all these functionalities in their own class in their own way.

6.Exception handling – CO4

Implement a program to handle Arithmetic exception, Array Index Out Of Bounds.
The user enters two numbers Num1 and Num2. The division of Num1 and Num2 is displayed. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception. Display the exception.

7.Template – CO4

Implement a generic program using any collection class to count the number of elements in a collection that have a specific property such as even numbers, odd number, prime number and palindromes.

8.File Handling- – CO5

Implement a program for maintaining a student records database using File Handling.
Student has Student_id,name,Roll_no, Class, marks and address. Display the data for five students.
i) Create Database
ii)Display Database
iii) Clear Records
iv)Modify record
v)Search Record

9.Case Study: – CO2, CO5

Using concepts of Object Oriented programming develop solution for any one application

1) Banking solution contains following operations such as
1. Create an account 2. Deposit money 3. Withdraw money 4. Honor daily withdrawal limit
5. Check the balance 6. Display Account information.

2) Inventory management contains following operations such as
1. List of all products 2. Display individual product information 3. Purchase 4. Shipping
5. Balance stock6. Loss and Profit calculation.

10. Factory Design pattern – CO6

Design and implement Factory design pattern for the given context. Consider Car building process, which requires many steps from allocating accessories to final makeup. These steps should be written as methods and should be called while creating an instance of a specific car type. Hatchback, Sedan, SUV could be the subclasses of Car class. Car class and its subclasses, CarFactory and TestFactoryPattern should be

1. Strategy Design Patten – CO6

Implement and apply Strategy Design pattern for simple Shopping Cart where three payment strategies are used such as Credit Card, PayPal, BitCoin. Create the interface for strategy pattern and give concrete implementation for payment.

Text Books:

1. E. Balagurusamy, "Programming with Java – A Primer", Tata – McGraw-Hill Publication, 4th Edition, 2019.
2. Kathy Sierra, ' OCA /OCP Java SE 7 Programmer I & II Study Guide (Exams 1Z0-803 & IZ)-804,) Oracle Press (2017)
3. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2009.

Reference Books:

1. H.M. Deitel, P.J. Deitel, "Java - How to Program", PHI Publication, 6th Edition, 2005.
2. Bruce Eckel, "Thinking in Java", PHI Publication.
3. Poo, Danny, Kiong, Derek, Ashok, Swarnalatha," Object-Oriented Programming and
4. Java", ISBN 978-1-84628-963-7
5. Erich Gamma,Richard Helm ,Ralph Johnson,JohnVlissides, "Design Patterns ,Eleements of
6. Reusable Object- Oriented Software" ISBN-13: 978-0201633610
7. RohitJoshi,"Java Design patterns, Reusable solutions to common problems" Java Code Geeks

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	2	-	-	2	-	2
CO2	3	3	3	3	2	3	3	1	-	2	-	2
CO3	3	3	3	3	2	3	3	1	-	2	-	2
CO4	3	3	3	3	2	3	3	1	-	2	-	2
CO5	3	3	3	3	2	2	2	-	-	2	-	-
CO6	3	3	3	3	2	2	2	-	-	2	-	-

Savitribai Phule Pune University Second Year Information Technology (2019 Course) 214449: Soft Skills Lab		
Teaching Scheme	**Credit**	**Examination Scheme**
PR: 02 hrs/Week	**01**	**TW : 25 Marks**

Prerequisites If any:

Course Outcomes:

CO1: Introspect about individual's goals, aspirations by evaluating one's SWOC and think creatively.
CO2: Develop effective communication skills including Listening, Reading, Writing and Speaking.
CO3: Constructively participate in group discussion, meetings and prepare and deliver presentations
CO4: Write precise briefs or reports and technical documents.
CO5: Understand professional etiquette, present oneself confidently and successfully handle personal interviews
CO6: Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.

COURSE CONTENT

Unit I	**Introspective & Self Development**	**(04 hrs)**
Introduction To Soft Skills, SWOC Analysis, Planning Career, Setting Short-Term & Long-Term Goals, Identifying Difference Between Jobs & Career, Aligning Aspirations With Individual Skills, Understanding Self-Esteem, Developing Discipline And Critically Evaluating Oneself		
Mapping of Course Outcomes for Unit I	**CO1, CO6**	
Unit II	**Communication Skills**	**(04 hrs)**
Essentiality Of Good Communication Skills, Importance Of Feedback, Different Types Of Communication, Barriers In Communication And How To Overcome These Barriers, Significance Of Non-Verbal Messages As Augmentation To Verbal Communication, Group Discussion, Listening Vs Hearing, Reading To Comprehend, Learning To Skim And Scan To Extract Relevant Information, Effective Digital Communication		
Mapping of Course Outcomes for Unit II	**CO2, CO3, CO5**	
Unit III	**Language and Writing Skills**	**(04 hrs)**
Fundamentals Of English Grammar, Improve Lexical Resource, Essential Steps To Improve Spoken And Written English, Business Vocabulary, Writing – Email, Resume, Formal Letter, Official Communication, Essay, Presentation – Planning, Organizing, Preparing And Delivering Professional Presentation		
Mapping of Course Outcomes for Unit III	**CO2, CO4**	
Unit IV	**Leadership Skills and Group Dynamics**	**(04 hours)**
Understanding Corporate Culture And Leadership Skills, Difference Between A Leader And A Manager, Importance Of Resilience In A Professional Surrounding, Developing Empathy And Emotional Intelligence, Being Assertive And Confident, 4-Ds of Decision Making, Creative And Solution-Centric Thinking, Resolving Conflicts, Working Cohesively As A Team To Achieve Success, 5 Qualities Of An Effective Team – Positivity, Respect For Others, Trust, Goal-Focused, Supportiveness		
Mapping of Course Outcomes for Unit IV	**CO1, CO5, CO6**	
Unit V	**Ethics, Professional Etiquette**	**(04 hours)**

Understanding Ethics And Morals, Importance Of Professional Ethics, Hindrances Due To Absence Of Work Ethics, Professional Etiquette – Introductions, With Colleagues, Attire, Events, Dinning, Telephone, Travelling, Netiquette, Social Media, Writing

Mapping of Course Outcomes for Unit V	**CO5, CO6**	

Unit VI	**Stress And Time Management**	**(04 hours)**

Stress As Integral Part Of Life, Identifying Signs And Sources Of Stress, Steps To Cope With Stress – Open Communication, Positive Thinking, Belief In Oneself, Ability To Handle Failure, Retrospective Thinking For Future Learning, Organizing Skills To Enhance Time Management, Focusing On Goals, Smart Work Vs Hard Work, Prioritizing Activities, Perils Of Procrastination, Daily Evaluation Of "To-Do" List

Mapping of Course Outcomes for Unit VI	**CO1, CO3, CO6**	

Text Book :

1. Gajendra Singh Chauhan, Sangeeta Sharma: Soft Skills – An Integrated Approach to Maximize Personality, WILEY INDIA, ISBN:13:9788126556397

Reference Books :

1. Indrajit Bhattacharya — An Approach to Communication Skills , Delhi, DhanpatRai, 2008.
2. Simon Sweeney — English for Business Communication , Cambridge University Press, ISBN 13:978-0521754507.
3. Sanjay Kumar and PushpaLata— Communication Skills , Oxford University Press, ISBN 10:9780199457069.
4. Atkinson and Hilgard's — Introduction to Psychology , 14th Edition, Geoffrey Loftus, ISBN-10:0155050699 © 2003
5. Kenneth G. Mcgee — Heads Up: How to Anticipate Business Surprises & Seize Opportunities First , Harvard Business School Press, Boston, Massachusetts, 2004, ISBN 10:1591392993.
6. Krishnaswami, N. and Sriraman T. — Creative English for Communication , Macmillan

Guidelines for Student's Lab Journal and TW Assessment

Each student should have a Lab Workbook (sample workbook attached) which outlines each lab activity conducted. The student must respond by writing out their learning outcomes and elaborating the activities performed in the lab. Continuous assessment of laboratory work is to be done based on overall performance and lab assignments and performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities-SWOC analysis, presentations, team activity, event management, group discussion, group exercises and interpersonal skills and similar other activities/assignments.

Guidelines for Conduction of Soft Skills Lab

The teacher may design specific assignments that can highlight the learning outcomes of each unit. Each activity conducted in the lab should begin with a brief introduction of the topic, purpose of the activity from a professional point of view and end with the learning outcomes as feedback from students. Most of the lab sessions can be designed to be inclusive; allowing students to learn skills experientially; which will benefit them in the professional environment. Every student must be given sufficient opportunity to participate in each activity and constructive feedback from the instructor / facilitator at the end of the activity should learn towards encouraging students to work on improving their skills. Activities should be

designed to respect cultural, emotional and social standing of students. Some of the activities can be designed to cater to enhancement of multiple skills – For eg – Team Building Activity can highlight 'open communication', 'group discussion', 'respecting perspectives', 'leadership skills', 'focus on goals' which can help students improve their inherent interpersonal skills.

At least 1 session should be dedicated to an interactive session that will be delivered by an expert from the industry; giving the students an exposure to professional expectations.

Recommended List of Lab Sessions

1. Introduction of Self / SWOC Analysis [CO1, CO4]

a. Explain how to introduce oneself in a professional manner and presenting oneself positively
   Name | Academic Profile | Achievements | Career Aspirations | Personal Information (hobbies, family, social).
b. Focus on introspection and become aware of one's Strengths, Weakness, Opportunities and Challenges.

Students can write down their SWOC in a matrix and the teacher can discuss the gist personally.

2. Career Goals and Planning [CO1, CO4]

a. Make students understand the difference between a job and a career. Elaborate steps on how to plan a career.

Students can choose a career and they should write down what skills, knowledge, steps are need to be successful in that particular career and how they can get the right opportunity.

b. Explain to students how to plan short term and long term goals.

Think and write down their short term goals and long terms goals. Teacher can read and discuss (provide basic counseling) about the choices written.

3. Public Speaking – (Choose any 2) [CO3, CO2]

a. Prepared Speech
   Topics are shared with students and they will be given 10 minutes to prepare and 3 minutes to deliver followed by Q&A from audience. Teacher can evaluate each student based on content, communication skills, logical and cohesive presentation of topic, perspective of student, ability to handle questions and respond positively.
b. Extempore Speech
   Various topics are laid out in front of the audience and each student is to pick one topic and speak about the topic for 5 minutes followed by Q&A from audience. Teacher can evaluate each student based on ability to think on his/her feet, content, communication skills, logical and cohesive presentation of topic, perspective of student, ability to handle questions and respond positively.
c. Reviewing an Editorial article
   Either using e-paper / printed copy, students have to select a recent editorial (that is non-controversial), read it and explain to the audience what the editor's perspective is and what the student's perspective is.
d. Book Review
   Each student will orally present to the audience his/her review of a book that he/she has recently read.

4. Group Discussion----------[CO3, CO2]

a. The class can be divided into groups of 8 – 10 students in for a discussion lasting 10 minutes.
   Topics can be topical and non-controversial. After each group finishes its discussion, the teacher can give critical feedback including areas of improvement. The teacher should act as a moderator / observer only

5. Listening and Reading Skills----------[CO2]

a. Listening Worksheets to be distributed among students

Each student can be given specifically designed worksheets that contain blanks / matching / MCQs that are designed to an audio (chosen by the faculty). Students have to listen to the audio (only once) and complete the worksheet as the audio plays. This will help reiterate active listening as well as deriving information (listening to information between the lines)

b. Reading Comprehension Worksheets to be distributed among students

Teacher can choose reading passages from non-technical domains, design worksheets with questions for students to answer. This will enhance student's reading skills by learning how to skim and scan for information.

6. Writing Skills (Choose any 2)----------[CO2]

a. Letter / Email Writing

After explaining to the students the highlights of effective writing, students can be asked to write (using digital platforms / paper-based) letter to an organization with the following subject matter,

i. requesting opportunity to present his/her product.
ii. complaining about a faulty product / service.
iii. apologizing on behalf of one's team for the error that occurred .
iv. providing explanation for a false accusation by a client .

b. Report Writing

After describing various formats to write report and explaining how to write a report, each student should be asked to write a report (digital / paper-based) on any of the following topics,

i. Industrial visit.
ii. Project participated in.
iii. Business / Research Proposal.

c. Resume Writing

The teacher should conduct a brief session outlining the importance of a CV / Resume and students can write / type out their own resumes,

i. Share various professional formats.
ii. Focus on highlighting individual strengths.
iii. Develop personalized professional goals / statement at the beginning of the resume.

7. Team Building Activities [CO3, CO4]

The class can be divided into groups of 4-5 students in each group and an activity can be given to each group.

The activities chosen for each team should be competitive and should involve every student in the team. The activities can be conducted indoors or outdoors depending on infrastructure. *Advice* – While selecting the team ensure that each team has a mix of students who have varied skills so as to not give any one team an advantage. The teacher can give critical feedback including areas of improvement at the end of the activity.

8. Expert Lecture [CO4]

Highlighting the need to manage stress and time, experts from the fields of health and fitness, counseling, training, medical or corporate HR can be invited to deliver a participatory session that focus on helping students to cope with parental, social, peer and career pressures.

9. Lateral and Creative Thinking----------[CO1, CO4]

Every student needs to step out of the linear thinking and develop lateral and creative thinking. Teacher can develop creative activities in the classroom / lab that will help students enhance their creative thinking. Some of the suggested activities,

i. Each group (3-4 students) can be given random unrelated items and they will be given 20 mins to come up with creative ideas on how the objects can be used for activities / purposes other than its intended one.
ii. Each student is given a random line and he/she has to spin a fictional story and tell it to the class (3 minutes). Each story should have a beginning, middle and end.
iii. Each group (3-4 students) can be given a fictional / hypothetical dangerous situation and they have to find a solution to that problem. They can present it to the other teams who will then get the opportunity to pick flaws in the ideas.

10. Mock Interviews [CO2, CO3]

Student has to undergo this session and the teacher should seek the assistance of another faculty member / TPO Officer to act as interview panel. Students will be informed beforehand about the job profile that they are appearing the interview for and they have to come prepared with a printed copy of their resume, formally dressed. Questions will include technical as well as HR. Faculty can choose to give problems that students have to solve using their technical skills. Students will be graded on the basis of their technical knowledge, ability to answer questions well, presentation of self, body language and verbal skills.

11. Presentation Skills [CO2, CO3]

Every student will have to choose a topic of his/her choice and make a 5-minute presentation using audio-video aids / PPT. The topic can either be technical or non-technical. Focus and evaluation of each presentation should be the depth of knowledge about the topic, originality of perspective on the topic, well-researched or not, verbal and non-verbal skills and ability to answer questions effectively. Plagiarism should be discredit and students should be warned about it.

12. Corporate and Business Etiquette----------[CO4, CO1]

The teacher can design an interactive session that allows students to be involved in understanding the requirements of a corporate environment. This can be done using innovative quiz competition in the classroom and the teacher explaining the concept / relevance of that particular aspect in the professional context. Alternatively, the teacher can invite professionals to have an interactive session with students about various aspects of professional etiquette.

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214450 (A): Mandatory Audit Course 3: Ethics and Values in Information Technology

Teaching Scheme:	Credit:	Examination Scheme:
01hr/week	Audit Course	Audit Course

Prerequisite Courses, if any:

Course Objectives:

1. To understand and implement the values and principles in the field of Information Technology
2. To nurture honest and responsible professionals in Information Technology.
3. To develop student's understanding about social/ professional ethical issues related to Information Technology.
4. To inculcate professional ethics in the field of IT

Course Outcomes:

CO1: Students will be able to get knowledge about global ethical principles and modern ethical issues.

CO2: Students will be able to understand the importance of ethics in the business relationships and ethical practices of IT users.

CO3: Students will be able to apply knowledge gained in implementing trustworthy computing to manage risk and security vulnerabilities.

CO4: The students will be able to analyze concerns of privacy, privacy rights in information-gathering practices in IT.

COURSE CONTENT

Unit -I	An Overview of Ethics	03 Hrs

An overview of Ethics: Brief about ethics, Ethics in the Business World, Ethics in IT.

Ethics for IT professionals and IT users: ***IT professionals*:** Changing Professional Services, Professional Relationships, Professional Codes of Ethics, IT professional malpractices, ***IT Users:*** Common Ethical Issues for IT Users, Supporting the Ethical Practices of IT Users.

Mapping of Course Outcomes for Unit I	CO1 , CO2

Unit- II	Computer And Internet Crime	03 Hrs

Introduction: IT security incidents, Types of Exploits, Types of Perpetrators, Laws for Prosecuting Computer Attacks, Implementing Trustworthy Computing, Risk and Vulnerability Assessment, Educating Employees, Contractors, and Part-Time Workers, Establishing a Security Policy

Privacy: The right of Privacy, Privacy Protection and the Law, Key Privacy and Anonymity Issues Identity Theft, Consumer Profiling, Treating Consumer Data Responsibility, Workplace Monitoring

Freedom of Expression: Defamation and Hate Speech, Key issues, Controlling Access to Information on the Internet, Anonymity on the Internet, Corporate Blogging, Pornography

Mapping of Course Outcomes for Unit II	**CO3, CO4**	
Unit- III	**Social Networking &Ethics Of It Organization**	**03 Hrs**

Social Networking: Brief about Social Networking, ***Social Networking Ethical Issues:*** Cyber bullying, Cyber stalking, Encounters with Sexual Predators, Uploading of Inappropriate Material,

Online VirtualWorlds: Crime in Virtual Worlds, Educational and Business Uses of Virtual Worlds.

Ethics of IT Organization: Key Ethical Issues for Organizations, of Workers, Outsourcing, Whistle-blowing, Code of Ethics and Professional Conduct.

Mapping of Course Outcomes for Unit III	**CO2, CO3, CO4**	
Unit - IV	**Case Studies**	**03 Hrs**

Case Study: Malware.

Case Study: Medical Implants.

Case Study: Abusive Workplace Behavior.

Case Study: Automated Active Response Weaponry.

Case Study: Malicious Inputs to Content Filters.

Mapping of Course Outcomes for Unit IV	**CO1, CO2, CO3, CO4**

Text Books:

1. Ethics in Information Technology 5th Edition by George Reynolds, Cengage learning
2. Professional Ethics by- R. Subramanian.

Reference Books:

1. An Introduction to Ethics, by William Lillie
2. Engineering Ethics by CHARLES B. FLEDDERMANN, Prentice Hall publication
3. Engineering Ethics &Human Values by: M.Govindarajan ,S.Natarajan&V.S.Senthilkumar PHI Learning Pvt. Ltd.
4. ACM Code of Ethics and Professional Conduct Case Studies https://www.acm.org/code-of-ethics/case-studies
5. Case Studies of Ethics https://flylib.com/books/en/4.269.1.115/1/
6. UNODC Case Studies https://www.unodc.org/e4j/en/integrity-ethics/module-12/exercises/case-studies.html

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214450 (B)- Mandatory Audit Course 3: Quantitative Aptitude & Logical Reasoning

Teaching Scheme:	Credit:	Examination Scheme:
01hr/week	Audit Course	Audit Course

Prerequisite Courses, if any:

Course Objectives:

1. To develop the quantitative, logical and verbal abilities.
2. To enable learners to interpret the data accurately.
3. To build logical thinking ability among the learners.
4. To enable students to comprehend the English text.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand the basic concepts of quantitative abilities

CO2: Understand the basic concepts of logical reasoning

CO3: Solve the problems related to quantitative abilities, logical and verbal reasoning

CO4: Compete in examinations like civil services, postgraduate admissions, industry placements etc.

Course Contents

Unit I	Fundamental Quantitative Abilities	(03 Hrs)
Concepts and Problems on Number System, HCF and LCM, Average, Ratio and Proportion, Percentage, Year month days counting, SI units and measurements		
Mapping of Course Outcomes for Unit I:	**CO 1, CO3, CO4**	
Unit II	**Arithmetic Quantitative Abilities**	**(02 Hrs)**
Concepts and Problems on Ages, Profit and loss, Simple and Compound interest, Time value of money, Time and distance, Time and Work, Geometry and Coordinate Geometry, logarithms		
Mapping of Course Outcomes for Unit II	**CO1, CO3, CO4**	
Unit III	**Logical Reasoning Ability**	**(02 Hrs)**
Number Series, Pattern recognition, Alpha Numerical, Letter & Symbol Series , Numerical and Alphabet Puzzles, Seating Arrangement		
Mapping of Course Outcomes for Unit III	**CO2, CO3, CO4**	
Unit IV	**Thinking and Reasoning**	**(02 Hrs)**
Objective Reasoning, Graph and Plots, Data sufficiency, Blood Relation, Coding deductive logic, Logical word sequence.		
Mapping of Course Outcomes for Unit IV	**CO2, CO3, CO4**	

Unit V	Verbal Ability	(03 Hrs)
Synonyms, Antonyms, Contextual Vocabulary, Error Identification, Sentence Correction, Sentence Improvement, Subject-Verb agreement, Tenses and Articles, Reading Comprehension, Preposition & Conjunction		
Mapping of Course Outcomes for Unit V	**CO3, CO4**	

Text Books:

1. Quantitative abilities by Arun Sharma
2. Quantitative Aptitude for Competitive Examinations by R S Agrawal
3. Verbal and Non-Verbal reasoning by R S Agrawal

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214450 (C) -Mandatory Audit Course 3: Language Study Japanese -Module I

Teaching Scheme	Credit	Examination Scheme:
01hr/week	Audit Course	Audit Course

Prerequisite Courses, if any: Audit Course 4: Language Study Japanese: Module-II

Course Objectives:

1. To teach pronunciation and intonation of Japanese sounds
2. To enable students to comprehend and speak simple sentences in Japanese
3. To introduce Japanese language at the basic level, to enable students to read and write the phonetic scripts, *Hiragana* and *Katakana,* and approx.100 *Kanji,*
4. To teach some aspects of Japanese society and culture

Course Outcomes:

On completion of the course, learner will be able to

CO1: Converse with simple sentences in Japanese
CO2: Recognize and read simple sentences in Japanese
CO3: Write simple sentences in Japanese
CO4: Be aware about Japanese society and people

Course Contents

Unit I	Japanese Oral Expression	(02 Hrs + 04 Hrs Self Study)

Oral practice of pronunciation and intonation of Japanese sounds, Japanese greetings, self-introduction, identifying things, time of the day, calendar; counting using Japanese numerical classifiers; describing things; making comparisons; talking of daily activities, kinship terms used for address and reference, seasons, giving and receiving, shopping; making requests, talking of one's likes and dislikes

Mapping of CO for Unit I	CO1	
Unit II	**Japanese Kana and Kanji**	**(02 Hrs + 04 Hrs Self Study)**

Introduction of the Japanese writing system, i.e. *Hiragana*, *Katakana* and *Kanji* (100-120), word-building, writing foreign names and loan words in Katakana

Mapping of CO for Unit II	CO2, CO3	
Unit III	**Japanese Greetings**	**(02 Hrs + 04 Hrs Self Study)**

Basic sentence patterns to be applied in self-introduction, identifying things; time of the day; calendar; counting using Japanese numerical classifiers; describing things; making comparisons; talking of daily activities; kinship terms used for address and reference; seasons; giving and receiving; shopping; making requests; talking of one's likes and dislikes

Mapping of CO for Unit III	CO1	
Unit IV	**Japanese Comprehension**	**(02 Hrs+ 04 Hrs Self Study)**

Extensive practice of basic patterns at the elementary level through drills and exercises

Mapping of CO for Unit IV	CO1, CO2	
Unit V	**Speaking Japanese**	**(02 Hrs + 4 Hrs Self Study)**

Simple conversation in situations such as describing things, making comparisons, talking of daily activities, giving and receiving of gifts, talking of illnesses and visit to a doctor, shopping, making requests, talking of one's likes and dislikes, talking on telephone etc.

Mapping of CO for Unit V	**CO1**	
Unit VI	**Social Environment of Japan**	**(02 Hrs + 4 Hrs Self Study)**

an introduction to some aspects of Japanese culture such as festivals, Japanese seasons, Japanese people and their love for nature; Japanese food, sports; society; geography; education system; Japan and the world etc. The objective is to create general awareness in students about life in Japan.

Mapping of CO for Unit VI	**CO4**

E-Resources for Learning Support:

a. https://www.duolingo.com/enroll/ja/en/Learn-Japanese
b. https://www.freejapaneselessons.com/
c. https://minato-jf.jp/ (Japan Foundation)

Text Books:

1. Taeko Kamiya, Japanese For Fun Phrasebook & Dictionary: The Easy Way to Learn Japanese Quickly, Rev Edition 2017 Tuttle Publishing, (ISBN 10- 4805313986, ISBN 13 -9784805313985)
2. EriBanno, Genki I: An Integrated Course in Elementary Japanese , 3rd Edition 2020, The Japan Times, (ISBN13: 9784789017305)
3. Sushama Jain, Japan : The Living Culture, Har-anand Publications, 2009, (ISBN 10: 8124114870 / ISBN 13: 9788124114872)

Reference Books:

1. Kanji Power Handbook for the Japanese Language Proficiency Test, 1994, ARC Press (ISBN: 9784872343144)
2. Yukiko Ogata, Kana Sumitani, Yasuko Hidari, Yukiko Watanabe, Nihongo fun and Easy -I Survival Japanese Conversation for Beginners,
3. Eriko Sato, Japanese Demystified: A Self-Teaching Guide, 2008, McGraw-Hill Companies, McGraw-Hill Demystified Series (ISBN 10-0071477268, ISBN 13-9780071477260)

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214450 (D)- Mandatory Audit Course 3: Cyber Security and Law

Teaching Scheme:	Credit	Examination Scheme:
01hr/week	Audit Course	Audit Course

Prerequisite Courses, if any: Basics of Computer

Course Objectives:

1. Understand basics of computer and cyber security.
2. To study the information technology law.
3. To understand reasons for cybercrime.
4. To learn investigation techniques.

Course Outcomes:

On completion of the course, learner will be able to -

CO1: Understand the basic concepts of cyber security and its abilities

CO2: analyze and evaluate the cyber security needs of an organization.

CO3: understand the importance of cyber laws and its practices.

CO4: Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation

Course Contents

Unit I	Basics of Cyber Security	(04 Hrs)

Information Security Definition and Concepts, Overview of Security Threats , Goals of Security, , Limitations and Challenges in cyber security , Types of Security attacks, Network Security, Malicious Codes, Intrusion detection systems, Hacking Techniques, Password cracking , Insecure Network Connections ,Concept of Firewall and Security.

Mapping of Course Outcomes for Unit I	CO1, CO2

Unit II	Cyber Laws	(04 Hrs)

Introduction, Definition and origin, Cybercrime and Information security, Classification of Cybercrimes, The legal perspectives- Indian perspective- IT Act 2000, Global perspective, Categories of Cybercrime, Reasonable Security Practices

Mapping of Course Outcomes for Unit II	CO2, CO3, CO4

Unit III	Cyber Crime	(04 Hrs)

Definition of Cyber Crime & Computer related Crimes, Classification &Differentiation between traditional crime and cybercrimes, Data Theft, Hacking, Spreading Virus &Worms, Phishing, Cyber Stalking / Bullying, Identity Theft &Impersonation, Credit card & Online Banking Frauds , Denial of Service Attacks , Cyber terrorism etc.. , Search and Seizure Procedures of Digital Evidence- Data Acquisition
Data Analysis, Reporting, Cybercrime Scenario in India

Mapping of Course Outcomes for Unit III	CO2, CO3, CO4

Text/Reference Books:

1. William Stallings, Computer Security: Principles and Practices, Pearson 6th Ed, ISBN: 978-0-13-335469-0
2. Nina Godbole, SunitBelapure , Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India Pvt.Ltd, ISBN- 978-81-265-2179-1
3. Nina Godbole , Information Systems Security , Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
4. Mark Merkow, Information Security-Principles and Practices, Pearson Ed., ISBN- 978-81-317-1288-7
5. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81-315-1349-1
6. The Information Technology Act, 2000; Bare Act – Professional Book Publishers

SEMESTER - II

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
207003: Engineering Mathematics III

Teaching Scheme:	Credit	Examination Scheme:
TH : 03 Hr/week TUT : 01 Hr/ week	03 01	Mid_Semester: 30Marks End_Semester: 70Marks TW : 25Marks

Prerequisites: Differential & Integral calculus, Taylor series, Differential equations of first order and first degree, Fourier series, Collection, Classification and Representation of data.

Course Objectives:

To make the students familiarize with concepts and techniques in Linear differential equations, Fourier transform& Z-transform, Statistical methods, Probability theory and Numerical methods. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcomes:

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

CO1: Solve Linear differential equations, essential in modelling and design of computer-based systems.

CO2: Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.

CO3: Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning.

CO4: Solve Algebraic &Transcendental equations and System of linear equations using numerical techniques.

CO5: Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

Course Contents

Unit I	Linear Differential Equations (LDE	08 Hrs

(08 Hours)

LDE of n^{th} order with constant coefficients, Complementary function, Particular integral, General method, Short methods, Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous & Symmetric simultaneous DE.

Unit I	Transforms	08 Hr

Unit II: Transforms (08 Hours)

Fourier Transform (**FT**)**:** Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine & Cosine transforms and their inverses, Discrete Fourier Transform.

Z - Transform **(ZT):**Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Solution of difference equations.

Unit I	Statistics	07 Hrs

Unit III: (07 Hours)

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting: fitting of straight line, parabola and related curves, Correlation and Regression, Reliability of Regression Estimates.

Unit IV	Probability and Probability	07 Hrs

	Distributions	
Probability, Theorems on Probability, Bayes theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeo metric, Sampling distributions, Test of Hypothesis: Chi-Square test,t-test.		
Unit V	**Numerical Methods**	**08 Hrs**
Numerical Solution of Algebraic and Transcendental equations: Bisection, Secant, Regula- Falsi, Newton–Raphson and Successive Approximation Methods, Convergence and Stability. Numerical Solutions of System of linear equations: Gauss elimination, LU Decomposition, Cholesky, Jacobi and Gauss-Seidel Methods.		
Unit VI	**Numerical Methods**	**08 Hrs**
Unit VI: Numerical Methods (08 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).		
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. Introduction to Probability and Statistics for Engineers and Scientists, 5e, by Sheldon M. Ross (Elsevier Academic Press). 6. Numerical Methods for Scientific and Engineering Computation, by M. K. Jain, S. R. K. Iyengar And R. K. Jain1, 5e, (New Age International Publication)		
Guidelines for Tutorial and Term Work:		
i) Tutorial shall be engaged in four batches (batch size of 20 students maximum) per division. ii) Term work shall be based on continuous assessment of six assignments (one per each unit) and perfo internal tests.		

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214451: Processor Architecture

Teaching Scheme:	Credit	Examination Scheme:
TH: 03hr/week	03	Mid_Semester: 30Marks End_Semester: 70Marks

Prerequisites: Logic Design & Computer Organization

Course Objectives :

1. To study architectural details of PIC 18 microcontroller.
2. To study applications of PIC through various interfacing devices.

Course Outcomes :

After completion of this course student will be able to:

CO1:Understand architecture and memory organization of PIC 18 microcontroller.

CO2: Learn and apply Embedded C programming for PIC 18.

CO3: Explain timers and interrupts of PIC 18.

CO4: Demonstrate real life applications using PIC 18.

CO5: Understand architectural details of ARM processor.

Course Contents

Unit I	PIC Microcontroller Architecture	(06 Hrs)

Introduction: introduction to microcontroller, Brief history of microcontrollers, Difference between microprocessor and microcontroller, Criteria for selection of microcontroller,

PIC18FXXX: Features and architecture, comparison of PIC 18 series microcontrollers; PIC18F458/452 Pin out connection, Registers of PIC18F,

Program and data memory organization: The Program Counter and Programmable ROM space in the PIC, File register and Access bank, Bank switching in PIC18;

Addressing modes : Addressing modes with instruction example, Oscillator configurations, Reset operations, Brownout reset, Watchdog timer, Power down modes & Configuration registers.

Mapping of Course Outcomes for Unit I	CO1,CO2

Unit II	PIC I/O Ports and Timer	(06 Hrs)

I/O Port : I/O Port structure with programming: I/O Port structure, I/O Port programming, I/O Bit manipulation Programming.

Timer/Counter: Registers used for Timer/Counter operation, Delay calculations, Programming of Timers using Embedded C.

Case Study	Traffic light signal controller using Timer/Counter
Mapping of Course Outcomes for Unit II	CO2, CO3

Unit III	PIC Interrupts & Interfacing Part I	(06 Hrs)

PIC Interrupts: Interrupt Vs Polling, IVT, Steps in executing interrupt, Sources of interrupts; Enabling and disabling interrupts, Interrupt registers, Priority of interrupts, Programming of: Timer using interrupts, External hardware interrupts, Serial communication interrupt; Interfacing of LED, Interfacing 16X2 LCD (8 bits) and Key board (4 x 4 Matrix), Interfacing Relay & Buzzer.		
Mapping of Course Outcomes for Unit III	**CO2, CO3, CO4**	
Unit IV	**PIC Interfacing Part II**	**(06 Hrs)**
CCP modes: Capture, Compare and PWM generation; DC Motor speed control with CCP, Stepper motor interfacing with PIC, **Basics of Serial communication protocols:** Study of RS232, I2C, SPI, UART, Serial communication programming using Embedded C.		
Mapping of Course Outcomes for Unit IV	**CO2, CO4**	
Unit V	**PIC Interfacing Part III**	**(06 Hrs)**
Interfacing : Interfacing of ADC and DAC 0808 with PIC, Temperature sensor interfacing using ADC and I2C with PIC, Interfacing of RTC (DS1306) using I2C with PIC, Interfacing of EEPROM using SPI with PIC,		
Case Study	**Home protection system, All programs in Embedded C**	
Mapping of Course Outcomes for Unit V	**CO2, CO4**	
Unit VI	**Current Trends**	**(06 Hrs)**
ARM & RISC :ARM and RISC design philosophy, Introduction to ARM processor & its versions ARM 7, ARM 9, ARM 11, Features& advantages of ARM processor, Suitability of ARM processor in embedded applications, ARM 7 dataflow model, Programmers model. CPSR & SPSR registers, Modes of operation, Difference between PIC and ARM.		
Mapping of for Unit VI	**CO5**	

Text Books:

1. 'PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18' 4th Edition by Muhammad Ali Mazidi , Danny Causey, Rolin McKinlay, Pearson international edition.
2. 'ARM System Developer's Guide Designing and Optimizing System Software' byAndrew N. Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann Publishers.

Reference Books:

1. 'Design with PIC Microcontroller' by Peatman, John B Pearson Education PTE.
2. 'Fundamentals of Microcontrollers and Applications In Embedded Systems' (with the PIC18 Microcontroller Family) by Ramesh Gaonkar.
3. Microchip's PIC18FXXX Data Sheet.
4. 'ARM Assembly Language Programming & Architecture' by Muhammad Ali Mazidi, Sarmad Naimi

The CO-PO mapping for the course												
PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	-	-	-	-	2
CO2	2	2	2	2	3	-	-	-	-	-	-	2
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	3	3	3	3	3	2	-	-	-	-	-	-
CO5	1	1	1	1	-	-	-	-	-	-	-	2

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214452: Database Management System

Teaching Scheme:	Credit	Examination Scheme:
TH: 03hr/week	03	Mid_Semester: 30Marks End_Semester: 70Marks

Prerequisite Courses, if any: Discrete Mathematics

Course Objectives:

1. The objective of the course is to present an introduction to database management system as a subject in its own right.
2. To understand the fundamental concepts of Relational Database management system.
3. To present SQL and procedural interfaces to SQL comprehensively.
4. To provide a strong formal foundation in Relational Database Concepts, database concepts, technology and practice &to introduce the concepts of Query Processing
5. To introduce the concepts of Transaction Processing and to present the issues and techniques relating to concurrency and recovery in multi-user database environments.
6. To introduce the recent trends in database technology.

Course Outcome: (COs)

After completion of this course student will be able to:

CO1: Define fundamental elements of database management systems

CO2: Describe the fundamental elements of relational database management systems and Design ER-models to represent simple database application scenarios.

CO3: Populate relational database and formulate SQL queries on data.

CO4: Improve the database design by normalization & to incorporate query processing

CO5: Illustrate ACID properties for transaction management & to describe concurrency control protocols.

CO6: Understand recent trends in database technology.

Unit I	Introduction to DBMS	6 Hrs

Introduction : Basic concepts, Advantages of DBMS over file processing systems, Data abstraction, Database languages, Data models, Data independence, Components of a DBMS, Overall structure of DBMS, Multi-user DBMS architecture, System catalogs, Data Modeling: Basic concepts, Entity, attributes, relationships, constraints, keys

Case Study	MySQL Database
Mapping of Course Outcomes for Unit I	CO1

Unit II	Relational Model	6 Hrs

ER and EER diagrams: Components of ER model, Conventions, Converting ER diagrams into tables

Relational Model: Basic concepts, Attributes and Domains, Codd's rules.

Relational Integrity: Nulls, Entity, Referential integrities, Enterprise constraints, Views, Schema diagram

Case Study	**Student / Timetable / Reservation / any data Management System**
Mapping of Course Outcomes for Unit II	**CO2**

Unit III	**Introduction to SQL - PL/SQL**	**6 Hrs**

Introduction to SQL: Characteristics and advantages SQL Data Types, Literals, DDL, DML, SQL Operators Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updation using Views, Indexes, Nulls SQL DML Queries: SELECT query and clauses, Set operations, Tuple Variables, Set comparison, Ordering of Tuples , Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update, Delete Queries, Stored Procedure, Triggers, Programmatic SQL : Embedded SQL, Dynamic SQL, ODBC

Case Study	**Employee database system**
Mapping of Course Outcomes for Unit III	**CO3**

Unit IV	**Database Design & Query Processing**	**6 Hrs**

Relational Databases Design: Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependencies. The process of Normalization: 1NF, 2NF, 3NF, BCNF. Introduction to Query Processing: Overview, Measures of Query cost, Selection and Join operations, Evaluation of Expressions Introduction to Query optimization: Estimation, Transformation of Relational Expression

Case Study	**Employee Database design**
Mapping of Course Outcomes for Unit IV	**CO4**

Unit V	**Transaction & Concurrency Control**	**6 Hrs**

Transaction Management: Basic concept of a Transaction, Properties of Transactions, Database Architecture, Concept of Schedule, Serial Schedule. Serializability: Conflict and View, Cascaded aborts Recoverable and Non-recoverable Schedules. Concurrency Control: Need Locking methods Dead locks, Timestamping Methods. Optimistic Techniques, Multi-version Concurrency Control. Different crash recovery methods: Shadow-Paging, Log-based Recovery: Deferred and Immediate, Check Points

Case Study	**Banking Transaction**
Mapping of Course Outcomes for Unit V	**CO5**

Unit VI	**Advanced Databases**	**6 Hrs**

Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Parallel Databases, Key elements of Parallel Database Processing, Architecture of Parallel Databases, Introduction to Distributed Databases, Architecture of Distributed Databases, Distributed Database Design

Emerging Database Technologies: Introduction, No SQL Databases- Internet Databases, Cloud databases, Mobile Databases, SQLite database, XML databases

Case Study	**RealmDB , ORMLite, Couchbase Lite**
Mapping of Course Outcomes for Unit VI	**CO6**

Text Books:

1. Silberschatz A., Korth H., Sudarshan S. "Database System Concepts", 6th edition, Tata McGraw Hill Publishers
2. G. K. Gupta "Database Management Systems" , Tata McGraw Hill

Reference Books:

1. Rab P., Coronel C. "Database Systems Design, Implementation and Management", 5th edition, Thomson Course Technology, 2002
2. Elmasri R., Navathe S. " Fundamentals of Database Systems", 4th edition, Pearson Education, 2003
3. Date C. " An Introduction to Database Systems", 7th edition, Pearson Education, 2002
4. Ramkrishna R., Gehrke J. " Database Management Systems", 3rd edition, McGraw Hill

Web Resources:

1. https://nptel.ac.in/courses/106/105/106105175/

CO-PO Mapping for the course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	1	-	-	1	-	-	-	2	3	1	-
CO2	2	1	2	-	2	-	-	1	2	-	-	2	3	2	2
CO3	2	-	1	-	-	-	-	1	-	-	-	2	3	-	-
CO4	2	-	-	-	-	-	-	1	-	-	-	2	3	-	-
CO5	2	-	-	-	2	-	-	1	-	-	-	2	3	-	-
CO6	3	-	-	-	1	-	-	1	-	-	-	2	3	1	-
AVG.	2.3	1.5	2	-	2.5	-	-	1	2	-	-	2	3	1.3	2

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214453: Computer Graphics

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hr/week	03	Mid_Semester: 30Marks End_Semester: 70Marks

Prerequisite Courses, if any: Basic Geometry, Trigonometry, Vectors and Matrices, Data Structures and Algorithms

Course Objectives:

1. Understand the foundations of computer graphics: hardware systems, math basis, light and color.
2. Understand the complexities of modeling realistic objects through modeling complex scenes using a high-level scene description language.
3. Become acquainted with some advanced topics in computer graphics. The student should gain an expanded vocabulary for discussing issues relevant to computer graphics (including both the underlying mathematics and the actual programming).
4. The student should gain an appreciation and understanding of the hardware and software utilized in constructing computer graphics applications.
5. The student should gain a comprehension of windows, clipping and view-ports in relation to images displayed on screen.
6. The student should gain an understanding of geometric, mathematical and algorithmic concepts necessary for programming computer graphics.

Course Outcome: (COs)

On completion of the course, learner will be able to–

CO1: Specify mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines and circle and apply it for problem solving.

CO2: Explain and employ techniques of geometrical transforms to produce, position and manipulate objects in 2 dimensional and 3-dimensional space respectively.

CO3: Describe mapping from a world coordinates to device coordinates, clipping, and projections in order to produce 3D images on 2D output device.

CO4: Apply the concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications.

CO5:Develop the competency to understand the concepts related to Virtual reality

Course Contents

Unit – 1	Computer Graphics Basic, OpenGL and Line, Circle Drawing	06 Hours

Introduction CG :Introduction to computer graphics, basics of graphics systems, raster and random scan, basic display processor

OpenGL – Introduction – Graphics function, OpenGL Interface, primitives and attributes, Control functions, programming events.

Line Drawing: DDA Line – Mathematical Treatment and algorithm, Bresenhem Line - Mathematical Treatment and algorithm **Circle Drawing:** Bresenhem – Mathematical Treatment and algorithm. **Character Generation:** Stroke principle, starburst principle, bitmap method.Introduction to aliasing and anti-aliasing.		
Case study	**Computer-generated imagery (CGI)**	
Mapping of Course Outcomes for Unit I	**CO1**	
Unit – 2	**Polygons, 2D Transformations**	**06 Hours**
Polygons: Polygons and its types, inside test, Polygon filling methods: 1. Seed Fill – Flood fill and Boundary Fill, Scan-line Fill algorithms, **2D Transformations:** Translation, Scaling, Rotation, Reflection and Shearing, Matrix representation and homogeneous coordinate system, composite transformations.		
Case study	**Transformation of an Object in Computer Graphics: Mathematical Matrix Theory**	
Mapping of Course Outcomes for Unit II	**CO2**	
Unit – 3	**Windowing, Clipping,3D Transformation, Projections**	**06 Hours**
Windowing: Concept of window and viewport, viewing transformations **Line Clipping:** Cohen Sutherland method of line clipping **Polygon Clipping:** Sutherland Hodgeman method for convex and concave polygon clipping. **3D Transformation:** Translation, scaling, rotation about X, Y, Z & arbitrary axis, and reflection about XY, YZ, XZ & arbitrary plane. **Projections:** Types of projections – Parallel – Perspective **Parallel:** oblique – Cavalier, Cabinet, Orthographic – isometric, diametric, trimetric **Perspective:** vanishing points as 1 point, 2 point and 3 point.		
Case Study	**3D Rendering and Modelling**	
Mapping of Course Outcomes for Unit III	**CO2 & CO3**	
Unit – 4	**Segments, Illumination models, colour models and shading**	**06 Hours**
Segments: Introduction, Segment table, segment creation, closing, deleting, renaming, and visibility. **Illumination models**: Light sources, ambient light, diffuse light, specular reflection, the Phong model, combined diffuse and specular reflections with multiple light sources. **Color Models:** CIE Chromaticity Diagram, Color Gamut, RGB, CMY, YIQ, CMY, HSV, HLS color models. **Shading Algorithms:** Constant intensity shading, Halftone, Gaurand and Phong Shading.		
Case study	**Best practices in Daylighting & Passive Systems for Smaller Commercial Buildings**	

Mapping of Course Outcomes for Unit IV	**CO4**	
Unit – 5	**Curves, fractals and Animation**	**06 Hours**
Curves: Introduction, interpolation and approximation, Spline Interpolation Methods – hermite interpolation, Bezier curves, B-Splines. **Fractals:** Introduction, Classification, fractal Dimension, Fractal dimension and surfaces, Hilbert curve, Koch Curve. **Animation:** Basics of animation, types of animation, principles of animation, design of animation sequences, animation languages, key frame, morphing, motion specification. Methods of controlling animation, frame-by-frame animation techniques, real-time animation techniques.		
Case study	**3D Animation services for character expressions.**	
Mapping of Course Outcomes for Unit V	**CO4**	
Unit – 6	**Virtual Reality**	**06 Hours**
Introduction of Virtual Reality: Fundamental Concept, Three I's of virtual reality and Classic Components of VR systems, Applications of VR systems. **Multiple Modals of Input and Output Interface in Virtual Reality:** Input – 3D position Trackers and its types, Navigation and Manipulation Interfaces, Gesture Interfaces, Graphics Displays – HMD and CAVE, Sound Displays, Haptic Feedback **Rendering Pipeline:** Graphics rendering Pipeline, Haptics Rendering Pipeline Modeling in Virtual Reality: Concepts of Geometric Modeling, Kinematic Modeling, Physical modeling and Behavior modeling.		
Case Study	**Virtual reality in aviation and Space travel Training**	
Mapping of Course Outcomes for Unit VI	**CO5**	

Test Books

1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN81 – 7808 – 794 – 4
2. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 –100472 – 6.
3. Virtual Reality Technology by Grigore C. Burdea, Philippe Coiffet, second edition, Wiley India Edition, ISBN 81-265-0789-6

Reference books

1. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill
2. Publication, 2001, ISBN 0 – 07 – 047371 – 4.
3. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
4. Foley, "Computer Graphics: Principles & Practice in C", 2e, ISBN 9788131705056, Pearson Edu.
5. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education

CO-PO Mapping for the course												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	2	1	0	1	1	0
CO2	3	3	3	2	2	2	0	0	2	2	2	0
CO3	3	3	3	2	2	2	0	0	0	0	1	0
CO4	2	3	1	2	1	2	1	2	1	1	0	1
CO5	2	3	1	2	1	2	1	2	1	1	0	1

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214455: Software Engineering

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 hr/week	03	Mid_Semester: 30 Marks End Semester: 70 Marks

Prerequisite Courses, if any:

Fundamentals of Programming Languages

Course Objectives:

1. To learn the principles of Software Engineering.
2. To learn and understand methods of capturing, specifying, visualizing and analyzing software requirements.
3. To know design principles to software project development.
4. To learn basics of IT project management.
5. To understand software quality attributes and testing principles.
6. To introduce formal methods and recent trends in Software Engineering.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify various software application domains and classify software applications.
CO2: Analyze software requirements by applying various modeling techniques.
CO3: Translate the requirement models into design models.
CO4: Apply planning and estimation to any project.
CO5: Apply quality attributes and testing principles in software development life cycle.
CO6: Discuss recent trends in Software engineering by using CASE and agile tools.

Course Contents

Unit I	Introduction To Software Engineering	(06 Hrs)

Software Engineering Fundamentals: Nature of Software, Software Engineering Practice, Software Process, Software Myths.
Process Models : A Generic Process Model, Linear Sequential Development Model, Iterative Development Model, The incremental Development Model
Agile software development: Agile manifesto, agility principles, Agile methods, myth of planned development, Introduction to Extreme programming and Scrum.
Agile Practices: test driven development, pair programming, continuous integration in DevOps , Refactoring

Case Studies	An information system – Library Management system
Mapping of Course Outcomes for Unit I	CO1

Unit II	Requirements Engineering& Analysis	(06 Hrs)

Requirements Engineering: User and system requirements, Functional and non-functional requirements, requirements engineering (elicitation, specification, validation, negotiation) prioritizing requirements (Kano diagram), requirement traceability matrix(RTM)
Software Requirements Specification (SRS): software requirements Specification document, structure of

SRS, writing a SRS, structured SRS for online shopping, **Requirements Analysis:** Analysis Model, data modeling, scenario based modeling, class based modeling, Flow oriented modeling, behavioral modeling-Introduction to UML diagrams		
Case Studies : Library Management system		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Design Engineering**	**(06 Hrs)**
Design Process & quality, Design Concepts, design Model, Pattern-based Software Design. Architectural Design :Design Decisions, Views, Patterns, Application Architectures, Component level Design: component, Designing class based components, conducting component-level design, User Interface Design: The golden rules, Interface Design steps & Analysis, Design Evaluation,		
Case Study : Web App Design **/** Library Management System		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**Project Planning, Management And Estimation**	**(06 Hrs)**
Project Planning: Project initiation, Planning Scope Management, Creating the Work Breakdown Structure, scheduling: Importance of Project Schedules, Developing the Schedule using Gantt Charts, Project Management: The Management Spectrum, People, Product, Process, Project, The W5HH Principle, Metrics in the Process and Project Domains, Software Measurement : size & function oriented metrics(FP & LOC), Metrics for Project Project Estimation: Software Project Estimation, Decomposition Techniques, Cost Estimation Tools and Techniques, Typical Problems with IT Cost Estimates.		
Case Study: Project Management tool like OpenProj or MS Project or JIRA		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**Software Quality And Testing**	**(06 Hrs)**
Quality Concepts: Quality, software quality, Quality Metrics, software quality dilemma, achieving software quality Software Testing: Introduction to Software Testing, Principles of Testing, Test plan, Test case, Types of Testing, Verification & Validation, Testing strategies, Defect Management, Defect Life Cycle, Bug Reporting, debugging.		
Case Studies: software testing tool like selenium		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**Formal Methods Recent Trends In Software Engineering**	**(06 Hrs)**
SCM, Risk Management, Technology evolution, process trends, collaborative development, software reuse, test-driven development, global software development challenges, CASE – taxonomy, tool-kits, workbenches, environments, components of CASE, categories (upper, lower and integrated CASE tools), Introduction to agile tools Jira, Kanban		
Case Studies: CASE software/ HP Quality Center (QC) / Jira		
Mapping of Course Outcomes for Unit VI	**CO6**	

Books & Other Resources:

Text Books:

1. Roger Pressman, "Software Engineering:A Practitioner's Approach", McGraw Hill,ISBN 0-07-337597-7
2. Ian Sommerville,Software Engineering,Addison and Wesley, ISBN 0-13-703515-2.

Reference Books:

1. Joseph Phillips, IT Project Management-On Track From start to Finish, Tata Mc Graw-Hill,ISBN13:978-0-07106727-0,ISBN-10:0-07-106727-2
2. Pankaj Jalote, Software Engineering: A Precise Approach,Wiley India, ISBN: 9788-1265-2311-5
3. Marchewka,Information Technology Project Management,Willey India, ISBN: 9788-1265-4394-6
4. Rajib Mall,Fundamentals of Software Engineering,Prentice Hall India, ISBN-13:9788-1203-4898-1

Web Resources:

1. Udemy 2. Coursera 3. LinkedIn Learning Modules

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1		-	1	-	-	-	-	-	1
CO2	2	2	-	1	-	-	-	-	1	2	-	1
CO3	2	2	2	1	2	-	-	1	1	1	1	1
CO4	2	2	-	1	-	1	1	2	1	1	-	1
CO5	1	1	2	1	1	1	1	2	1	1	-	1
CO6	1	1	1	-	2	1	1	1	1	-	-	1

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214455: Programming Skill Development Lab

Teaching Scheme:	Credit	Examination Scheme
TH:02Hr/week	01	TW: 25Marks PR: 25Marks

Prerequisites: Computer Organization and Architecture

Course Objectives :

1. To learn embedded C programming and PIC18FXXXmicrocontrollers.
2. To learn interfacing of real world input and output devices to PIC18FXXX microcontroller

Course Outcomes :

CO1 : After completion of this course student will be able to

CO2 : Students will learn concepts related to embedded C programming.

CO3 : Students will be able to write and execute embedded C program to perform array addition, block transfer, sorting operations

CO4 : Students will be able to learn interfacing of real world input and output devices to PIC18FXXX microcontroller.

CO5 : Students will learn open source prototype platform like Raspberry-Pi/Beagle board/Arduino.

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant. The instructor's manual should include prologue, university syllabus, conduction & Assessment guidelines, topics under consideration- concept, objectives, outcomes, algorithm, sample test cases and references etc.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal. The Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, circuit diagram, pin configuration, conclusion/analysis), printouts of the code written using coding standards, sample test cases etc.
2. Practical Examination will be based on the term work submitted by the student in the form of journal
3. Candidate is expected to know the theory involved in the experiment
4. The practical examination should be conducted if the journal of the candidate is completed in all respects and certified by concerned faculty and head of the department
5. All the assignment mentioned in the syllabus must be conducted

Guidelines for Lab /TW 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. Necessary knowledge of usage of software and hardware of PIC18FXXX microcontrollers and its

interfacing kits should be checked by the concerned faculty members.

Guidelines for Laboratory Conduction

1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.
2. The guidelines published by BOS time to time regarding conduction of laboratory assignments and Practical/Oral examination is mandatory.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements for practical examination. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to judge the student's understanding of the fundamentals, effective and efficient implementation. The evaluation should be done by both external and internal examiners.

Suggested List of Laboratory Assignments

Suggested List of Laboratory Assignments Group A (Any Three):

Mapping of Course Outcomes for Group A : CO1 , CO2

1. Write an Embedded C program to add array of n numbers.
2. Write an Embedded C program to transfer elements from one location to another for following.
   I) Internal to internal memory transfer
   II) Internal to external memory transfer
3. Write an Embedded C menu driven program for
   i) Multiply 8 bit number by 8 bit number
   ii) Divide 8 bit number by 8 bit number
4. Write an Embedded C program for sorting the numbers in ascending and descending order.

Group B (Any Three):

Mapping of Course Outcomes for Group B : CO3

5. Write an Embedded C program to interface PIC 18FXXX with LED & blinking it using specified delay.
6. Write an Embedded C program for Timer programming ISR based buzzer on/off.
7. Write an Embedded C program for External interrupt input switch press, output at relay.
8. Write an Embedded C program for LCD interfacing with PIC 18FXXX.

Group C (Any two) :

Mapping of Course Outcomes for Group C : CO3

9. Write an Embedded C program for Generating PWM signal for servo motor/DC motor.
10. Write an Embedded C program for PC to PC serial communication using UART.
11. Write an Embedded C program for Temperature sensor interfacing using ADC & display on LCD.

Group D :

Mapping of Course Outcomes for Group D : CO4

12. Study of Arduino board and understand the OS installation process on Raspberry-pi .
13. Write simple program using Open source prototype platform like Raspberry-Pi/Beagle

board/Arduino for digital read/write using LED and switch Analog read/write using sensor&actuators.

Reference Books

1. Mazidi, Rolin McKinlay and Danny Causey, 'PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education.
2. Raspberry Pi for Beginners 2nd Edition book" e book

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	3	-	2	-	-	-	-	2
CO2	1	3	3	2	2	2	2	-	-	-	-	2
CO3	1	2	3	3	2	1	2	-	-	-	-	2
CO4	1	1	2	2	3	-	1	1	-	-	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214456: Database Management System LAB

Teaching Scheme:	Credit	Examination Scheme
Pr:04Hr/week	02	PR: 25Marks TW: 25Marks

Prerequisites: Data structures and Software engineering principles and practices.

Course Objectives :

1. Understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
2. To provide a strong formal foundation in database concepts, recent technologies and best industry practices.
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
4. To learn the SQL database system.
5. To learn and understand various Database Architectures and its use for application development.
6. To programme PL/SQL including stored procedures, stored functions, cursors and packages.

Course Outcomes :

After completion of this course student will be able to

CO1 : To install and configure database systems.

CO2 : To analyze database models & entity relationship models.

CO3 : To design and implement a database schema for a given problem-domain

CO4 : To understand the relational database systems.

CO5 : To populate and query a database using SQL DDL / DML / DCL commands.

CO6 : To design a backend database of any one organization: CASE STUDY

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical and Oral Examination will be based on all the assignments in the lab manual
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Oral /Practical Assessment

1. Examiners will assess the student 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.

Suggested List of Laboratory Assignments

Group A: Study of Databases

Mapping of Course Outcomes Group A : CO1

1. Study of MySQL Open source software. Discuss the characteristics like efficiency, scalability, performance and transactional properties
2. Install and configure client and server of MySQL.(Show all commands and necessary steps for installation and configuration)
3. Study of SQLite: What is SQLite? Uses of Sqlite. Building and installing SQLite.

Group B: MySQL

Mapping of Course Outcomes Group B : CO2, CO3, CO4, CO5

1. Design any database with at least 3 entities and relationships between them. Draw suitable ER/EER diagram for the system.
2. Design and implement a database (for assignment no 1) using DDL statements and apply normalization on them
3. Create Table with primary key and foreign key constraints.
   a. Alter table with add n modify b. Drop table
4. Perform following SQL queries on the database created in assignment 1.
   - Implementation of relational operators in SQL
   - Boolean operators and pattern matching
   - Arithmetic operations and built in functions
   - Group functions
   - Processing Date and Time functions
   - Complex queries and set operators
5. Execute DDL/DML statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.

Group C: PL/SQL

Mapping of Course Outcomes Group C : CO6

1. Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.
2. Write and execute suitable database triggers .Consider row level and statement level triggers.
3. Write a PL/SQL block to implement all types of cursor.

Group D: Relational Database Design

Mapping of Course Outcomes Group D : CO5, CO6

Design and case study of any organization (back end only), Project Proposal and High Level SRS

To prepare for your project, do the following:

1. Form teams of around 3 to 4 people
2. Create a requirements document with the following information;
1. Give a one or two paragraph description of your goals for the topic(s).
2. List all what all types of users will be accessing your application (e.g., for moodle, the types are teachers, students, teaching assistants, and a few more types).
3. List the various functionalities that your application will support. Explain each in about a paragraph worth of detail.
4. List the hardware and software requirements at the backend and at the front end.
5. Give an estimate of the number of users of each type, the expected load (transactions per day), and the expected database size.

Project ER Diagram and Database Design

For ER diagram and Database design following guidelines can be used

1. Draw an ER diagram of your project.
2. Reduce this ER diagram into the tables and complete database design.
3. Subsequently, list all the functional dependencies on each table that you expect will hold.
4. Check that the database schema is in 3NF/BCNF. If it is not, apply normalization. Use non-loss decomposition and bring the database schema in 3NF/BCNF.

Give the ER diagram and the data dictionary as part of the requirement specifications file which you created for the project proposal.

Reference Books:

1. Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g Black Book, DreamTech.
2. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publication.
3. Reese G., Yarger R., King T., Williums H, Managing and Using MySQL, Shroff Publishers and Distributors Pvt. Ltd., ISBN: 81 - 7366 - 465 – X, 2nd Edition.
4. Eric Redmond, Jim Wilson, Seven databases in seven weeks, SPD, ISBN: 978-93-5023-918-6.Jay Kreibich, Using SQLite, SPD, ISBN: 978-93-5110-934-1, 1st edition.

Web Resources:

1. Udemy 2. Coursera 3. SQL TutorialsPoint

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	2	-	-	2	2	-	-	2
CO2	2	3	2	-	2	-	-	-	1	-	-	-
CO3	2	2	3	1	-	-	-	-	1	-	1	1
CO4	2	-	3	2	3	2	-	2	-	-	-	-
CO5	2	-	3	-	3	-	-	-	-	-	-	-
CO6	3	3	3	3	3	2	1	-	3	-	1	1
	2.3	**1.5**	**2**	**-**	**1.5**	**-**	**-**	**1**	**2**	**-**	**-**	**2**

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214457: Computer Graphics Lab

Teaching Scheme:	Credit	Examination Scheme
Practical:02Hr/week	02	TW: 25Marks PR 25Marks

Prerequisites: Basic Geometry, Trigonometry, Vectors and Matrices, Data Structures and Algorithms

Course Objectives :

1. To acquaint the learners with the concepts of OpenGL
2. To acquaint the learners with the basic concepts of Computer Graphics
3. To implement the various algorithms for generating and rendering the objects
4. To get familiar with mathematics behind the transformations
5. To understand and apply various methods and techniques regarding animation

Course Outcomes :

After completion of this course student will be able to

CO1: Apply and implement line drawing and circle drawing algorithms to draw the objects.
CO2: Apply and implement polygon filling methods for the object
CO3: Apply and implement polygon clipping algorithms for the object
CO4: Apply and implement the 2D transformations on the object
CO5: Implement the curve generation algorithms
CO6: Demonstrate the animation of any object using animation principles

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical and Oral Examination will be based on all the assignments in the lab manual
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the student 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.

Guidelines for Laboratory Conduction

1. All the assignments should be implemented in C++ with OpenGL libraries.
2. Assignment 1 (week 1) should all the basic functions of openGL to get students familiar with Graphics Environment. Hence, this assignment is not included in Practical Exam.
3. The different objects/shapes/patterns should be drawn for implementation of drawing algorithm.
4. All the assignments should explore the conceptual understanding of students.
5. The keyboard/Mouse interfaces should be used wherever possible.

Guidelines for PRACTICAL EXAM conduction

1. There will be 2 problem statements in chit and student will have to perform any one.
2. All the problem statements carry equal weightage.

Suggested List of Laboratory Assignments

1. Install and explore the OpenGL (1 week, 2 hrs) - **CO1**

2. Implement DDA and Bresenham line drawing algorithm to draw (2 week, 4 hrs)
   - i) Simple line
   - ii) Dotted line
   - iii) Dashed line
   - iv) Solid line

   using mouse interface. Divide the screen in four quadrants with center as (0, 0). The line should work for all the slopes +ve, -ve, >1,<1

3. Implement Bresenham circle drawing algorithm to draw any object. The object should be displayed in all the quadrants with respect to center and radius (1 week, 2 hrs) -**C02**

4. Implement the following polygon filling methods (1 week, 2 hrs)

i) Flood fill / Seed fill

ii) Boundary fill

using mouse click, keyboard interface and menu driven programming-**CO4**

5. Implement Cohen Suterland polygon clipping method to clip the polygon with respect the viewport and window. Use mouse click, keyboard interface (1 week, 2 hrs) - **CO4**

6. Implement following 2D transformations on the object with respect to axis (1 week, 2 hrs) – **CO5**

a. Scaling

b. Rotation about arbitrary point

c. Reflection

7. Generate fractal patterns using (1 week, 2 hrs)

a. Bezier b. Koch Curve

8. Implement animation principles for any object (2 week, 4 hrs) -**CO6**

Text Books

1. S. Harrington, “Computer Graphics”, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0-07-100472-6

2. D. Rogers, “Procedural Elements For Computer Graphics”, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0-07-047371-4

3. F.S. Hill JR, “Computer Graphics Using OpenGL”, Pearson Education

Reference Books
1. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9
2. D.Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN81 – 7808 – 794 – 4
3. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8
4. Zhigang Xiang, Roy Plastock, "Computer Graphics", Schaum's Series outlines
5. Shirley, Marschner, "Fundamentals of Computer Graphics", Third Ed, A K Peters SPD
6. D.P. Mukharjee, Debasish Jana, "Computer Graphics Algorithms and implementation", PHI Learning
7. Samuel R. Buss, "3D Computer Graphics", Cambridge University Press
8. Mario Zechner, Robert Green, "Beginning Android 4 Games Development", Apress, ISBN: 978-81-322-0575-3
9. Maurya, "Computer Graphics with Virtual Reality Systems, 2ed.", Wiley, ISBN-9788126550883
10. Foley, "Computer Graphics: Principles & Practice in C", 2e, ISBN 9788131705056, Pearson Edu

The CO-PO mapping for the course

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	1	-	-	-	-	-	-
CO2	3	2	-	-	2	1	-	-	-	-	-	-
CO3	3	2	-	-	2	1	-	-	-	-	-	-
CO4	3	2	-	-	2	1	-	-	-	-	-	-
CO5	3	2	-	-	2	1	-	-	-	-	-	-
CO6	2	2	2	-	3	-	-	-	-	-	-	-

Home

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019 Course)
214458: Project Based Learning

Teaching Scheme:	Credit	Examination Scheme:
Lab: 04hrs. / week	02	TW : 50Marks

Prerequisite Courses, if any:

1. The primary objective of project-based learning course is to develop critical thinking and engineering problem solving skills by exploring and proposing sustainable solutions to real-world problems.
2. PBL requires continuous mentoring by faculty throughout the semester for successful completion of the tasks selected by the students per batch. While assigning the teaching workload a load of 2 Hrs./week/batch needs to be considered for the faculty involved. This course specifically utilizes Project Based Learning (PBL) to engage students in a semester long process of analyzing, evaluating, and creating solutions to an engineering real-world problem. These projects assist students in learning important domain knowledge, technical content, and develop needed skills in critical thinking, teamwork, peer evaluation, and communications.
3. Students will work on their project from a first week to a semester end – that engages them in solving a real-world problem or answering a complex question. The Batch needs to be divided into sub-groups of 3 to 6 students. Assignments / activities / models/ projects etc. under project based learning is carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester. A mentor will assign to every team who will be guided them to build their projects.

Companion Course, if any: Online courses relevant to the project, along with expert lecture on Intellectual right and patients.

Course Objectives :

After completing PBL course, the student will be able to:

1. Know about project and project based learning
   - Experience the concept of learning by doing,
   - Experience advanced and efficient learning model
2. Understand the various processes involved in project based learning and the importance of team work in project based learning
   - develop projects for various real life situations,
   - work in realistic contextualized problem-solving environments,
   - realize the success of a project by experiencing the desired output
3. Apply knowledge and understanding of project based learning processes in new situations
   - improve communication skills,
   - enhance self-confidence,

- build up teamwork and leadership skills

4 Model to meet the societal and educational demands

- Solving challenges of society through technology

Probable solution for various problems coming from various Hackathon competitions

Course Outcomes:

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

CO1: Students will gain knowledge of how to provide solution to real life problems and analyze its concerns through shared cognition.

CO2: Students will be able to understand concepts of various disciplines and apply them in practical way.

CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill.

CO4: Becoming well prepared for the labor market.

CO5: Student will motivate to collaborate with external partners and engage in interdisciplinary learning environments

Course Contents

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project / activity, which addresses the stated problem.

1. There should be team of 3 to 6 students who will work cohesively .
2. A Mentor should be assigned to individual groups who will help them with learning process

Selection of Project/Problem:

The project-based project model begins with the identifying of a real-world problem, often growing out of a question or “wondering”. The formulated problem will then stands as the starting point for learning. Students will be designed and analyze the problem within an articulated interdisciplinary or subject frame.

A problem statement can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students’ wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

1. A few hands-on activities that may or may not be multidisciplinary
2. Use of technology in meaningful ways to help them investigate, collaborate, analyze synthesize and present their learning.

3. Activities may include- Solving real life problem , investigation /study and Writing reports of in depth study, fieldwork
4. Reports of in depth study, fieldwork

Assessment:

The department should committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL will be monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is to be monitored and continuous assessment should be done by mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self- motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes. Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

1. Individual assessment for each student (Understanding individual capacity, role and involvement in the project).
2. Group assessment (roles defined, distribution of work, intra-team communication and togetherness.
3. Documentation and presentation.

Evaluation and Continuous Assessment:

Project Based Learning is an instructional approach that emphasizes critical-thinking, collaboration and personalized learning. These projects are based on problems, which are real-life oriented, curriculum-based, and often interdisciplinary. At the end of the PBL, students demonstrate their newly acquired knowledge and are evaluated by how much they have learned and how well they communicate it. Throughout this process, the teacher's role is to guide and advise students, rather than to direct and manage student work.

It is recommended that the all activities are to be recorded, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes. Recommended parameters for assessment, evaluation and weightage :

1. Idea Inception (5%)
2. Outcomes of PBL/Problem Solving Skills/Solution provided/Final product **(40%)** (Individual assessment and team assessment)

3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents **(25 %)**

4. Potential for the patient **(10%)**

5.Demonstration (Presentation, User Interface, Usability etc.) **(10%)**

6. Contest Participation/ publication **(5%)**

7. Awareness /Consideration of Environment/ Social /Ethics/ Safety measures/Legal aspects **(5%).**

PBL workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken

References:

1. Project-Based Learning, Edutopia, March 14,2016.

2. What is PBL? Buck Institute forEducation.

3. www.schoology.com

4. www.wikipedia.org

5. www.howstuffworks.com

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019Course)
214459: Mandatory Audit Course-4 A: Water Supply and management

Teaching Scheme:	Credit	Examination Scheme:
1 Hr/ week	Non Credit Course	Audit Course

Prerequisite Courses: Basic knowledge of environmental science and mathematics

Course Objectives:

1. Enable the student to understand the various components of environment in and around the earth crust and understand the effects of it over plants, animals, etc
2. Understand the important concepts of good water supply system to a city/town or a village
3. To understand the need of conservation of rain water and its applications
4. To understand the sources, effects, prevention and control measures of water pollution and its legislative aspects.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Relate the relations between the environment and ecology, estimating water requirement for public water supply scheme

CO2: Ascertain the quality of water as per BIS and select the appropriate treatment method required for the water source

CO3: Study & Establish the suitable distribution system for a locality and know the appurtenances used

CO4: Identify and summarize the arrangement of water supply and fittings in a building

CO5: Determine the need of conservation of water and rural water supply

CO6: Identify the sources of water pollution and suitable control measures

Course Contents

Unit I	Introduction To Environment, Water Requirement And Water Sources	2 Hr

ENVIRONMENT AND ECOLOGY: Atmosphere, Lithosphere, Hydrosphere, Biosphere. Relation between Plant, Animals and Environment. Eco System, Man and Ecology.

WATER REQUIREMENT: Necessity of water supply, Methods of population forecasting (Arithmetical, Geometrical and Incremental Increase method), Water Requirements for a) Domestic Purpose b) Industrial Use c) Fire Fighting

d) Public Purpose e) Losses. Per Capita Demand and Factors affecting it. Total Quantity of Water Required for a Town.

SOURCES OF WATER: Surface Sources - Lakes, Streams, Rivers. Impounded Reservoirs. Underground Sources - Infiltration Galleries, Infiltration Wells and Springs

Mapping of Unit I	CO1

Unit II	Quality And Treatment Of Water	2 Hr

QUALITY OF WATER: Impurities of water - organic and inorganic classification and examination of water. Physical - temperature, colour, turbidity, taste and odour. Chemical - pH Value, TotalSolids, Hardness, Chlorides, Iron and Manganese, Fluoride and Dissolved Oxygen. Bacteriological- E-coli, Most Probable Number (MPN), Quality Standards for Domestic purpose as perBIS.

TREATMENT OF WATER: Flow diagram of different units of treatment, brief description of constructional details, working and operation of the following units - plain sedimentation, sedimentation with coagulation, flocculation, filtration-Slow sand filters, Rapid sand filters and pressure filters (no design) Disinfection of water, Chlorination		
Mapping of Unit II	CO2	
Unit III	**Water Distribution System**	2 Hr
DISTRIBUTION SYSTEM: General Requirements, Systems of Distribution- Gravity System, Combined System, Direct Pumping. Maintenance of required pressure in Distribution Systems. Storage-Underground, Ground Level And OverheadServiceReservoirs–Sketch,NecessityandAccessories.Typesoflay-out : dead end, grid iron, radial and ring systems, their merits and demerits and their suitability **APPURTENANCES IN DISTRIBUTION SYSTEM:** Use of Sluice Valves, Check Valves, Air Valves, Scour Valves, Zero Velocity Valves, Fire Hydrants, Water Meter		
Mapping of Unit III	**CO3**	
Unit IV	**Water Supply In Buildings**	**2 Hr**
Water Supply arrangement in Buildings: General lay-outofwatersupplyarrangementforsingleandmulti-storiedbuildingsasperB.I.S code of practice. Pipe Materials- Plastic Pipes, High Density Polythene Pipes, Densified cast iron pipes, Merits and Demerits. Connections from water main to buildings. Water supply fittings - their description and uses, water main, service pipes, supply pipe, distribution pipe, domestic storage tank, stop cock, ferrule, goose neck, water tap, Modern systems of Potable water purification-(RO, UV, Activated carbon), Hot water supply - electric and solar water heaters.		
Mapping of Unit IV	**CO4**	
Unit V	**Water Conservation**	**2 Hr**
WATER CONSERVATION: Conservation of rain water, roof water harvesting, recharging of ground water. RURAL WATER SUPPLY: Rural water supply systems, Disinfection of well water.		
Case Studies:	Refer suggested list of Case studies/ Students activities	
Mapping Unit V	CO5	
Unit VI	**Water Pollution And Pollution control**	**2 Hr**
WATER POLLUTION AND CONTROL: Sources of water pollution, types and itseffects,Preventionandcontrolmeasuresofwaterpollution,Legalaspectsregarding water pollution control.		
Mapping of VI	**CO6**	

Reference Books:

1. S.K. Garg, Water Supply Engineering Vol-I,Khanna Publishers
2. G.S.Birdie,WaterSupply&SanitaryEngineering-includingEnvironmental Engineering ,water and air pollution aws and Ecology, Dhanpat Raiand Sons publishers,ISBN:81-87433-31-0.
3. Dr. P.N. Modi, Environmental Engg.-Vol-I, Standard Book House.

A.K.Chatterji,WaterSupply,WasteDisposalandEnvironmentalPollution Engineering, Khanna publishers.

Web Resources:

1.Udemy 2.Coursera 3.NPTEL

SUGGESTED LIST OF CASE STUDIES/STUDENTACTIVITIES

1. Collect the information about biotic and abiotic components of surrounding environment and

frame relation among them.

2. Estimatethetotalquantityofwaterrequiredforatown/locality/Institute.
3. Prepare map and written report for surface and underground sources of water in the neighborhood
4. Visit nearby Certified Water testing laboratories and identify various tests conducted on water.
5. Visit Water Treatment Plant and collect details of unit operations and processes involved init.
6. Study the distribution system of water supply of your locality.
7. Visit a newly constructed building and study plumbing work.
8. Study a rooftop rain water harvesting system of existing building.
9. Study a Solar water heating system and collect necessary data.
10. Collect a necessary data/information about issues related to water pollution and Prepare report/presentation.

Evaluation:

Students should select any one of the above topic in a group of 3 to 5. Students should submit a written report and make a presentation on the topic. The task should not be repeated among students. Report will be evaluated by the faculty as per rubrics defined by him/her/them at start of course.

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019Course)
214459: Mandatory Audit Course -4B: Language Study Japanese: Module-II

Teaching Scheme:	Credit	Examination Scheme:
1 Hr/ week	Audit Course	Audit Course

Prerequisite Courses: Audit Course 3**:** Language Study Japanese: Module-I

Course Objectives:

1. To develop the Japanese communicative competence of students with small sentence formation to make primitive social conversation in Japanese
2. To enable students with comprehension ability of Japanese grammar
3. To enable students to translate simple conversations from English to Japanese and vice a versa
4. To make students aware about Japanese Culture and Customs

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Have Japanese Communicative competence for primitive Social conversation in Japanese

CO2: Comprehend Grammar of Japanese Script

CO3: Translate simple sentences from Japanese to English and vice a versa

CO4: Be aware about Japanese society and people

Course Contents

Unit I	Japanese Conversation	(02 Hrs +04 Hrs Self Study)
Oral practice of conversation in situations such as declining an invitation, reporting an event, narrating a story, short formal speeches on occasions such as welcoming, introducing and thanking a guest, talking about Japanese and Indian festivals, hostel life etc		
Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**Japanese Text and Kanji**	**(04 Hrs +04 Hrs Self Study)**
Diverse texts based on Japanese culture, customs, history, food habits, and science etc, for the development of communicative competence of students; skimming, scanning of texts with emphasis on advanced sentence patterns, grammatical structures and idiomatic phrases, reading and writing of approximately 400 *kanji*.		
Mapping of Course Outcomes for Unit II	**CO2,CO3**	
Unit III	**Japanese Grammar and Composition**	**(02 Hrs +04 Hrs Self Study)**
Basic sentence patterns to be applied in self introduction, identifying things; time of the day; calendar; counting using Japanese numerical classifiers; describing things; making comparisons; talking of daily activities; kinship terms used for address and reference; seasons; giving and receiving; shopping; making requests; talking of one's likes and dislikes		
Mapping of Course	**CO2, CO3**	

Outcomes for Unit III		
Unit IV	**Japanese – English Translation**	**(04 Hrs +04 Hrs Self Study)**
Practice in English to Japanese and Japanese to English translation of short passages on various topics such as culture, society, religion and life style taken from books, newspapers, magazines, internet etc.		
Mapping of Course Outcomes for Unit IV	**CO3**	
Unit V	**Language and Literature of Japan**	**(02 Hrs Self Study)**
History of Japanese language, literary trends, religions, spread of Chinese influence, development of art and culture in Japan.		
Mapping of Course Outcomes for Unit V	**CO4**	

E-Resources for Learning Support:

1. https://www.duolingo.com/enroll/ja/en/Learn-Japanese
2. https://www.freejapaneselessons.com/
3. https://minato-jf.jp/ (Japan Foundation)

Text Books:

1. Eri Banno, Genki I: An Integrated Course in Elementary Japanese , 3rd Edition 2020, The Japan Times, (ISBN13: 9784789017305)
2. George Trombley , Yukari Takenaka, Japanese From Zero, 6th Edition, Learn From Zero Publishers (ISBN10- 0976998122, ISBN13-9780976998129)
3. Tae Kim, A Guide to Japanese Grammar, 2012, CreateSpace Publishing, (ISBN-1469968142, ISBN13-9781469968148) http://www.guidetojapanese.org/learn/grammar

Reference Books:

1. Yukiko Ogata, Kana Sumitani, Yasuko Hidari, Yukiko Watanabe, Nihongo fun and Easy -II, Basic Grammar for Conversation
2. Nobuo Akiyama, Carol Akiyama, Japanese Grammar (Barron's Grammar), 3rd edition 2012, Barrons Educational Series
3. Storry Richard, A History Of Modern Japan, 1973, Penguin Books Ltd,
4. James W. Heisig, Remembering the Kanji 1 : A Complete Course on How Not To Forget the Meaning and Writing of Japanese Characters, 6h Edition, University of Hawai'i Press (ISBN10-0824835921, ISBN13-9780824835927)

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019Course)
214459: Mandatory Audit Course-4 C: e-Waste Management and Pollution Control

Teaching Scheme:	Credit	Examination Scheme:
1 Hr/ Week	Audit Course	Audit Course

Prerequisite Courses:if any:

Course Objectives:

1. To make the students aware about importance of environmental study
2. To study impact of professional engineering products in societal contexts
3. To understand impact of professional engineering products in environmental contexts
4. To learn e-waste management and e-waste recycling process
5. To understand causes, effects and control measures of environment pollutions
6. To learn impact of environment controlling methods on human health

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Discuss various types of e-waste sources
CO2: Understand impact of various e-wastes
CO3: Identify characteristics of various e-Waste pollutants
CO4: Understand process of e-Waste Recycling and relevant technologies
CO5: Discuss causes, effects and control measures of different environment pollution
CO6: Demonstrate Safe methods for disposal of e-waste and controlling the pollution

Course Contents

Unit I	E-Waste Overview and Sources	2 Hr

e-waste Overview: What is e-waste, E-waste growth- An overview, hazards of e-waste **Sources of e-wastes:** Discarded computers, televisions. VCRs. stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed.

Mapping of Course Outcomes for Unit I	CO1

Unit II	Impact of various e-wastes	2 Hr

Solder in printed circuit boards, glass panels and monitors, Chip resistors and semiconductors, Relays and switches, Printed Circuit Boards, Cabling and computer housing, Plastic housing of electronic equipment and circuit boards., Front panel of CRTs, Motherboards.

Mapping of Course Outcomes for Unit II	CO2

Unit III	E- Waste pollutants and Characteristics	2 Hr

Digital dump yard, how to minimize e-waste, Hazardous substances waste Electrical and Electronic Equipment, characteristics of pollutants, batteries, electrical and electronic components, plastic and flame retardants, circuit boards, pollutants in waste electrical and electronic equipment		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**E-Waste Recycling**	**2 Hr**
Overview of e-Waste recycling, Technologies for recovery of resources from electronic waste, resource recovery potential of e-waste, steps in recycling and recovery of materials-mechanical processing, technologies for recovery of materials		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**Environmental Pollution**	**2 Hr**
Causes and effects and control measures of :Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Role of an individual in prevention of pollution, Pollution case studies: Pollution caused because of electronic waste material and measures for controlling.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**Impact on human health and Pollution Controlling**	**2 Hr**
Impact of products from e-waste in human health, Current disposal methods of e-waste, e-waste recycling technologies and methods recycling pose a risk to environmental and human health. Safe methods for disposal of e-waste and controlling relevant pollution		
Mapping of Course Outcomes for Unit VI	**CO6**	

E-Resources from Learning Support:

1. https://nptel.ac.in/courses/105/105/105105169/
2. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
3. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

Text Books:

1. E-Waste Managing the Digital Dump Yard, Edited by Vishakha Munshi, ICFAI University Press,2007
2. Text Book of Environmental Studies for undergraduate Courses by Bharucha Erach, University Press, II-Edition 2013Available online free edition:

Reference Book:

1. E-waste: Implications, Regulations and Management in India and Current Global Best Practices, Edited by Rakesh Johri, The Energy and Resources Institute, New Delhi,2008

Savitribai Phule Pune University, Pune
Second Year Information Technology (2019Course)
214459: Mandatory Audit Course-4 D:Intellectual Property Rights

Teaching Scheme:	Credit	Examination Scheme:
01 hr/week	Audit Course	Audit Course

Prerequisite Courses, if any:

Course Objectives:

1. To introduce fundamental aspects of Intellectual property Rights (IPR)
2. To disseminate knowledge about types of IP like Patents, Copyrights, Trade Secrets
3. To make students aware about current trends in IPR and their importance
4. To motivate students for innovative thinking and making inventions

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Exhibit the concepts of Intellectual Property Rights

CO2: Differentiate among different IPR

CO3: Formulate and characterize innovative ideas and inventions into IPR

CO4: Demonstrate knowledge of advances in patent law and IP regulations

Course Contents

Unit I	Overview Of Intellectual Property	(02 Hrs)
Introduction and the need for intellectual property right (IPR) - Types of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret.		
Mapping of Course Outcomes for Unit I	**CO1, CO2**	

Unit II	Patents	(04 Hrs)
What is invention? Patentability criteria: Novelty, Non-Obviousness (Inventive Steps), Industrial Application, Non- Patentable Subject Matter, Patent Search, Patent Registration Procedure, Rights and Duties of Patentee, Assignment and license, Infringement.		
Mapping of Course Outcomes for Unit II	**CO3, CO4**	

Unit III	Copyrights	(2Hrs)
Concept of Copyright –Copyright Subject matter: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and license of copyright - Infringement		
Mapping of Course Outcomes for Unit III	**CO3**	

Unit IV	Trademarks	(02 Hrs)
Nature of Trademarks - Different kinds of trademarks (, logos, signatures, symbols, well known marks, brand names, certification and service marks) – Trademarks that can't be registered–Trademarks		

registration procedure - Rights of holder and assignment and licensing of marks - Infringement		
Mapping of Course Outcomes for Unit IV	**CO3**	
Unit V	**Advances in IP Laws and Government policies**	**(02 Hrs)**
Amendments and India`s New National IP Policy, Promoting IPR policy for Start-ups, Career Opportunities in IP - IPR in current scenario		
Mapping of Course Outcomes for Unit V	**CO4**	

Text Books:

1. Niraja Pandey, Khushdeep Dharni (2014), "Intellectual Property Rights", PHI
2. Nithyananda K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.

Reference Books

1. Mishra, "An introduction to Intellectual property Rights", Central Law Publications
2. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis