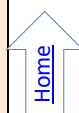


SEMESTER – III

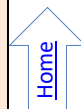


Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218541 : Discrete Mathematics		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 03 hrs/week	03	Mid_Semester : 30 Marks End_Semester : 70 Marks
Prerequisite Courses, if any: Basic Mathematics		
Companion Course, if any:		
Course Objectives: <ol style="list-style-type: none"> 1. To 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, students will be able to– CO1: Formulate and 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)
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.		
Mapping of Course Outcomes for Unit I	CO1	
Unit II	Combinatorics And Discrete Probability	(06 hrs)
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.		

Mapping of Course Outcomes for Unit II	CO2	
Unit III	Graph Theory	(06 hrs)
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.		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Relations And Functions	(06 hrs)
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.		
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	Introduction To Number Theory	(06 hrs)
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.		
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	Algebraic Structures	(06 hrs)
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.		
Mapping of Course Outcomes for Unit VI	CO6	
Text Books:		
1. C. L. Liu and D. P. Mohapatra, “Elements of Discrete Mathematics”, 4 th Edition, McGraw-Hill 2. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, & 7 th edition, McGraw-Hill		

Reference Books:

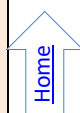
1. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, "Discrete mathematical structures", 6th edition, Prentice Hall of India
2. Edgar G. Goodaire, Michael M. Parmenter, "Discrete Mathematics with Graph Theory", 3rd Edition, Pearson Education
3. Tremblay J. S., "Discrete mathematical structures with application", 3rd Edition, 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, "Elementary Number Theory", & 7th Edition, McGraw-Hill



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218542: Data Structure & Algorithms		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH): 03hrs/week	03	Mid_Semester: 30 Marks End_Semester: 70 Marks
Prerequisite Courses, if any: Fundamental knowledge of programming language and basics of algorithms		
Companion Course, if any: Discrete Structures/Discrete Mathematics		
Course Objectives: <ol style="list-style-type: none"> 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: On completion of the course, students will be able to– <ul style="list-style-type: none"> CO1: Perform basic analysis of algorithms with respect to time and space complexity. CO2: Select appropriate searching and/or sorting techniques in the application development. CO3: Implement abstract data type (ADT) and data structures for given application. CO4: Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc. CO5: Apply implement learned algorithm design techniques and data structures to solve problems. CO6: Design different hashing functions and use files organizations. 		
COURSE CONTENTS		
Unit- I	Introduction	07hrs
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 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, Sequential Organization: Single and multidimensional array and address calculation. Linked Organization: Concept of linked organization, Singly Linked List, Doubly Linked List, Circular Linked List (Operations: Create, Display, Search, Insert, Delete).		
Case Study	Set Operation, String Operation	
Mapping of Course Outcomes for Unit I	CO1, CO3, CO5	
Unit- II	Searching and Sorting	06 hrs
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. Analyze Insertion sort, Quick Sort, binary search, hashing for Best, Worst and Average case.		

Case Study	Study and Analyze Selection sort, bucket sort, radix sort.	
Mapping of Course Outcomes for Unit II	CO1, CO2, CO4, CO5	
Unit- III	Stack & Queue	06 hrs
Stack: Concept of stack, Concept of implicit and explicit stack, stack as an ADT using sequential and linked organization, Applications of stack: recursion, 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 Study	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 III	CO1, CO3, CO4, CO5	
Unit- IV	Trees	06 hrs
Tree : Trees and binary trees-concept and terminology, Expression tree, Binary tree as an ADT, , Binary search tree, Recursive and Non recursive algorithms for binary tree traversals , Binary search tree as ADT (Insert Search Delete, level wise Display) 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 Study	Construction of BST from pre and postorder traversal, Expression Tree construction	
Mapping of Course Outcomes for Unit IV	CO1, CO2, CO3, CO5	
Unit- V	Graph and Symbol Table	07hrs
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 Dijkstra's algorithm, topological sorting. Symbol Table -Notion of Symbol Table, OBST, AVL Trees Heap: Heap data structure, Min and Max Heap, Heap sort, applications of heap		
Case Study	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. In a system, jobs are submitted for execution at different times. If the system is idle, the job is taken for executed immediately. If there is a job in execution, the newly submitted job is added to a queue. The jobs are assigned a number, which indicates tells the priority of the jobs. The system must execute the high priority jobs first for execution. Implement the above said system using heap data structure.	

Mapping of Course Outcomes for Unit V	CO1, CO2, CO3, CO4, CO5	
Unit- VI	Hashing and File Organization	06 hrs
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. File: Concept of File, File types and file organization (sequential, index sequential and Direct Access), Comparison of different file organizations.		
Case Study	What are the advantages of binary tree and binary search in file handling? Study Hashing techniques for expandable Files(Extendible, Dynamic and Linear Hashing)	
Mapping of Course Outcomes for Unit VI	CO1, CO3,CO5,CO6	
Text Books:		
1. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928 2. Y. Langsam, M. Augenstein, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.		
Reference Books:		
1. G. A.V, PAI , “Data Structures and Algorithms “, McGraw Hill, ISBN -13: 978-0-07-066726-6 2. A. Tharp , "File Organization and Processing", 2008 ,Willey India edition, 9788126518685 3. M. Folk, B. Zoellick, G. Riccardi, "File Structure An Object Oriented Approach with C++", Pearson Education, 2002, ISBN 81 - 7808 - 131 - 8. 4. M. Welss, “Data Structures and Algorithm Analysis in C++", 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0		



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218543: Computer Networks		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 03 hrs/week	03	Mid_Semester : 30 Marks End_Semester : 70 Marks
Prerequisite Courses, if any: Basics of Communications		
Companion Course, if any:		
Course Objectives: <ol style="list-style-type: none"> 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 and Application Layer 		
Course Outcomes: On completion of the course, students will be able to– CO1: Understand data/signal transmission over communication media. CO2: Understand basics of computer networking and compare functions of OSI and TCP/IP model using concepts of communication theory. CO3: Analyze data link layer services, different access techniques, and Ethernet standards. CO4: Understand the network layer services, apply skills of subnetting, supernetting and routing mechanisms. CO5: Illustrate services and protocols used at transport layer. CO6: Understand and learn the different application layer protocols.		
COURSE CONTENTS		
Unit I	Basics of data communication	(06 hrs)
Signals: Types of Signals, A/D, D/A, A/A, D/D Signal Conversion Methods, Bandwidth Utilization and Data Rate Limits, Multiplexing Techniques. Modulation: Introduction, Need for Modulation, Electromagnetic Spectrum and typical Applications. Noise: Types of noise, Shannon Hartley Theorem, Channel capacity, Nyquist and Shannon Theorem, Bandwidth S/N trade off.		
Mapping of Course Outcomes for Unit I	CO1	
Unit II	Introduction to basics of Computer Networking	(06 hrs)

Computer network fundamentals Networking Reference Models: ISO OSI Model, TCP/IP Protocol Suite. Addressing : Physical addressing, Logical addressing, Port addressing and other addressing Types of network: LAN, WAN, MAN, PAN. Network architecture: Peer to Peer network architecture, Server client network architecture. Network Topologies: Bus Topology, Star Topology, Ring Topology, Mesh Topology, and Hybrid Topology with advantages and disadvantages. Types of cable connection: Straight through connection, Cross over Connection. Guided Media: Twisted Pair Cable, Coaxial Cable and Fiber-Optic Cable. Unguided Media: Wireless, Radio Waves, Microwaves and Infrared, Wireless frequency spectrum. Network connecting devices: Router, Switch, bridge, hub, repeaters, and its comparisons		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	Data Link Layer	(06 hrs)
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. 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. Random Access Techniques: CSMA, CSMA/CD, CSMA/CA Ethernet: IEEE Standards: 802.3, 802.4, 802.5, 802.6 Comparisons of Standard Ethernet, Fast Ethernet, Gigabit Ethernet.		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Network Layer	(06 hrs)
Network Layer Services IPv4 Addresses: Classful and Classless Addressing, Subnet Mask, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, IPv4 header and Fragmentation, private IPv4 addresses, Public IPv4 addresses, NAT. IPv6 addresses: Header, Types of IPv6 addresses Structure of Router Network layer protocols: ARP, RARP, DHCP, ICMPv4. Routing: Metric, Routing Tables, Static routing, dynamic routing, Default Routing. Unicast Routing Protocols : Distance vector routing, Link State routing, Path vector routing Interior Gateway Routing Protocols: RIP, EIGRP, OSPF Exterior Gateway Routing Protocol: BGP		
Mapping of Course Outcomes for Unit IV	CO4	

Unit V	Transport Layer	(06 hrs)
Transport Layer Services, Transport Layer Protocols. UDP: UDP header, Services, Applications. TCP: Services, Features, Segment, TCP Header, TCP Connection, Window in TCP, TCP Timers, Options, TCP Package. Applications: SCTP: Features, Services, Packet Format Flow control protocols Congestion Control protocols: Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS. Socket: TCP and UDP Socket, Applications.		
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	Application Layer	(06 hrs)
Application layer services : Client Server Paradigm, Peer to Peer Paradigm, Communication using TCP and UDP services. Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME. Network Management: SNMP.		
Mapping of Course Outcomes for Unit VI	CO6	
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.		

Savitribai Phule Pune University Second Year Artificial Intelligence & Machine Learning (2020 Course) 218544: Object Oriented Programming		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH): 03hrs/Week	03	Mid_Semester: 30 Marks End_Semester: 70 Marks
Prerequisites: Principles of Programming Languages		
Course Objectives: <ol style="list-style-type: none"> 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: On completion of the course, students will be able to– CO1: Differentiate various programming paradigms. 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 principles. CO4: Handle different types of exceptions and perform generic programming. CO5: Use of files for persistent data storage for real world application. CO6: Apply appropriate design patterns to provide object-oriented solutions.		
COURSE CONTENTS		
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 Study	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, Dynamic Initialization of an Object, Constructor with Default Arguments, Symbolic Constants, Garbage Collection: Destructors and Finalizes.		
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, and 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 McGraw Hill
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.



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218545 : Software Engineering		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory(TH) : 03 hrs/week	03	Mid_Semester: 30 Marks End_Semester: 70 Marks
Prerequisite Courses, if any: Fundamentals of Programming Languages		
Course Objectives: <ol style="list-style-type: none"> 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, students will be able to -- CO1: Classify various software application domains. CO2: Analyze software requirements by using various modeling techniques. CO3: Translate the requirement models into design models. CO4: Apply planning and estimation to any project. CO5: Use 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 Study	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 Study : Library Management system		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	Design Engineering	06 hrs
Design Engineering : 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	6 hrs
Project Planning: Project initiation, Planning Scope Management, Creating the Work Breakdown Structure, scheduling: Importance of Project Schedules, Developing the Schedule using Gantt Charts, PERT/ CPM 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		
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 Study : Software testing tool like selenium		
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	Formal Methods Recent Trends In Software Engineering	06 hrs
Recent Trends in SE : 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 Study : CASE software/ HP Quality Center (QC) / Jira	
Mapping of Course Outcomes for Unit VI	CO6
Text Books:	
<ol style="list-style-type: none"> 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:	
<ol style="list-style-type: none"> 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 	



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218546 : Data Structure & Algorithms Laboratory		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02	PR : 25 Marks TW: 25 Marks
Prerequisite Courses, if any: Fundamental knowledge of programming language and basics of algorithms		
Course Objectives: <ol style="list-style-type: none"> 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: On completion of the course, students will be able to– CO1: Analyze algorithms and to determine algorithm correctness and time efficiency class. CO2: Implement abstract data type (ADT) and data structures for given application. CO3: Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.). CO4: Solve problems using algorithmic design techniques and data structures. CO5: Analyze of algorithms with respect to time and space complexity.		
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. Experiments to be conducted in C++.		
Guidelines for Student's Lab Journal		
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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. 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. 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
<p>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.</p> <p>All the assignments should be conducted on multicore hardware and 64-bit open-source software.</p>
Guidelines for Practical Examination
<p>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.</p>
List of Assignments
Virtual Laboratory
<ul style="list-style-type: none"> https://ds1-iiith.vlabs.ac.in/data-structures-1/ https://ds2-iiith.vlabs.ac.in/data-structures-2/ http://cse01-iiith.vlabs.ac.in/
1. Searching and Sorting -- CO1, CO2, CO3, CO5
<p>Consider a student database of SEIT class (at least 15 records). Database contains different fields of every student like Roll No, Name and SGPA.(array of structure)</p> <ol style="list-style-type: none"> Design a roll call list, arrange list of students according to roll numbers in ascending order (Use Bubble Sort) Arrange list of students alphabetically. (Use Insertion sort) Arrange list of students to find out first ten toppers from a class. (Use Quick sort) Search students according to SGPA. If more than one student having same SGPA, then print list of all students having same SGPA. Search a particular student according to name using binary search without recursion. (all the

<p>student records having the presence of search key should be displayed) (Note: Implement either Bubble sort or Insertion Sort.)</p>
<p>2. Stack -- CO1, CO2, CO3, CO5</p>
<p>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.</p>
<p>3. Circular Queue -- CO1, CO2, CO3, CO5</p>
<p>Implement Circular Queue using Array. Perform following operations on it.</p> <ol style="list-style-type: none"> Insertion (Enqueue) Deletion (Dequeue) Display <p>(Note: Handle queue full condition by considering a fixed size of a queue.)</p>
<p>4. Expression Tree -- CO1, CO2, CO3, CO5</p>
<p>Construct an Expression Tree from postfix and prefix expression. Perform recursive and non- recursive In-order, pre-order and post-order traversals.</p>
<p>5. Binary Search Tree -- CO1, CO2, CO3, CO5</p>
<p>Implement binary search tree and perform following operations:</p> <ol style="list-style-type: none"> Insert (Handle insertion of duplicate entry) Delete Search Display tree (Traversal) Display - Depth of tree Display - Mirror image Create a copy Display all parent nodes with their child nodes Display leaf nodes Display tree level wise <p>(Note: Insertion, Deletion, Search and Traversal are compulsory, from rest of operations, perform Any three)</p>
<p>6. Threaded Binary Tree -- CO1, CO2, CO3, CO5</p>
<p>Implement In-order Threaded Binary Tree and traverse it in In-order and Pre-order.</p>
<p>7. Graph: Minimum Spanning Tree -- CO1, CO2, CO3, CO5</p>
<p>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</p> <ol style="list-style-type: none"> Using Kruskal's algorithm. Using Prim's algorithm.
<p>8. Graph: Shortest Path Algorithm -- CO1, CO2, CO3, CO5</p>

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

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

10. FILE Handling -- CO1, CO3, CO5

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



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218547 : Object Oriented Programming Laboratory		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02	PR: 25 Marks TW: 25 Marks
Prerequisites: Student should have knowledge of programming language.		
Course Objectives: <ol style="list-style-type: none"> 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: On completion of the course, students will be able to– CO1: Differentiate various programming paradigms. 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		
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<p>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.</p>
Guidelines for Laboratory Conduction
<p>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, instructors may take different case studies with similar complexity level. Operating System recommended :- 64-bit Open source Linux or its derivative Programming tools recommended: - JAVA IDE</p>
List of Assignments
1.Classes and object -- CO1 and CO2
<p>Design a class 'Complex 'with data members for real and imaginary part. Provide default and Parameterized constructors. Write a program to perform arithmetic operations of two complex numbers.</p>
2. Polymorphism -- CO3
<p>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 orderCopies(). Magazine Class has methods orderQty, Current issue, receiveissue().Write a program to find how many copies of the given books are ordered and display total sale of publication.</p>

3.Inheritance -- CO3
Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable. Employee class has Emp_name, Emp_id, Address, Mail_id, and Mobile_no as members. Inherit the classes: Programmer, Team Lead, Assistant Project Manager and Project Manager 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 shape. 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 are 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 database of student records using Files. Student has Student_id, name, Roll_no, Class, marks and address. Display the data for few students. <ol style="list-style-type: none"> 1. Create Database 2. Display Database 3. Delete Records 4. Update Record

5. Search Record
9. Case Study -- CO2, CO5
<p>Using concepts of Object-Oriented programming develop solution for any one application</p> <p>1) Banking system having following operations :</p> <p>1. Create an account 2. Deposit money 3. Withdraw money 4. Honor daily withdrawal limit 5. Check the balance 6. Display Account information.</p> <p>2) Inventory management system having following operations :</p> <p>1. List of all products 2. Display individual product information 3. Purchase 4. Shipping 5. Balance stock 6. Loss and Profit calculation.</p>
10. Factory Design Pattern -- CO6
<p>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 Test Factory Pattern should be implemented.</p>
11. Strategy Design Pattern -- CO6
<p>Implement and apply Strategy Design pattern for simple Shopping Cart where three payment strategies are used such as Credit Card, PayPal, Bit Coin. Create an interface for strategy pattern and give concrete implementation for payment.</p>
Text Books:
<p>1. E. Balagurusamy, "Programming with Java – A Primer", Tata – McGraw-Hill Publication, 4th Edition, 2019</p> <p>2. Kathy Sierra, "OCA /OCP Java SE 7 Programmer I & II Study Guide"(Exams 1Z0-803 & 1Z-804) Oracle Press (2017)</p> <p>3. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2009</p>
Reference Books:
<p>1. H.M. Deitel, P.J. Deitel, "Java - How to Program", PHI Publication, 6th Edition, 2005</p> <p>2. Bruce Eckel, "Thinking in Java", PHI Publication</p> <p>3. Poo, Danny, Kiong, Derek, Ashok, Swarnalatha, "Object-Oriented Programming and Java", ISBN 978-1-84628-963-7</p> <p>4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns, Elements of Reusable Object-Oriented Software" ISBN-13: 978-0201633610</p> <p>5. Rohit Joshi, "Java Design patterns, Reusable solutions to common problems" Java Code Geeks</p>



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218548 : Computer Networks Laboratory		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 02 hrs/week	01	PR : 25 Marks TW: 25 Marks
Prerequisite Courses, if any:		
Course Objectives: <ol style="list-style-type: none"> 1. To design and implement small size network and to understand various networking commands. 2. To provide the knowledge of various networking tools and their related concepts. 3. To understand various application layer protocols for its implementation in client/server environment. 4. To understand network layer protocols and its implementations. 5. To explore and understand various simulations tools for network applications. 		
Course Outcomes: On completion of the course, students will be able to– CO1: Implement small size network and its use of various networking commands. CO2: Understand and apply of networking and simulation tool i.e packet tracer. CO3: Configure the various routing and switching protocols using packet tracer. CO4: Configure various client/server environments to use application layer protocols. CO5: Explore use of protocols in various wired applications.		
Guidelines for Instructor's Manual		
<p>The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.</p> <p>The instructor's manual should include prologue, university syllabus, conduction & assessment guidelines, topics under consideration-concept, objectives, outcomes, networking diagrams in packet tracer, and rules to implement the protocols.</p>		
Guidelines for Student's Lab Journal		
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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. 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.
Guidelines for Laboratory Conduction
<p>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.</p> <p>All the assignments should be conducted on 64-bit open-source software like packet tracer, g++/turbo C++/Eclipse, Seventh assignment is for study only. Configure the application protocols on latest server operating system separately.</p>
Guidelines for Practical Examination
<p>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.</p>
List of Assignments
1. Network Commands on Linux/Windows - CO1
<p>Explore and Study of TCP/IP utilities and Network Commands on Linux/Windows.</p> <ol style="list-style-type: none"> Ping ipconfig / ifconfig Hostname Whois Netstat Route Tracert/Traceroute/Tracepath NSlookup Arp Finger Port Scan / nmap
2. Configuration of router using router commands and subnetting of network -CO2,CO3,CO5
<p>Using a Network Simulator (e.g. packet tracer) Configure</p> <ol style="list-style-type: none"> A router using router commands, Sub-netting of a given network

3.Configuration of Static routing and Default routing - CO2,CO3,CO5
Using a Network Simulator (e.g. packet tracer) Configure i) Static Routing ii) Default Routing
4. Configuration of EIGRP,RIPv2,OSPF - CO2,CO3,CO5
Using a Network Simulator (e.g. packet tracer) Configure i) EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation, ii) RIPv2 iii) OSPF – Explore Neighbor-ship Condition and Requirement, Neighbor-ship states, OSPF Metric Cost Calculation.
5. Configuration of NAT,ACL,VLAN,STP - CO2,CO3,CO5
Using a Network Simulator (e.g. packet tracer) Configure i) Network Address Translation: Static, Dynamic & PAT (Port Address Translation) ii) Access Control lists – Standard & Extended. iii) VLAN, Dynamic trunk protocol and spanning tree protocol.
6. Socket Programming - CO4,CO5
Socket Programming using C/C++/Java. i) TCP Client, TCP Server ii) UDP Client, UDP Server
7. Server Administration - CO4,CO5
Introduction to server administration (server administration commands and their applications) and configuration of any three of below Server: (Study/Demonstration Only) FTP, Web Server, DHCP, Telnet, Mail, DNS
Reference Books
<ol style="list-style-type: none"> 1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3. 2. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill Education, ISBN: 978-1-25-906475-3, 5th Edition. 3. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878-1. 4. Mayank Dave, Computer Network, Cengage Learning, ISBN :978-81-315-0986-9.



Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218549: Humanities and Social Sciences		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Tutorial : 01 hrs/week	01	Term work : 25 marks
Course Objectives: <p>To enable the students to explore aspects of human society and to acquire the intellectual, communication skills and develop characteristics that encourages personal fulfillment, meaningful professional life and responsible citizenship.</p> <ol style="list-style-type: none"> 1. To facilitate Holistic growth; 2. To Educate about Contemporary, National and International affairs; 3. To bring awareness about the responsibility towards society. 4. To give an insight about the emergence of Indian society and the relevance of Economics. 		
Course Outcomes: <p>On completion of the course, students will be able to–</p> <p>CO1: Aware of the various issues concerning humans and society.</p> <p>CO2: Aware about their responsibilities towards society.</p> <p>CO3: Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.</p> <p>CO4: Able to understand the nature of the individual and the relationship between self and the community.</p> <p>CO5: Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.</p>		
COURSE CONTENTS		
<p>Preamble: As applied sciences, Engineering and Technology are meant to come up with effective solutions to social problems making it imperative that the present generation of engineers and technologists understand the society they live in. Studying the social sciences can provide individuals with crucial answers and observations that could certainly help in understanding of one's life which can alleviate social relations. A broad perspective of nationalistic thinking will provide the students with the ability to be socially conscientious, more resilient and open to building an inclusive society.</p> <p>Experiencing real-life situations and complex scenarios that arise in each situation will help the budding professions to contribute their skills and knowledge to helping people improve and understand their behaviour or psychological processes. Understanding how the world works begins with an understanding of oneself and gaining hands-on experience and/or thinking about human values and ethics will help trigger a sense of responsibility among the students and lead them to finding effective solutions.</p> <p>Course Structure: The tutorial sessions to be divided into 2 groups</p>		

1. Interactive Sessions to be conducted in classroom
2. Interactive Activities to be conducted Outside Classroom

MOOC/ Video Lectures available at\$:

<https://nptel.ac.in/courses/109/103/109103023/>

<https://nptel.ac.in/courses/109/107/109107131/>

- a) Teachers will play the role of interventionists and instigating students to apply their thinkingabilities on social concepts
- b) As facilitators and mentors teachers will coax the students to thinking out-of-the-box to comeup with creative solutions
- c) Teachers should focus on instilling a sense of social consciousness through the activities conducted indoors and outdoors.

Change of Mindset

- a) Since the course deviates from technical subjects, students will have to be counseled into the importance of social sciences.
- b) A background understanding of the importance of this course in their professional and personal life will have to be enumerated to the students.
- c) Teachers will have to rationalize the course outcomes to get the students invested in the activities being conducted.

Designing of Course

- a) Since students lack prior knowledge, it is imperative that the tutorials conducted be engaging in its activities.
- b) Focus of the sessions should be the learning outcome of each activity conducted either in the class or outside the class.
- c) All activities designed should be as close to real-life making them relatable and applicable.
- d) Student-engagement should be a priority so that the knowledge internalized will be higher.
- e) The activities chosen can be modified to cater to the college location and social context.
- f) The learning should be focused on application of ethics and values during each activity.
- g) The chosen sessions should cater to giving the students the opportunity to be involved and engaged in their role as contributors to society and the nation at large.

Basic function of the tutor

- a) To present a holistic view of the curriculum and the role of this course in it and emphasizing the benefit of the sessions towards developing communications skills, critical thinking and problems solving.

Grouping

- a) The class will be divided into groups of 20 students.
- b) The blend of cultural and social diversity will enhance the learning at the end of each activity.
- c) Teachers will have to be mentored to handle sensitive issues diplomatically while encouraging students to stand up for their beliefs.
- d) The groups will have to have inter-personal sessions so that they get to understand their team members better and work cohesively.
- e) Management support and encouragement to engage students in life-enriching experiences is important.

Assessment of Learning

- a) It is important for tutors to make sure that assessment is consistent with learning objectives of each activity.
- b) Assessment of students should be focused on the students' ability to internalize the learning.
- c) Tutors need to understand meaningful ways of assessing students' work to motivate learning.

Tutorial Conduction and Term Work guidelines

Interactive Sessions to be conducted during Tutorial (in classroom)

1. PREPARED SPEECH ON CURRENT AFFAIRS

- a) Purpose – Get students to stay abreast and invested in national current affairs.
- b) Method – Each student has to read an editorial from any national paper (English), find out more information on the topic and present it to the class; ending the session with his/her opinion on the matter.
- c) Outcome – Awareness of national state of affairs. Improve on oratory skills. Instil the thinking and contemplative skills and form non-judgmental opinions about an issue.

2. UNDERSTANDING INDIA'S CULTURAL DIVERSITY

- a) Purpose – Expose students to the intricacies of Indian cultural across various states
- b) Method – Each student (or a small group of students in case the number of students is large) has to pick a state and come to the tutorial session prepared with a PPT that will showcase the demographic, sociographic and cultural information of that state
- c) Outcome – Information about the beauty of Indian cultural diversity. Enhance exploratory skill, communication skills and learn to present using technological tools.

3. WRITING AN ARTICLE ON ANY SOCIAL ISSUE

- a) Purpose – Highlight various social and cultural evil malevolence existing in our country and express one's opinion on how it can be changed.
- b) Method – Each student will have to write a 200 word essay on any of existing social malice that is prevalent in society. On evaluation, the top 5 essays can be displayed on the college wall magazine and rewarded if deemed appropriate.
- c) Outcome – Learn to raise one's voice against the wrong doings in communities. Build writing skills, improve language and gain knowledge about how to write an impactful essay.

4. GROUP DISCUSSION ON COMMUNAL TOPIC

- a) Purpose – Make students aware of the issues that are pertinent in a society and express a learned opinion about it.
- b) Method – Students in groups of 20 each will discuss a relevant and grave issue that is dogging the nation. Alternatively, topics from current affairs (National budget, democratic process, economical strengthening of the country).
- c) Outcome – Develop group communication skills. Learn to speak up one's opinion in a forum.

Cultivate the habit of presenting solution-driven arguments making them contributors in any team.

5. QUIZ ON SOCIAL BEHAVIOR

- a) Purpose – Augment proper social etiquette among students and make them responsible citizens
- b) Method – Conduct a quiz on traffic rules using audio-visual aids or using dumb charades where one student has to enact the traffic rule and the others have to guess that rule
- c) Outcome – Grasp of various traffic rules and driving etiquette. Build verbal and non- verbal communication skills

6. SCREEN A MOVIE (FOCUS ON POSITIVITY AND POWER OF THE MIND)

- a) Purpose – Expose students to introspective skills and try to develop a positive thinking in life.
- b) Method – Screen a movie / a documentary / a video that focuses on the power of the mind and how to create affirmations in one's life. At the end of the movie, students can be asked to express their opinions and write down what changes / improvements they plan to take in their choices thereafter. This can be followed by a guest lecture by expert/s or workshop.
- c) Outcome – Comprehend the areas of improvement within themselves. Understand the importance of staying positive and develop affirmations.

7. QUIZ ON SOCIAL BEHAVIOR

- a) Purpose – Augment proper social etiquette among students and make them responsible citizens.
- b) Method – Conduct a quiz on traffic rules using audio-visual aids or using dumb charades where one student has to enact the traffic rule and the others have to guess that rule.
- c) Outcome – Grasp of various traffic rules and driving etiquette. Build verbal and non- verbal communication skills.

8. DEBATE ON A TOPIC FROM SOCIAL SCIENCES

- a) Purpose – Educate students about various domains in social sciences and develop an interest towards gaining knowledge about these topics
- b) Method – Various topics from various domains of social sciences can be chosen and students in pairs can pick a topic and present their arguments for or against the topic.
- c) Time for each debate will be 10 minutes maximum
- d) Outcome – Recognize the significance of social sciences in our lives. Cultivate the habit to present forceful arguments while respecting the opponents perspective and enhance verbal skills.

Interactive Activities to be conducted during Tutorial (Outside Classroom)

1. WASTE MANAGEMENT and CLEAN CAMPUS

- a) Purpose: Create awareness among students about the significance of a clean environment and social responsibility to deter littering and segregate waste.
- b) Method: Students (in groups) will be given charge of areas of campus and will be expected to clean that segment. Also, they will be entrusted with the responsibility to collect, separate waste and hand over to the housekeeping authority.
- c) Outcome: Develop the habit to maintain cleanliness at home as well as learn to respect community areas at college or workplace. It will also encourage them become ambassadors among their peers to advocate protection of the environment.

2. MAKING A VIDEO ON SOCIAL WASTAGES.

- a) Purpose: Instil among students a sense of responsibility towards judiciously using natural resources like water and electricity
- b) Method: Using their phones / hand-held devices, groups of students will make a 3 – 4 minute short film that will highlight irresponsible behavior in terms of wastage of water, leaving lights, fans and other electrical appliances on when not in use, defacing public and campus property by scribbling on walls and common areas. They will make awareness for the same among students. The creative videos will be posted on the college website and social media as an encouragement
- c) Outcome: Conscientious behavior towards saving public utility resources. Explore the use of audio-visual tools to create more meaningful messages that can effect a change in society

3. RELAY MARATHON (3 – 5 kms)

- a) Purpose: Propagate a social message by way of a sport activity
- b) Method: A group of students will begin the race with banner / placard in hand that contains a social message. The group runs for 500 meters and hands over the banner / placard to the next group of students. This chain of exchange will continue for 3 – 5 kms.
- c) Outcome: Become aware of the need for fitness and encouragement towards healthier lifestyle. Students will also be able to express their creativity in terms of meaningful messages and gain attention towards worthy social causes from the community in and around the campus.

4. TREE PLANTATION ON CAMPUS

- a) Purpose: Involve students to actively participate in environment protection and develop greener surroundings.
- b) Method: Each student will plant a sapling and take care of that plant until it is able to sustain itself. Alternatively, students can organize a tree plantation drive in a public area and nurture it.
- c) Outcome: Besides increase in plants in the locality, students will feel a sense of empowerment and become social contributors towards protecting the environment.

5. VISIT TO AN OLD AGE HOME / ORPHANAGE

- a) Purpose: Build a sense of responsibility towards the less fortunate in our society and feel privileged to be able to effect real change in the world around us.
- b) Method: Students have to visit an old age home or orphanage in the vicinity of the college. They can interact with the inmates, probably donate utilities to the charity organization and/or probably stage a few inclusive activities with the residents of the place. After the visit, students can submit a brief report about their experience.
- c) Outcome: Learn first-hand about the conditions and social situations that the no-so-privileged members of our society have to endure to survive and go beyond their embarrassment to interact with the destitute which will help students appreciate the importance of Indian family values.

6. STREET PLAY ACTIVITY

- a) Purpose: Create awareness in themselves as well as people in the community on various social evils that need to be eradicated
- b) Method: Students will prepare and enact a street play on any pertinent issues in society. The topics suggested can be perils of mobile phones / online fraud / safety for girls / mental and physical health of the youth.
- c) Outcome: Allow students to deliberate and think deeply about the looming issues that is dogging our society and the future of the youth. This will also bring out the creative skills among the students and allow them to showcase their talent.

7. BUDDY / BIG BROTHER SYSTEM

- a) Purpose: Include and involve the less fortunate children making them feel wanted and cared for as well as use the opportunity to share knowledge among school students.
- b) Method: Students have to go to nearby schools after procuring appropriate permissions to teach a particular topic on either technical or non-technical domains. Each student can choose to adopt 5 students from the class to be their mentor over a period of 1 year by staying in touch with them and helping them resolve their issues on academic or other matters.
- c) Outcome: Appreciation and respect towards the responsibility of teaching. They will learn to be accountable as social contributors and bring about some change in the lives of the young students they mentor as Buddies or Big Brother.

Term Work Assessment Guidelines

Students must submit the report of all conducted activities. Conducted during Tutorial (Outside Classroom) of at least 04 activities (out of 07 activities) from group (of 02-03) students.

The brief guidelines for report preparations are as follows:

1. One activity report must be of maximum 3 pages;
2. Combined Report of all activities with cover pages, table of contents and certificate (signed by instructor) is to be submitted in soft copy (pdf) format only.
3. The report must contain:
 - General information about the activity;
 - Define the purpose of the activity;
 - Detail out the activities carried out during the visit in chronological order;
 - Summarize the operations / process (methods) during the activities;
 - Describe what you learned (outcomes) during the activities as a student;
 - Add photos of the activity;(optional)
 - Add a title page to the beginning of your report;
 - Write in clear and objective language; and
 - Get well presented, timely and complete report submitted.

Recommended Assessment and Weightage Parameters:

(Attendance 30%, Assignments/Activities- Active participation and proactive learning 50% and report 20%)

Books:

1. A. Alavudeen, M. Jayakumaran, and R Kalil Rahman, "Professional Ethics and Human Values"
2. Ram Ahuja, "Social Problems in India" (third edition)
3. Shastry, T. S. N., "India and Human rights: Reflections", Concept Publishing Company India Pvt.Ltd., 2005.
4. Nirmal, C.J., "Human Rights in India: Historical, Social and Political Perspectives (Law in India)", Oxford India
5. Rangarajan, "Environmental Issues in India", Pearson Education.
6. University of Delhi, The Individual and Society, Pearson Education.
7. Wikipedia.org / wiki /social studies.
8. M. N. Srinivas, "Social change in modern India", 1991, Orient Longman.
9. David Mandelbaum, Society in India, 1990, Popular.

Dr. Abha Singh, "Behavioral Science: Achieving Behavioral Excellence for Success", Wiley.

e-books:

- <https://www.moteoo.org/en/products/social-science-and-humanities-student-book-english>
- <https://www.springeropen.com/books>
(SpringerOpen open access books; download them free of charge from SpringerLink)
- <https://muse.jhu.edu/article/541846/pdf>

(This content has been declared *free* to read by the publisher during the COVID-19)



Savitribai Phule Pune University Second Year Artificial Intelligence & Machine Learning (2020 Course) 218550 : Soft Skill Laboratory		
Teaching Scheme:	Credit Scheme :	Examination Scheme:
Practical (PR) : 02 hrs/Week	01	TW : 25 Marks
Prerequisites , If any: -----		
Course Objectives: <ol style="list-style-type: none"> 1. To facilitate a holistic development of students while focusing on enhancing soft skills. 2. To highlight the need to improve soft skills among engineering students so as to become good professionals. 3. To develop and nurture the soft skills of the students through individual and group activities. 4. To expose students to right attitudinal and behavioural aspects and assist in building the same through activities. 		
Course Outcomes: On completion of the course, students will be able to– 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: Practice professional etiquette, present oneself confidently and successfully handle personal interviews . CO6: Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.		
COURSE CONTENTS		
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 hrs
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, five 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 hrs
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 hrs
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 Pushpa Lata, “Communication Skills”, Oxford University Press, ISBN 10:9780199457069		

4. Atkinson and Hilgard, "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 e.g. – 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 one 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.

Virtual Laboratory

- <https://ve-iitg.vlabs.ac.in/>

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 counselling) about the choices written.

3. Public Speaking -- (Choose any 2) -- CO3, CO2

- a. Prepared Speech
Topics will be shared with students and they will be given 10 minutes to prepare and 3 minutes to deliver followed by Q&A from audience. Teacher will 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 will be 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 will 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 will be divided into groups of 8 – 10 students in for a discussion lasting 10 minutes.
- b. Topics should be topical and non-controversial. After each group finishes its discussion, the teacher will 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 will 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/displayed to students
Teacher will 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

<p>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,</p> <ol style="list-style-type: none"> Requesting opportunity to present his/her product. Complaining about a faulty product / service. Apologizing on behalf of one's team for the error that occurred. Providing explanation for a false accusation by a client. <p>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,</p> <ol style="list-style-type: none"> Industrial visit. Project participated in. Business / Research Proposal. <p>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</p> <ol style="list-style-type: none"> Share various professional formats. Focus on highlighting individual strengths. Develop personalized professional goals / statement at the beginning of the resume.
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7. Team Building Activities -- CO3, CO4

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

The activities chosen for each team should be competitive and should involve every student in the team. The activities may be conducted indoors or outdoors depending on infrastructure. While selecting the team, ensure that each team has a mix of students who have varied skills. The teacher should 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, counselling, training, medical or corporate HR may 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,

- Each group (3-4 students) can be given random unrelated items and they will be given sufficient time to come up with creative ideas on how the objects can be used for activities / purposes other than its intended one.
- 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.
- 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 interview session and the teacher should seek the assistance of another faculty member / TPO Officer/ Alumni 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. Interviewer can choose to give problems to solve using 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 instructed 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.



<p align="center">Savitribai Phule Pune University, Pune</p> <p align="center">Second Year Artificial Intelligence & Machine Learning (2020 Course)</p> <p align="center">218551 (A): Mandatory Audit Course 3:</p> <p align="center">Ethics and Values in Information Technology</p>		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
01hrs/week	Non Credit	Audit Course
Prerequisite Courses, if any:--		
<p>Course Objectives:</p> <ol style="list-style-type: none"> 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. 		
<p>Course Outcomes:</p> <p>On completion of this course students will be able to-</p> <p>CO1: Adapt the global ethical principles and modern ethical issues.</p> <p>CO2: Apprehend ethics in the business relationships and practices of IT.</p> <p>CO3: Implement trustworthy computing to manage risk and security vulnerabilities.</p> <p>CO4: Analyse concerns of privacy, privacy rights in information-gathering practices in IT.</p>		
COURSE CONTENTS		
Unit -I	An Overview of Ethics	03hrs
<p>An overview of Ethics: Brief about ethics, Ethics in the Business World, Ethics in IT.</p> <p>Ethics for IT professionals and IT users: IT professionals: Changing Professional Services, Professional Relationships, Codes of Ethics, awareness of IT malpractices, IT Users: Common Ethical Issues for IT Users, Supporting the Ethical Practices of IT Users.</p>		
Mapping of Course Outcomes for Unit I	CO1 , CO2	
Unit- II	Computer And Internet Crime	03hrs
<p>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</p> <p>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</p> <p>Freedom of Expression: Defamation and Hate Speech, Key issues, Controlling Access to Information on the Internet, Anonymity on the Internet, Corporate Blogging, Pornography</p>		
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 Virtual Worlds: 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 Study	03hrs
Malware, Medical Implants, Abusive Workplace Behaviour, Automated Active Response Weaponry, Malicious Inputs to Content Filters.		
Mapping of Course Outcomes for Unit IV	CO1, CO2, CO3, CO4	
Text Books:		
1. George Reynolds, "Ethics in Information Technology", Cengage learning, 5th Edition 2. R. Subramanian, "Professional Ethics", OXFORD University Press, Second Edition		
Reference Books:		
1. William Lillie, "An Introduction to Ethics", Allied Publishers 2. Charles b. Fleddermann, "Engineering Ethics", Prentice Hall 3. M.Govindarajan, S.Natarajan & V.S.Senthilkumar, "Engineering Ethics & Human Values", PHI Learning 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		
Evaluation :		
Students should select any one of the 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.		



<p align="center">Savitribai Phule Pune University, Pune Second Year Artificial Intelligence & Machine Learning (2020 Course) 218551 (B) : Mandatory Audit Course3: Quantitative Aptitude & Logical Reasoning</p>		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
01hrs/week	Non Credit	Audit Course
Prerequisite Courses, if any:--		
<p>Course Objectives:</p> <ol style="list-style-type: none"> 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. 		
<p>Course Outcomes:</p> <p>On completion of the course, learner will be able to ---</p> <p>CO1: Apply basic concepts of quantitative abilities</p> <p>CO2: Use logical reasoning for solving real world problems</p> <p>CO3: Compete in examinations like internships, industry placements, postgraduate admissions, civil services etc.</p>		
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	CO1, CO2, CO3	
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, CO2, CO3	
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	
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	
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	CO1, CO2, CO3	
Text Books:		
1. Quantitative abilities by Arun Sharma, Motilal Uk Books of India, 2012 2. Quantitative Aptitude for Competitive Examinations by R S Agrawal 3. Verbal and Non-Verbal reasoning by R S Agrawal		
Evaluation :		
Students should select any one of the 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 Artificial Intelligence & Machine Learning (2020 Course) 218551 (C) : Mandatory Audit Course 3: Language Study Japanese -Module I		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
01hrs/week	Non Credit	Audit Course
Prerequisite Courses, if any: Audit Course 4: Language Study Japanese: Module-II		
Course Objectives: <ol style="list-style-type: none"> 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, <i>Hiragana</i> and <i>Katakana</i>, and approx.100 <i>Kanji</i>. 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 Course Outcomes for Unit I	CO1	
Unit II	Japanese Kana and Kanji	(02 hrs + 04 hrs Self Study)
Introduction of the Japanese writing system, i.e. <i>Hiragana</i> , <i>Katakana</i> and <i>Kanji</i> (100-120), word-building, writing foreign names and loan words in Katakana		
Mapping of Course Outcomes 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 Course Outcomes 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 Course Outcomes 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 Course Outcomes 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 Course Outcomes for Unit VI	CO4	
E-Resources for Learning Support:		
a. https://www.duolingo.com/course/ja/en/Learn-Japanese https://www.duolingo.com/course/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. Eri Banno, 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)		
Evaluation :		
Students should select any one of the 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 Artificial Intelligence & Machine Learning (2020 Course) 218551 (D) : Mandatory Audit Course 3: Cyber Security and Law		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
01hrs/week	Non Credit	Audit Course
Prerequisite Courses, if any: Basics of Computer		
Course Objectives: <ol style="list-style-type: none"> 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: Analyse and evaluate the cyber security needs of an organization. CO3: Understand the importance of cyber laws and its practices. CO4: Determine and analyse 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 Books:	
<ol style="list-style-type: none"> 1. William Stallings, "Computer Security: Principles and Practices", Pearson 6th Ed, ISBN: 978-0-13-335469-0 2. Nina Godbole, Sunit Belapure, "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 	
Evaluation :	
Students should select any one of the 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.	