Faculty of Science & Technology

Savitribai Phule Pune University,Pune,

Maharashtra, India

Curriculum For

Third Year of Information Technology

(2019 Course)

(With effect from AY 2021-22)

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Savitribai Phule Pune University, Pune Bachelor of Information Technology	
Program Educational Objectives	
PEO1	**Possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.**
PEO2	**Possess knowledge and skills in the field of Computer Science and Information Technology for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.**
PEO3	**Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science and Information Technology.**
PEO4	**Have commitment ethical practices, societal contributions through communities and life-long learning.**
PEO5	**Possess better communication, presentation, time management and team work skills leading to responsible & competent professional sand will be able to address challenges in the field of IT at global level.**

Program Outcomes		
Students are expected to know and be able to–		
PO1	Engineering knowledge	An ability to apply knowledge of mathematics, computing, science, engineering and technology.
PO2	Problem analysis	An ability to define a problem and provide a systematic solutionwith the help of conducting experiments, analyzing the problem and interpreting the data.
PO3	Design / Development ofSolutions	An ability to design, implement, and evaluate software or asoftware /hardware system ,component ,or process to meet desired need switch in realistic constraints.
PO4	Conduct Investigation of Complex Problems	An ability to identify, formulate, and provide essay schematicsolutions to complex engineering /Technology problems.
PO5	Modern Tool Usage	An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional.
PO6	The Engineer and Society	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems with necessary constraints andassumptions.
PO7	Environment and Sustainability	An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society.
PO8	Ethics	An ability to understand professional, ethical, legal, security andsocial issues and responsibilities.
PO9	Individual and Team Work	An ability to function effectively as an individual or a sate ammember to accomplish a desired goal(s).
PO10	Communication Skills	An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies /tools with the help of electives, profession along animations and extra-curricular activities.
PO11	Project Management and Finance	An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.
PO12	Life-long Learning	An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

Program Specific Outcomes(PSO)	
A graduate of the Information Technology Program will demonstrate-	
PSO1	**An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applications in the interdisciplinary domain.**
PSO2	**An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems.**
PSO3	**An understanding of professional, business and business processes, ethical,legal, security and social issues and responsibilities.**
PSO4	**Practice communication and decision-making skills through the use of appropriate technology and be ready for professional responsibilities.**

SEMESTER – V

Savitribai Phule Pune University
Third Year of Information Technology (2019 course)
(With effect from Academic Year 2021-22)

Semester-V

Course Code	Course Name	Teaching Scheme (Hours/ week)			Examination Scheme and Marks						Credit Scheme			
		Theory	Practical	Tutorial	Mid-Sem	End-Sem	Term work	Practical	Oral	Total	Lecture	Practical	Tutorial	Total
314441	Theory of Computation	03	-	-	30	70	-	-	-	100	3	-	-	3
314442	Operating Systems	03	-	-	30	70	-	-	-	100	3	-	-	3
314443	Machine Learning	03	-	-	30	70	-	-	-	100	3	-	-	3
314444	Human Computer Interaction	03	-	-	30	70	-	-	-	100	3	-	-	3
314445	Elective-I	03	-	-	30	70	-	-	-	100	3	-	-	3
314446	Operating Systems Lab	-	04	-	-	-	25	25	-	50	-	2	-	2
314447	Human Computer Interaction- Lab	-	02	-	-	-		-	50	50	-	1		1
314448	Laboratory Practice-I	-	04	-	-	-	25	25		50	-	2	-	2
314449	Seminar	-	01	-	-	-	50	-	-	50	-	1	-	1
314450	Audit Course 5	-	-	-	-	-	-	-	-	-	-	-	-	-
										Total Credit	15	06	-	21
	Total	15	11	-	150	350	100	50	50	700	15	06	-	21

Abbreviations: TH: Theory, TW: Term Work, PR: Practical , OR: Oral ,TUT: Tutorial

Elective-I:
- 314445A- Design and Analysis of Algorithm
- 314445B- Advanced Database and Management System
- 314445C- Design Thinking
- 314445D- Internet of Things

Audit Course 5:
- 314450A-Banking and Insurance
- 314450B-Startup Ecosystems
- 314450C- Foreign Language–(Japanese Language- III)

Laboratory Practice-I:
Assignment from Machine Learning and Elective I

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

Savitribai Phule Pune University
Third Year of Information Technology (2019 Course)
(With effect from Academic Year 2021-22)

Semester-VI

Course Code	Course Name	Teaching Scheme (Hours/ week)			Examination Scheme and Marks						Credit Scheme			
		Lecture	Practical	Tutorial	Mid-Sem	End-Sem	Term Work	Practical	Oral	Total	Lecture	Practical	Tutorial	Total
314451	Computer Networks& Security	03	-	-	30	70	-	-	-	100	03			03
314452	Data Science and Big Data Analytics	03	-	-	30	70	-	-	-	100	03			03
314453	Web Application Development	03	-	-	30	70	-	-	-	100	03			03
314454	Elective-II	03	-	-	30	70	-	-	-	100	03			03
314455	Internship	-	04	-	-	-	100	-	-	100		04		04
314456	Computer Networks& Security-Lab	-	04	-	-	-	25	-	50	75		02		02
314457	DS & BDA-Lab	-	02	-	-	-	25	25	-	50		01		01
314458	Laboratory Practice-II	-	04	-	-	-	50	25	-	75		02		02
314459	Audit Course 6	-	-	-	-	-	-	-	-	-	-	-	-	-
										Total	12	09	-	21
	Total	12	14	-	120	280	200	50	50	700	12	09	-	21

Abbreviations: TH: Theory, TW: Term Work, PR: Practical , OR: Oral, TUT: Tutorial

Elective-II:
314454A- Artificial Intelligence
314454B- Cyber Security
314454C -Cloud Computing
314454D- Software Modeling and Design

Audit Course 6:
314459A - Green and Unconventional Energy
314459B - Leadership and Personality Development
314459C- Foreign Language-(Japanese Language- IV)

Laboratory Practice-II:
Assignments from Web Application Development and Elective-II.

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

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314441: Theory of Computation

HOME

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

Prerequisite Courses:

1. Discrete Structures.
2. Data structures.

Companion Course, if any: NA

Course Objectives:

1. To know the applicability of the model of computation to different problems.
2. To understand in detail the relationship among formal languages, formal grammars and automata.
3. To learn the design of Finite Automata, Pushdown Automata and Turing Machine for processing offormal languages.
4. To study the theory of computability and complexity for algorithm design.

Course Outcomes:

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

CO1: Construct finite automata and its variants to solve computing problems.

CO2: Write regular expressions for the regular languages and finite automata.

CO3: Identify types of grammar, design and simplify Context Free Grammar.

CO4: Construct PushdownAutomata machine for the Context Free Language.

CO5: Design and analyze Turing machines for formallanguages.

CO6: Understand decidable and undecidable problems, analyze complexity classes.

COURSE CONTENTS

Unit I	FINITE AUTOMATA	(06 hrs)

Basic Concepts: Symbols, Strings, Language, Formal Language.

Finite Automata (FA): Formal definition and notations for FSM, Concept of state transition diagram and transition table for FA, Construction of DFA, NFA, NFA with epsilon moves. Conversion of NFA with epsilon moves to NFA, Conversion of NFA to DFA, and Conversion of NFA with epsilon moves to DFA, Minimization of FA, Equivalence of FAs, and Applications of FA.

Finite State Machine with output: Moore and Mealy machines - Definition, Construction, Inter-Conversion.

Mapping of Course Outcomes for Unit I	CO1

Unit II	REGULAR EXPRESSIONS AND LANGUAGES	(06 hrs)

Regular Expressions (RE) : Definition and Identities of RE, Operators of RE, Equivalence of two regular expressions, Equivalence of regular expressions and regular languages (RL), Conversion of RE to FA using direct method, Conversion of FA to RE using Arden's theorem, Pumping lemma for RLs, Closure properties of RLs, Applications of Regular Expressions.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**CONTEXT FREE GRAMMAR AND LANGUAGE**	**(06 hrs)**
Grammar: Introduction and representation, Chomsky Hierarchy, Formal definition of Regular **Grammar(RG), Conversions:** LRG to RLG, RLG to LRG, RG to FA, FA to RG. **Context Free Grammar (CFG):** Definition of CFG, Derivation tree, sentential forms, Leftmost and Rightmost derivations, Ambiguous Grammar and unambiguous grammar, Context Free Language (CFL). **Grammar Simplification, Normal forms:** Chomsky Normal Form, Greibach Normal Form. Closure properties of CFL, Pumping lemma for CFL.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**PUSHDOWN AUTOMATA AND POST MACHINE**	**(06 hrs)**
Pushdown Automata(PDA) : Introduction and formal definition of PDA, Construction of Transition diagram and Transition table for PDA, Instantaneous Description of PDA, Equivalence of Acceptance by Final State & Empty stack, Deterministic PDA and Nondeterministic PDA, Context Free Language and PDA, Conversion of CFG to PDA and PDA to CFG. **Post Machine (PM):** Definition and construction of Post Machine.		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**TURING MACHINE**	**(06 hrs)**
Turing Machine (TM) : Formal definition of a Turing machine, Design of Turing machines, Variants of **Turing Machines:** Deterministic TM, Nondeterministic TM, Multi-tape TM, Universal Turing Machine, Halting problem of TM , Church-Turing thesis, Recursive Languages and Recursively Enumerable Languages, Post Correspondence Problem.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**COMPUTATIONAL COMPLEXITY**	**(06 hrs)**
Decidability: Decidable problems concerning regular languages, Decidable problems concerning context free languages, Un-decidability. **Computational Complexity:** Measuring Complexity, The Class P, Examples of problems in P, The Class NP, and Examples of problems in NP, Reducibility, Mapping Reducibility, Polynomial Time Reduction and NP Completeness. Satisfiability Problem, NP Completeness of the SAT Problem, Normal Forms for Boolean Expressions, Cook's theorem, Node-C over Problem.		

Mapping of Course Outcomes for Unit VI	**CO6**

Text Books:

1. John C. Martin, Introduction to Language and Theory of Computation, TMH, 3rd Edition, ISBN: 978-0070660489.
2. Vivek Kulkarni, Theory of Computation, Oxford University Press,ISBN-13 : 978-0198084587.

Reference Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, Introduction to Automata Theory Languages and Computation, Addison-Wesley, ISBN 0-201-44124-1.
2. K.L.P Mishra, N. Chandrasekaran, Theory of Computer Science : Automata, Languages and Computation, Prentice Hall India, 2nd Edition.
3. Michael Sipser, Introduction to the Theory of Computation, CENGAGE Learning, 3rd Edition ISBN- 13:978-81-315-2529-6.
4. Daniel Cohen, "Introduction to Computer Theory", Wiley & Sons, ISBN 97881265133454.
5. Kavi Mahesh, "Theory of Computation: A Problem-Solving Approach", Wiley India, ISBN-1081265331106.

E- Books / E- Learning References :

1. https://cglab.ca/~michiel/TheoryOfComputation/TheoryOfComputation.pdf
2. https://theory.cs.princeton.edu/complexity/book.pdf

NPTEL video lecture link :

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314442: Operating Systems

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Computer Organization and Architecture
2. Fundamentals of Data Structures

Companion Course, if any: NA

Course Objectives:

1. To introduce basic concepts and functions of modern operating systems.
2. To understand the concept of process, thread management and scheduling.
3. To learn the concept of concurrency control.
4. To study various Memory Management techniques.
5. To know the concept of I/O and File management.
6. To learn concept of system software.

Course Outcomes:

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

CO1: Understanding the role of Modern Operating Systems.

CO2: Apply the concepts of process and thread scheduling.

CO3: Apply the concept of process synchronization, mutual exclusion and the deadlock.

CO4: Understand and apply the concepts of various memory management techniques.

CO5: Make use of concept of I/O management and File system.

CO6: Understand Important of System software.

COURSE CONTENTS

Unit I	OVERVIEW OF OPERATING SYSTEM	(06 hrs)

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, Introduction to Linux OS, BASH Shell scripting: Basic shell commands.

Mapping of Course Outcomes for Unit I	CO1

Unit II	PROCESS MANAGEMENT	(06 hrs)

Process: Concept of a Process, Process States, Process Description, Process Control

Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Threadprogramming Using Pthreads.

Scheduling: Types of Scheduling, Scheduling Algorithms, First Come First Served, Shortest Job First, Priority, Round Robin

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**CONCURRENCY CONTROL**	**(06 hrs)**
Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirementsfor Mutual Exclusion, Mutual Exclusion: Operating System Support (Semaphores and Mutex). **Classical synchronization problems:** Readers/Writers Problem, Producer and Consumer problem, Inter-process communication (Pipes, Shared Memory). **Deadlock:** Principles of Deadlock, Deadlock Modeling, and Strategies to deal with deadlock: Prevention, Avoidance, Detection and Recovery. Example: Dining Philosophers Problem / Banker's Algorithm.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**MEMORY MANAGEMENT**	**(06 hrs)**
Memory Management: Memory Management Requirements, **Memory Partitioning:** Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Page table structure, Segmentation **Virtual Memory:** Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal), Allocation of frames, Thrashing		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**INPUT/OUTPUT AND FILE MANAGEMENT**	**(06 hrs)**
I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, I/O Buffering, Disk Scheduling (FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK). **File Management:** Overview-Files and File Systems, File structure. File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**SYSTEMS SOFTWARE AND ITS IMPORTANCE**	**(06 hrs)**
Need of System Software, study of various components of system software. **Assemblers:** Elements of Assembly Language Programming, A simple Assembly Scheme and pass structure of Assemblers. **Introduction to compilers:** Phase structure of Compiler and entire compilation process. Introduction to Macro processors, Macro Definition and call, Macro Expansion Loaders and Linkers. General Loader Scheme, Subroutine Linkages, Relocation and linking Linkages, Relocation and linking		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition,2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts,John Wiley & Sons ,Inc., 9th Edition,2012, ISBN 978-1-118-06333-0

Reference Books:

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN- 10: 0596009526, ISBN-13: 978-0596009526.
2. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13: 978-0131828278.
3. Thomas W. Doeppner, Operating System in depth: Design and Programming, WILEY, ISBN:978-0-471-68723-8.
4. Mendel Cooper, Advanced Shell Scripting, Linux Documentation Project.
5. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition.

E- Books / E- Learning References :

1. https://cglab.ca/~michiel/TheoryOfComputation/Theory Of Computation.pdf
2. https://theory.cs.princeton.edu/complexity/book.pdf

NPTEL video lecture link :

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Savitribai Phule Pune University, Pune **Third Year Information Technology (2019 Course)** **314443: Machine Learning**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory (TH) :3hrs/week	**03 Credits**	**Mid_Semester : 30 Marks** **End_Semester :70 Marks**

HOME

Prerequisite Courses:

1. Basics of Statistics ,2 Linear Algebra, Calculas 3.Probability

Companion Course:

1. Artificial Intelligence, Deep Learning

Course Objectives:

1. To understand the basic concepts of machine learning and apply them for the various problems.
2. To learn various machine learning types and use it for the various machine learning tasks.
3. To optimize the machine learning model and generalize it.

Course Outcomes:

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

CO1: Apply basic concepts of machine learning and different types of machine learning algorithms.

CO2: Differentiate various regression techniques and evaluate their performance.

CO3: Compare different types of classification models and their relevant application.

CO4: Illustrate the tree-based and probabilistic machine learning algorithms.

CO5: Identify different unsupervised learning algorithms for the related real world problems.

CO6: Apply fundamental concepts of ANN.

COURSE CONTENTS

Unit I	**INTRODUCTION TO MACHINE LEARNING**	**(06 hrs)**
Introduction: What is Machine Learning, Definitions and Real life applications, **Data and types:** Scales of Measurement. Data, **Features and Patterns:** Learning Tasks- Descriptive and Predictive Tasks. Learning Paradigms: Supervised, Unsupervised and Reinforced Learnings. **Learning Models. Data and Dimensionality:** Feature Sets, Feature Extraction and Subset Selection, Feature Transformation. Dimensionality reduction techniques- PCA and LDA		
Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**REGRESSION**	**(06 hrs)**
Introduction, Univariate Regression – Model Representation, Least-Square Method for finding values of the regression coefficients. Cost Functions: MSE, MAE, R-Square, Performance Evaluation, Optimizing Simple Linear Regression with Gradient Descent Algorithm. **Multivariate Regression** –Model Representation, Polynomial Regression. Performance enhancement with Regularization techniques. Generalization Issues- Overfitting Vs. Underfitting, Bias Vs. Variance		

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**CLASSIFICATION**	**(06 hrs)**
Binary Classification: Linear Classification model , Performance Evaluation- Confusion Matrix, Accuracy and ROC curves. Logistic Regression – Model, Cost Function. Linear Support Vector Machines (SVM) – Introduction, Soft Margin SVM, Introduction to various SVM Kernel to handle non-linear data – RBF, Gaussian, Polynomial, Sigmoid. Multiclass Classification techniques -One vs One, One vs Rest. **Enhancing Performance of classification:** Cross-Validation, Sub-Sampling, HyperParameter Tuning Techniques.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**TREE BASED AND PROBABILISTIC MODELS**	**(06 hrs)**
Tree Based Model : Decision Tree – Concepts and Terminologies, Impurity Measures -Gini Index, Information gain and Entropy. Random Forest and concept of Ensemble Learning. **Probabilistic Models:** Conditional Probability and Bayes Theorem, MLE and MAP estimations, Naïve Bayes Classifier, Bayesian networks for Learning and Inferencing.		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**DISTANCE AND RULE BASED MODELS**	**(06 hrs)**
Distance Based Models: Distance Metrics (Euclidean ,Manhattan, Hamming , Minkowski Distance Metric), K-Nearest Neighbour for Classification and Regression, **Clustering as Learning Task:** K-means clustering Algorithm with example, Hierarchical Clustering, Divisive Dendrogram for hierarchical clustering, Performance Measures. **Association Rule Mining:** Introduction, Rule learning for subgroup discovery, Apriori Algorithm, Performance Measures – Support and Confidence.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**INTRODUCTION TO ARTIFICIAL NEURAL NETWORK**	**(06 hrs)**
Perceptron Learning : Biological Neuron, Introduction to ANN, McCulloch Pitts Neuron, Perceptron and its Learning Algorithm, Activation Functions and types: Soft and Hard limiting functions, Tanh and ReLu. **Multi-layer Perceptron Model**: Introduction, Learning parameters- Weights and Bias, Learning algorithm, Loss function- Mean Square Error. Concept of Deep Learning.		

Mapping of Course Outcomes for Unit VI	**CO6**

Text Books:

1. Ethem Alpaydin, Introduction to Machine Learning, PHI 2nd Edition-2013
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012
4. Tom M. Mitchell , Machine Learning, 1997, McGraw-Hill, First Edition

Reference Books:

1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition
3. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.
4. Parag Kulkarni : Reinforcement and Systematic Machine Learning for Decision Making, Wiley IEEE Press, Edition July 2012.
5. Shalev-Shwartz S., Ben-David S., Understanding Machine Learning: From Theory to Algorithms, CUP, 2014
6. Jack Zurada: Introduction to Artificial Neural Systems, PWS Publishing Co. Boston, 2002

E- Books / E- Learning References :

1. Introduction to Machine Learning : https://nptel.ac.in/courses/106/106/106106139/
2. Machine Learning: https://nptel.ac.in/courses/106/106/106106202/
3. Machine Learning for Science and Engineering applications: https://nptel.ac.in/courses/106/106/106106198/
4. Introduction to Machine Learning: https://nptel.ac.in/courses/106/105/106105152/
5. Deep Learning (Part-I) : https://nptel.ac.in/courses/106/106/106106184/
6. Deep Learning : https://onlinecourses.nptel.ac.in/noc19_cs54/preview
7. Naive Bayes from Scratch: https://courses.analyticsvidhya.com/courses/naive-bayes
8. Getting Started with Neural Networks: https://courses.analyticsvidhya.com/courses/getting-started-with-neural-networks
9. Machine Learning – Offered by Stanford Online - https://www.coursera.org/learn/machine-learning

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314444: Human Computer Interaction

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Problem Solving and Object Oriented Technologies

Course Objectives:

1. To introduce to the field of human-computer-interaction study.
2. To gain an understanding of the human part of human-computer-interactions.
3. To learn to do design and evaluate effective human-computer-interactions.
4. To study HCI models and theories.
5. To understand HCI design processes.
6. To apply HCI to real life use cases.

Course Outcomes:

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

CO1: Explain importance of HCI study and principles of user-centered design (UCD) approach.

CO2: Develop understanding of human factors in HCI design.

CO3: Develop understanding of models, paradigms, and context of interactions.

CO4: Design effective user-interfaces following a structured and organized UCD process.

CO5: Evaluate usability of a user-interface design.

CO6: Apply cognitive models for predicting human-computer-interactions.

COURSE CONTENTS

Unit I	INTRODUCTION	(06 hrs)

What is HCI?, Disciplines involved in HCI, Why HCI study is important? The psychology of everydaythings Donald A. Norman, Principles of HCI, User-centered Design. Measurable Human factors.

Mapping of Course Outcomes for Unit I	CO1

Unit II	UNDERSTANDING THE HUMAN and HUMAN INTERACTION	(06 hrs)

Input-output channels, Human memory, Human emotions, Individual differences, Psychology. Ergonomics, Human errors, Models of interaction, Paradigms of Interactions, Interaction styles, Interactivity, Context of interaction, User experience.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**HCI MODELS AND THEORIES**	**(06 hrs)**
User Profiles, categorization of users, Goal and task hierarchy model, Linguistic model, Physical and device models, GOMS, Norman's 7 stage model, Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**DESIGN PROCESS**	**(06 hrs)**
Design Rules : Principles that support usability, Design standards, Design Guidelines, What is interaction design?, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques, Wire-Framing, Understanding the UI Layer and Its Execution Framework, Model-View-Controller(MVC) Framework		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**HCI GUIDELINES AND EVALUATION TECHNIQUES**	**(06 hrs)**
Using toolkits, User interface management system (UIMS), Goals of evaluation, Categorization of Evaluation techniques, Choosing an Evaluation Method. DECIDE, Heuristic Evaluation, cognitive walk through, Usability testing		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**FUTURE TRENDS**	**(06 hrs)**
Ubiquitous Computing, Design thinking, Finding things on web, Augmented Reality, Virtual Reality , Challenges in designing interfaces for smart homes, smart devices, handheld devices, smart wristwatch, Future of HCI		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Alan Dix (2008). Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5.
2. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013).
3. Designing The User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited. ISBN 978-1-292-03701-1.

Reference Books:

1. Gerard Jounghyun Kim (20 March 2015). Human–Computer Interaction: Fundamentals andPractice. CRC Press. ISBN 978-1-4822-3390-2.
2. Donald A. Norman (2013). The Design of Everyday Things Basic Books. ISBN 978-0-465-07299-6.
3. Jeff Johnson (17 December 2013). Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines. Elsevier. ISBN 978-0-12-411556-9.
4. Alan Cooper; Robert Reimann; David Cronin; Christopher Noessel (13 August 2014). About Face:The Essentials of Interaction Design. Wiley. ISBN 978-1-118-76658-3.
5. Alan Cooper (1 January 1999). The Inmates are running the Asylum, Sam's. ISBN 978-0-672-31649-4.
6. John M. Carroll (21 May 2003). HCI Models, Theories, and Frameworks: Toward aMultidisciplinary Science. Morgan Kaufmann. ISBN 978-0-08-049141-7.
7. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, About Face: The Essentials of Interface Design, Wiley India, ISBN : 9788126559718,4th Ed
8. Rogers, Sharp, Preece, Interaction Design: Beyond Human Computer Interaction, Wiley India, ISBN:11. 9788126544912,3ed
9. Wilbert O.Galitz, The Essential Guide to user Interface Design, Wiley India, ISBN: 9788126502806

E- Books / E- Learning References :

1. http://hcibib.org/
2. Andriod Design Guidelines --- https://developer.android.com/guide/practices/ui_guidelines/index.html
3. iOS Human Interface Guidelines -- https://developer.apple.com/ios/human-interfaceguidelines/ overview/design-principles/
4. MacOS Human Interface Guidelines ---- https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/OSX HIGuidelines/
5. www.baddesigns.com

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314445(A) : Elective -I : Design and Analysis of Algorithm

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Data Structures and Algorithms.
2. Discrete Structures.
3. Basic mathematics: Induction, probability theory, logarithms.

Course Objectives:

1. To understand the problem solving and problem classification.
2. To know the basics of computational complexity analysis of various algorithms.
3. To provide students with foundations to deal with a variety of computational problems using different design strategies.
4. To select appropriate algorithm design strategies to solve real world problems.
5. To understand the concept of nondeterministic polynomial algorithms.

Course Outcomes:

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

CO1: Calculate computational complexity using asymptotic notations for various algorithms.

CO2: Apply Divide & Conquer as well as Greedy approach to design algorithms.

CO3: Understand and analyze optimization problems using dynamic programming.

CO4: Illustrate different problems using Backtracking.

CO5: Compare different methods of Branch and Bound strategy.

CO6: Classify P, NP, NP-complete, NP-Hard problems.

COURSE CONTENTS

Unit I	INTRODUCTION	(07 hrs)

Proof Techniques: Contradiction, Mathematical Induction, Direct proofs, Proof by counter example, Proof by contraposition.

Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega.

Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations using Masters theorem and Substitution method.

Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem.

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**DIVIDE AND CONQUER AND GREEDY METHOD**	**(06 hrs)**
Divide & Conquer: General method, Quick Sort – Worst, Best and average case. Binary search, Finding Max-Min, Large integer Multiplication (for all above algorithms analysis to be done with recurrence). **Greedy Method:** General method and characteristics, Kruskal's method for MST (using nlogn complexity), Dijkstra's Algorithm, Fractional Knapsack problem, Job Sequencing, Max flow problem and Ford-Fulkerson algorithm in transport network		
Mapping of Course Outcomes for Unit II	**CO1, CO2**	
Unit III	**DYNAMIC PROGRAMMING**	**(06 hrs)**
General strategy, Principle of optimality, 0/1 knapsack Problem, Coin change-making problem, Bellman-Ford Algorithm , Multistage Graph problem(using Forward computation), Travelling Salesman Problem		
Mapping of Course Outcomes for Unit III	**CO1, CO3**	
Unit IV	**BACKTRACKING**	**(06 hrs)**
General method, Recursive backtracking algorithm, Iterative backtracking method. n-Queen problem, Sum of subsets, Graph coloring, 0/1 Knapsack Problem.		
Mapping of Course Outcomes for Unit IV	**CO1, CO4**	
Unit V	**BRANCH AND BOUND**	**(06 hrs)**
The method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem – LC branch and bound and FIFO branch and bound solution, Traveling salesperson problem- LC branch and bound		
Mapping of Course Outcomes for Unit V	**CO1, CO5**	
Unit VI	**COMPUTATIONAL COMPLEXITY**	**(05 hrs)**
Non Deterministic algorithms, The classes: P, NP, NP Complete, NP Hard, Satisfiability problem, Proofs for NP Complete Problems: Clique, Vertex Cover		
Mapping of Course Outcomes for Unit VI	**CO1, CO6**	
Text Books:		
1. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia, ISBN 81-7371-612-9. **2.** Anany Levitin, Introduction to the Design & Analysis of Algorithm, Pearson, ISBN 81- 7758-835-4.		

Reference Books:

1. Jon Kleinberg, Algorithm Design, Pearson , ISBN : 0-321-29535-8

2. S. Sridhar, Design and Analysis of Algorithms, Oxford, ISBN 10 : 0-19-809369-1.

3. Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithm, PHI, ISBN: 9788120340077

4. Gilles Brassard, Paul Bratle, Fundamentals of Algorithms, Pearson, ISBN 978-81-317-1244-3.

5. R. C. T. Lee, SS Tseng, R C Chang, Y T Tsai, Introduction to Design and Analysis of Algorithms, A Strategic approach, Tata McGraw Hill, ISBN-13: 978-1-25-902582-2. ISBN-10: 1-25-902582-9.

6. Steven S Skiena, The Algorithm Design Manual, Springer, ISBN 978-81-8489-865-1.

7. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Desktop Quick Reference, O'Reilly, ISBN: 9789352133611.

8. Michael T. Goodrich, Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet

9. Examples, Wiley India, ISBN: 9788126509867

10. Rod Stephens, Essential Algorithms: A Practical Approach to Computer Algorithms, Wiley India,ISBN: 9788126546138

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314445(B): Elective -I : Advanced Database Management System

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Database Management System

Course Objectives:

1. To understand the fundamental concepts of Relational and Object-oriented databases.
2. To learn and understand various Parallel and Distributed Database Architectures and Applications.
3. To understand and apply the basic concepts, categories and tools of NoSQL Database.
4. To learn and understand Data warehouse and OLAP Architectures and Applications.
5. To learn data mining architecture, algorithms, software tools and applications.
6. To learn enhanced data models for advanced database applications.

Course Outcomes:

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

CO1: Understand relational and object-oriented databases.

CO2: Learn and understand of parallel & distributed database architectures..

CO3: Learn the concepts of NoSQL Databases.

CO4: Understand data warehouse and OLAP technologies.

CO5: Apply data mining algorithms and to learn various software tools. CO6: Learn emerging and enhanced data models for advanced applications.

COURSE CONTENTS

Unit I	REVIEW OF RELATIONAL DATA MODEL AND RELATIONAL DATABASE CONSTRAINTS	(06 hrs)

Relational model concepts, Relational model constraints and relational database schemas, Update operations, anomalies, dealing with constraint violations, Types and violations. **Overview of Object-Oriented Concepts** – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism examples.

Mapping of Course Outcomes for Unit I	CO1

Unit II	PARALLEL AND DISTRIBUTED DATABASES	(06 hrs)

Introduction to Parallel Databases, Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations, Parallel query optimizations. **Introduction to distributed databases**, Distributed DBMS architectures, storing data in a Distributed DBMS, Distributed catalog management, Distributed Query processing, Updating distributed data, Distributed transactions, Distributed Concurrency control and Recovery.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**NOSQL DATABASES**	**(06 hrs)**
Introduction, **Overview, and History of NoSQL Databases**- The definition of Four Types of No SQL Databases. NoSQL Key/Value Database: MongoDB, **Column-Oriented Database:** Apache Cassandra, Comparison of Relational and NoSQL databases, NoSQL database Development Tools (Map Reduce/Hive) and Programming Languages (XML/JSON)		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**DATA WAREHOUSING**	**(06 hrs)**
Architectures and components of data warehouse, Characteristics and limitations of data warehouse, Data warehouse schema (Star, Snowflake), OLAP Architecture (ROLAP/MOLAP/HOLAP), Introduction to decision support system, Views and Decision support		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**DATA MINING**	**(06 hrs)**
Introduction to Data Mining, KDD seven step process, Architecture of data mining, Introduction to predictive and descriptive algorithms, Data mining software and applications		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS**	**(06 hrs)**
Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical InformationSystems; Genome data management.		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication,ISBN-0-07-120413-X, Sixth Edition.
2. S. K. Singh, Database Systems: Concepts, Design and Application, Pearson Publication, ISBN-978-81-317-6092-5.

Reference Books:

1. Kristina Chodorow, Michael Dirolf, “MongoDB: The Definitive Guide”, O’Reilly Publications
2. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Elsevier
3. Mario Piattini, Oscar Diaz “Advanced Database Technology and Design”- online book.
4. M. Tamer Özsu, Patrick Valduriez, “Principles of Distributed Database Systems” Prentice Hall, 1999.
5. Ramez Elmasri and Shamkant B. Navathe “Fundamentals of Database System”7th Edition

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314445(C) : Elective -I : Design Thinking

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credits	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:
1. Software Engineering, 2. Problem Solving

Companion Course: Human Computer Interaction

Course Objectives:
1. To learn the Design thinking basic concepts.
2. To identify the opportunities and challenges for design thinking innovation.
3. To describe the define and ideate process of design thinking.
4. To summarize the prototyping techniques.
5. To enlist the activities carried out in Test and reflect phase of design thinking.
6. To Interpret Design Thinking case studies.

Course Outcomes:
On completion of the course, students will be able to–
CO1: Identify need and features of design thinking.
CO2: Identify the opportunities and challenges for design thinking innovation.
CO3: Learn the process of design thinking using various tools.
CO4: Summarize and learn the various prototyping techniques.
CO5: Enlist the activities carried out in Test and reflect phase of design thinking.
CO6: Interpret the design thinking disruptive innovations through case studies.

COURSE CONTENTS

Unit I	INTRODUCTION TO DESIGN THINKING	(06 hrs)

Introduction to Design and Design Thinking, Definition of Design Thinking, Need of Design Thinking, Features of Design Thinking, Problem Solving and Design, Design thinking as Strategy of Innovation, Use of Design Thinking, Design Thinking-Attributes, The Principles of Design Thinking, The Five-step Process of Design Thinking(Empathize, Define, Ideate, Prototype, Test),Design **Thinking-A Solution based thinking:** Design Thinking vs. Scientific Method, Problem Focused vs. Solution Focused, Analysis vs. Synthesis, Divergent Thinking vs. Convergent Thinking , Roots of Design Thinking in Human Centric Design Process.

Mapping of Course Outcomes for Unit I	CO1

Unit II	EXPLORE AND EMPATHIZE	(06 hrs)

Explore- STEEP Analysis, Activity Systems, Stakeholder Analysis, Framed Opportunities Empathise- Observation, Problem statement, User Interviews- Interview for Empathy, Explorative Interview, Ask 5x Why, 5W+H questions (Design Thinking Toolbox), Needs Finding, Empathy Map, Persona Development, Customer Journey Map		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**DEFINE AND IDEATE**	**(06 hrs)**
Define- Define Point of view, "How might we ..." question, Storytelling, Context Mapping Ideate-Brainstorming, 2x2 Matrix Ideate- Purpose, Methods & Tools, SCAMPER, SCAMPER for Ideation, SCAMPER template, Analogous Inspiration, IDEATION using Deconstruct & Reconstruct, User Experience Journey		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**PROTOTYPE**	**(06 hrs)**
Get Visual, Design Principals, Determine What to Prototype, Storyboard Prototype- How to carry out Prototyping? Frequently used kinds of prototypes, Focused experiments – Critical Experience Prototype (CEP) & Critical Function Prototype (CFP), Crazy experiments – Dark horse Prototype, Combined experiments – Funky prototype Prototyping -Paper Prototyping, Digital Prototyping- Wireframe vs Realistic Prototypes, HTML vs WYSIWYG Editors, Additional Tools for Prototyping, Working with a Developer, Prototype Examples		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**TEST AND REFLECT**	**(06 hrs)**
Test- Testing Sheet, Feedback Capture Grid, Powerful questions in experience testing, Solution interview, Structured Usability Testing, A/B Testing, Design Testing with Users, Exploring Visual Design Mock-Ups, Choosing a Design Testing, Usability Testing, Reflect- I like, I wish, I wonder, Create a pitch, lean canvas, lessons learned, Road map for implementation Evolve- Concept Synthesis, Viability Analysis(Impact Evaluation), Innovation Tool using user needs, CAP, 4s.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**DISRUPTIVE INNOVATION**	**(06 hrs)**
Reimagining the Trade Show Experience at IBM, Redesigning the Customer Contact Center at Toyota, Social Networking at MeYou Health, Rethinking Subsidized Meals for the Elderly at The Good Kitchen THE SOCIAL PROBLEM Design Thinking in Healthcare with IDEO, Design Thinking Transformed Airbnb, IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver, UberEATS.		
Mapping of Course Outcomes for Unit VI	**CO6**	
Text Books:		

1. Michael Lewrick, Patrick Link, Larry Leifer , "The Design Thinking Toolbox: A Guide to Masteringthe Most Popular and Valuable Innovation Methods", March 2020 edition, ISBN: 978-1-119- 62921-4, WILEY Publication.
2. Mr Lee Chong Hwa (Lead Facilitator), "The Design Thinking: Guidebook"

Reference Books:

1. IDEO (Firm), "The Field Guide to Human-centered Design: Design Kit", 1st edition, ISBN-978099140631-9, IDEO 2015.
2. Russ Unger, Carolyn Chandler, "A Project Guide to UX Design For user experience designers inthe field or in the making (Voices That Matter)", 2nd Edition, ISBN 13: 978-0-321-81538-5
3. Karl T Ulrich, "Design – Creation of Artifacts in Society", 1st edition, ISBN 978-0-9836487-0-3, University of Pennsylvania.
4. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", ISBN- 9780061937743, Harper Collins, 2009.
5. Eli Woolery, "Design Thinking Handbook", In-Vision publisher.
6. Jeanne Liedtka, Andrew King, Kevin Bennett, "Solving Problems with Design Thinking: TenStories of What Works", Columbia Business School Publishing, E-ISBN 978-0-231-53605-9
7. Jake Knapp, John Zeratsky, Braden Kowitz, "Sprint: How to Solve Big Problems and Test NewIdeas in Just Five Days", ISBN 9780593076118, Bantam Press, 2016.
8. Don Norman, "The Design of Everyday Things: Revised and Expanded Edition", ISBN9780465072996, Basic Books, 2013.
9. Tom Kelly, "Creative Confidence: Unleashing the Creative Potential Within Us All", October 2013 edition , ISBN: 978-0-385-34936-9

E -Books / E -Learning References :

1. Creating Customer Journey Maps - MODULE 4: Design Thinking and Customer Journey Maps Coursera
2. The IBM Story: https://www.coursera.org/lecture/uva-darden-design-thinking-innovation/the-ibm-story-iq0kE
3. Design Thinking - A Primer online course video lectures by IIT Madras (freevideolectures.com)
4. NPTEL :: Humanities and Social Sciences - NOC: Understanding Design Thinking & People Centered Design
5. NPTEL :: Management - NOC:Design Thinking - A Primer
6. Design Thinking Transformed Airbnb: https://review.firstround.com/How-design-thinking-transformed-Airbnb-from-failing-startup-to-billion-dollar-business
7. UberEATS: https://medium.com/uber-design/how-we-design-on-the-ubereats-team-ff7c41fffb76
8. IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver: https://www.ibm.com/blogs/think/2016/01/ibm-design-thinking-a-framework-for-teams-to-continuously-understand-and-deliver/
9. https://www.tutorialspoint.com/design_thinking/index.htm
10. https://www.designkit.org/case-studies
11. https://www.innovationtraining.org/design-thinking-workshop-resources/

Savitribai Phule Pune University, Pune Third Year Information Technology (2019 Course) 314445(D) : Elective -I : Internet of Things		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory (TH) : 3 hrs/week	**03 Credits**	**Mid_Semester : 30 Marks** **End_Semester : 70 Marks**

HOME

Prerequisite Courses:

1. Basics of Computer Network
2. Processor Architecture

Course Objectives:

1. To know the IoT fundamentals and understanding the technologies.
2. To learn the concept of M2M (machine to machine) with necessary protocols.
3. To understand the Python Scripting Language and controlling hardware for IoT.
4. To learn the IoT Platforms widely used in IoT applications.
5. To understand the implementation of web-based services on IoT devices with cloud interface.
6. To introduce the IoT applications.

Course Outcomes:

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

CO1: Discuss fundamentals, architecture and framework of IoT.

CO2: Select suitable sensors and actuators for real time scenarios.

CO3: Justify the significance of protocol for wireless communication and IoT challenges

CO4: Understand the Python programming for development of IoT applications.

CO5: Understand the cloud interfacing technologies.

CO6: Design and Implement real time IoT applications.

COURSE CONTENTS

Unit I	**INTRODUCTION TO IOT**	**(06 hrs)**

Definition and Characteristics of IoT, IoT Framework and Architecture, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT Levels and Templates, **IoT Enabled Technologies** – Wireless Sensor Networks, Cloud Computing, Embedded Systems, Big Data Analysis, UAV, Web Services, IoT & M2M- Machine to Machine, Difference between IoT and M2M, Software Defined Network & NFV

Mapping of Course Outcomes for Unit I	**CO1**

Unit II	**THINGS IN IOT**	**(06 hrs)**

Introduction to Sensors - Light sensor, voltage sensor, Temperature and Humidity Sensor, Motion Detection Sensors, Wireless Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasonic sensor Introduction to Actuators- Connecting LED, Buzzer, Controlling- AC Power devices, Servo motor, Speed DC Motor. Electronic Communication Protocols (Device Interfacing) Protocols: I2C,SPI,UART,USRT,CAN.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**COMMUNICATION PROTOCOLS AND IOT CHALLENGES**	**(06 hrs)**
Introduction to Non IP Based Protocol (IEEE 802.11, IEEE 802.15.4), BlueTooth, ZigBee, IP Based Protocol (IPV4, IPV6, 6LoWPAN), Application Layer Protocols (MQTT, AMQP) Wireless medium access issues, MAC protocol ,routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**IOT PLATFORMS AND ITS PROGRAMMING**	**(06 hrs)**
Introduction to Arduino and Raspberry Pi- Installation, Interfaces (Serial, SPI, I2C), Introduction to Python program with Raspberry Pi with focus on interfacing external gadgets (Bluetooth Speaker, CCTV Camera, Robotic Arm etc.), controlling output, and reading input from pins. Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**IOT PHYSICAL SERVERS AND CLOUD OFFERINGS**	**(06 hrs)**
Introduction to Cloud Storage models (SaaS, Paas, IaaS) and communication APIs Web server – Web server for IoT, Cloud for IoT (ThingSpeak, Ubidots), Python web application framework, Designing a RESTful web API. **IoT Security**: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modelling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non repudiation and availability, Security model for IoT.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**DOMAIN SPECIFIC APPLICATIONS Of IOT**	**(06 hrs)**
Home Automation - Smart Appliances, Intrusion Detection, Smoke/Gas Detector, Smart City -Smart Parking, Smart Road, Structural Health Monitoring, Surveillance applications, Health - Fitness and Health Monitoring, Wearable Electronics, Agriculture - Smart Irrigation, Greenhouse Control, Environment - Weather Monitoring, Noise Pollution Monitoring, Logistic - Root Generation and Scheduling, Shipment Monitoring, Retail Management - Inventory Management, Smart Payments, **Industry Applications** - Machine Diagnosis and Prognosis, Indoor Air Quality Monitoring.		
Mapping of Course Outcomes for Unit VI	**CO6**	
Text Books:		

1. Vijay Madisetti, ArshdeepBahga, “Internet of Things: A Hands-On Approach” , 2014, Universities Press(India) Pvt Ltd., ISBN: 9788173719547
2. Matt Richardson & Shawn Wallac, “Getting Started with Raspberry Pi”, 2014, O'Reilly (SPD), ISBN:9789350239759
3. Pethuru Raj and Anupama C Raman, “The Internet of Things: Enabling Technologies, Platforms and Use Cases”, 2017, CRC Press, ISBN: 13:978-1-4987-6128-4.
4. Rushi Gajjar, “Raspberry Pi Sensors”, 2015, Packt Publishing, ISBN : 978-1-78439-361-8
5. Robert H. Bishop, “The Mechatronics Handbook”, 2002, CRC Press , ISBN: 0-8493-0066-5/02

Reference Books:
1. Peter Waher, “Learning Internet of Things”, 2015,Packt Publishing, ISBN: 978-1-78355-353-2
2. Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment”, 2014, River Publishers, ISBN: 978-87-93102-94-1
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theoryand Practice", 2010 , Wiley Publication, ISBN: 978-0-470-99765-9
4. Simon Monk, “Raspberry Pi Cookbook, Software and Hardware Problems and solutions”, 2019, O'Reilly, ISBN 9781492043225
E- Books / E- Learning References :
1. Introduction to Arduino and its Setup : https://www.arduino.cc/en/software
2. Introduction to Raspberry Pi and its OS (Raspbian Lit) : https://www.raspberrypi.org/software/operating- systems/
3. Cloud for IoT– ThingSpeak : https://thingspeak.com/
4. Cloud for IoT - Ubidots : https://ubidots.com/stem/
5. Overall IoT Course Contents: https://onlinecourses.nptel.ac.in/noc21_cs17/preview

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314446 : Operating Systems Lab

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credits	PR: 25 Marks TW: 25 Marks

HOME

Prerequisites:

1. C Programming
2. Fundamentals of Data Structure

Course Objectives:

1. To introduce and learn Linux commands required for administration.
2. To learn shell programming concepts and applications.
3. To demonstrate the functioning of OS basic building blocks like processes, threads under the LINUX.
4. To demonstrate the functioning of OS concepts in user space like concurrency control (process synchronization, mutual exclusion), CPU Scheduling, Memory Management and Disk Scheduling in LINUX.
5. To demonstrate the functioning of Inter Process Communication under LINUX.
6. To study the functioning of OS concepts in kernel space like embedding the system call in any LINUX kernel.

Course Outcomes:

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

CO1: Apply the basics of Linux commands.

CO2: Build shell scripts for various applications.

CO3: Implement basic building blocks like processes, threads under the Linux.

CO4: Develop various system programs for the functioning of OS concepts in user space like concurrency control, CPU Scheduling, Memory Management and Disk Scheduling in Linux.

CO5: Develop system programs for Inter Process Communication in Linux.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical 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 and only if the journal of the candidate is complete in all aspects.

Guidelines for Lab /TW Assessment

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

Guidelines for Laboratory Conduction

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student's programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

List of Laboratory Assignments

Group A

Assignment No. 1 :

A. Study of Basic Linux Commands: echo, ls, read, cat, touch, test, loops, arithmetic comparison, conditional loops, grep, sed etc.

B. Write a program to implement an address book with options given below: a) Create address book. b) View address book. c) Insert a record. d) Delete a record. e) Modify a record. f) Exit

Assignment No. 2:

Process control system calls: The demonstration of FORK, EXECVE and WAIT system calls along with zombie and orphan states.

A. Implement the C program in which main program accepts the integers to be sorted. Main program uses the FORK system call to create a new process called a child process. Parent process sorts the integers using sorting algorithm and waits for child process using WAIT system call to sort the integers using any sorting algorithm. Also demonstrate zombie and orphan states.

B. Implement the C program in which main program accepts an array. Main program uses the FORK system call to create a new process called a child process. Parent process sorts an array and passes the sorted array to child process through the command line arguments of EXECVE system call. The child process uses EXECVE system call to load new program which display array in reverse order.

Assignment No. 3:

Implement the C program for CPU Scheduling Algorithms: Shortest Job First (Preemptive) and Round Robin with different arrival time.

Assignment No. 4:

A. Thread synchronization using counting semaphores. Application to demonstrate: producer-consumer problem with counting semaphores and mutex.

B. Thread synchronization and mutual exclusion using mutex. Application to demonstrate: Reader-Writer problem with reader priority.

Assignment No. 5:

Implement the C program for Deadlock Avoidance Algorithm: Bankers Algorithm.

Assignment No. 6:

Implement the C program for Page Replacement Algorithms: FCFS, LRU, and Optimal for frame size as minimum three.

Assignment No. 7:

Inter process communication in Linux using following.

A. FIFOS: Full duplex communication between two independent processes. First process accepts sentences and writes on one pipe to be read by second process and second process counts number of characters, number of words and number of lines in accepted sentences, writes this output in a text file and writes the contents of the file on second pipe to be read by first process and displays onstandard output.

B. Inter-process Communication using Shared Memory using System V. Application to demonstrate: Client and Server Programs in which server process creates a shared memory segment and writes the message to the shared memory segment. Client process reads the message from the shared memory segment and displays it to the screen.

Assignment No. 8: Implement the C program for Disk Scheduling Algorithms: SSTF, SCAN, C-Look considering the initial head position moving away from the spindle.

Study Assignment: Implement a new system call in the kernel space, add this new system call in theLinux kernel by the compilation of this kernel (any kernel source, any architecture and any Linux kernel distribution) and demonstrate the use of this embedded system call using C program in user space.

Reference Books:

1. Das, Sumitabha, UNIX Concepts and Applications, TMH, ISBN-10: 0070635463, ISBN-13: 978-0070635463, 4th Edition.
2. Kay Robbins and Steve Robbins, UNIX Systems Programming, Prentice Hall, ISBN-13: 978-0134424071, ISBN-10: 0134424077, 2nd Edition.
3. Mendel Cooper, Advanced Shell Scripting Guide, Linux Documentation Project, Public domain.
4. Yashwant Kanetkar, UNIX Shell Programming, BPB Publication.

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314447: Human Computer Interaction Laboratory

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 2 hrs/week	01 Credits	OR: 50 Marks

HOME

Prerequisites:

1. Problem Solving and Object-Oriented Technologies

Course Objectives:

1. To study the field of human-computer-interaction.
2. To gain an understanding of the human part of human-computer-interactions.
3. To learn to do design and evaluate effective human-computer-interactions.
4. To study HCI models and theories.
5. To understand HCI design processes.
6. To apply HCI to real life use cases.

Course Outcomes:

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

CO1: Differentiate between good design and bad design.

CO2: Analyze creative design in the surrounding.

CO3: Assess design based on feedback and constraint.

CO4: Design paper-based prototypes and use wire frame.

CO5: Implement user-interface design using web technology.

CO6: Evaluate user-interface design using HCI evaluation techniques.

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the experiments, and it should bemade 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, references.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by students in the form of journals. The Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept, printouts of the code written using coding standards, sample test cases etc. To support Go-green, printouts should be asked to any 2 students from each batch. However, all students must submit the soft copy and should be maintained by batch teacher.
2. Oral Examination will be based on the HCI theory and HCI lab term work.
3. Candidate is expected to know the theory involved in the experiment.

4. The Oral examination should be conducted if the journal of the candidate is completed in all respects and certified by concerned faculty and head of the department.

5. All the assignment mentioned in the syllabus must be conducted.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.

2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.

3. Appropriate knowledge of usage of software and hardware such as tags, coding standards, design flow to be implemented etc. should be checked by the concerned faculty member(s).

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. All the assignments should be conducted on 64-bit open-source software.

Guidelines for Oral Examination

Both internal and external examiners should jointly conduct Oral examination. During assessment, the examiners should give the maximum weightage to the satisfactory answer of the problem statement in question. 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.

List of Laboratory Assignments

Group A: CO1,2,3

1. Identify and observe bad designs

Students are expected to submit minimum of 3 to 5 photographs of bad designs in their surrounding or home or any product or neighborhood and create a report mentioning why is it bad? They can submit word/pdf file having photos and description, source of photos and place and mention why is it bad and discuss the outcome during lab session.

2. "The Jugad" :

Humans are very creative and often use it to get work done with available set up and resources. Students are expected to identify Jugad (things used creatively but not meant for that) things and submit minimum of 3 to 5 photographs of jugad in their surrounding or home or neighborhood. Prepare a report mentioning the Jugad and source of photos. Discuss the outcome during lab session.

3. Feedback and Constraint:

Products or interfaces should offer useful feedback to understand the state and have constraints to avoid mistakes while using them. Students are expected to identify and analyze minimum of 5

interfaces or products offering feedback and constraint. Prepare a report clearly showcasing feedback and constraint and support it with minimum of 5 photographs taken in their surrounding or home or neighborhood. Discuss the outcome during lab session

Group B: CO 4,5

4. Prototype and wire frame:

Students are expected to choose a problem statement and identify –

Types of users going to use (age, experience, environmental conditions during use etc..)Minimum 3 scenarios of use Create paper-based prototypes for scenarios.

Use any open-source tool to wire frame scenarios.

5. CSS:

Students are expected to design minimum of 5 web pages using CSS for the problem statement chosen in assignment no. 4. Apply CSS properties Border, margins, Padding, Navigation, dropdown list to page

Group C: CO 5,6

1. CMS tool:

Develop website using any CMS tool which falls into one of the categories blog, social networking, News updates, Wikipedia, E-commerce store. Website must include home page, and at least 5 forms. Use WordPress/ Joomla/ Drupal /PHP/ CSS/Bootstrap/ JavaScript.

2. Evaluation of Interface:

Students are expected to evaluate minimum of two products / software interface against known HCI evaluation.

Reference Books:

1. Alan Dix (2008). Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5
2. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013). Designing the User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited.ISBN 978-1-292-03701-1.
3. https://www.w3schools.com

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314448 : Laboratory Practice-I (Machine Learning)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credits	PR : 25 Marks TW: 25 Marks

HOME

Prerequisites:

1. Python programming language

Course Objectives:

1. The objective of this course is to provide students with the fundamental elements of machine learning for classification, regression, clustering.
2. Design and evaluate the performance of a different machine learning models.

Course Outcomes:

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

CO1: Implement different supervised and unsupervised learning algorithms.

CO2: Evaluate performance of machine learning algorithms for real-world applications.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

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

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratories should be as a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in a journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student programs should be attached to the journal by every student and the same to be maintained by the department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Laboratory Conduction

1. All the assignments should be implemented using python programming language
2. Implement any 4 assignments out of 6
3. Assignment number 4 is compulsory
4. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.
5. The instructor may frame multiple sets of assignments and distribute them among batches of students.
6. All the assignments should be conducted on multicore hardware and 64-bit open-sourcesoftware

Guidelines for Practical Examination

1. 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.
2. 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.
3. The evaluation should be done by both external and internal examiners.

List of Laboratory Assignments

Group A

1. **Assignment on Regression technique**

   Download temperature data from below link. https://www.kaggle.com/venky73/temperatures-of-india?select=temperatures.csv

   This data consists of temperatures of INDIA averaging the temperatures of all places month wise. Temperatures values are recorded in CELSIUS

   - **A.** Apply Linear Regression using suitable library function and predict the Month-wise temperature.
   - **B.** Assess the performance of regression models using MSE, MAE and R-Square metrics
   - **C.** Visualize simple regression model.

2. **Assignment on Classification technique**

   Every year many students give the GRE exam to get admission in foreign Universities. The data set contains GRE Scores (out of 340), TOEFL Scores (out of 120), University Rating (out of 5), Statement of Purpose strength (out of 5), Letter of Recommendation strength (out of 5), Undergraduate GPA (out of 10), Research Experience (0=no, 1=yes), Admitted (0=no, 1=yes). Admitted is the target variable.

   Data Set Available on kaggle (The last column of the dataset needs to be changed to 0 or 1)Data Set : https://www.kaggle.com/mohansacharya/graduate-admissions

   The counselor of the firm is supposed check whether the student will get an admission or not based on his/her GRE score and Academic Score. So to help the counselor to take appropriate decisions build a machine learning model classifier using Decision tree to predict whether a student will get admission or not.

   Apply Data pre-processing (Label Encoding, Data Transformation….) techniques if necessary.

Perform data-preparation (Train-Test Split)

C. Apply Machine Learning Algorithm
D. Evaluate Model.

3. Assignment on Improving Performance of Classifier Models

A SMS unsolicited mail (every now and then known as cell smartphone junk mail) is any junk message brought to a cellular phone as textual content messaging via the Short Message Service (SMS). Use probabilistic approach (Naive Bayes Classifier / Bayesian Network)to implement SMS Spam Filtering system. SMS messages are categorized as SPAM or HAM using features like length of message, word depend, unique keywords etc.

Download Data -Set from : http://archive.ics.uci.edu/ml/datasets/sms+spam+collection

This dataset is composed by just one text file, where each line has the correct class followed by the raw message.

- **A.** Apply Data pre-processing (Label Encoding, Data Transformation….) techniques if necessary
- **B.** Perform data-preparation (Train-Test Split)
- **C.** Apply at least two Machine Learning Algorithms and Evaluate Models
- **D.** Apply Cross-Validation and Evaluate Models and compare performance.
- **E.** Apply Hyper parameter tuning and evaluate models and compare performance.

4. Assignment on Clustering Techniques

Download the following customer dataset from below link:

Data Set: https://www.kaggle.com/shwetabh123/mall-customers

This dataset gives the data of Income and money spent by the customers visiting a Shopping Mall. The data set contains Customer ID, Gender, Age, Annual Income, Spending Score. Therefore, as a mall owner you need to find the group of people who are the profitable customers for the mall owner. Apply at least two clustering algorithms (based on Spending Score) to find the group of customers.

- **A.** Apply Data pre-processing (Label Encoding , Data Transformation….) techniques if necessary.
- **B.** Perform data-preparation(Train-Test Split)
- **C.** Apply Machine Learning Algorithm
- **D.** Evaluate Model.
- **E.** Apply Cross-Validation and Evaluate Model

5. Assignment on Association Rule Learning

Download Market Basket Optimization dataset from below link.

Data Set: https://www.kaggle.com/hemanthkumar05/market-basket-optimization

This dataset comprises the list of transactions of a retail company over the period of one week. It contains a total of 7501 transaction records where each record consists of the list of items sold in one transaction. Using this record of transactions and items in each transaction, find the association rules between items.

There is no header in the dataset and the first row contains the first transaction, so mentioned header = None here while loading dataset.

- **A.** Follow following steps :
- **B.** Data Preprocessing
- **C.** Generate the list of transactions from the dataset
- **D.** Train Apriori algorithm on the dataset
- **E.** Visualize the list of rules

F. Generated rules depend on the values of hyper parameters. By increasing the minimum confidence value and find the rules accordingly

6. **Assignment on Multilayer Neural Network Model**

Download the dataset of National Institute of Diabetes and Digestive and Kidney Diseases from below link :

Data Set: https://raw.githubusercontent.com/jbrownlee/Datasets/master/pima-indians-diabetes.data.csv

The dataset is has total 9 attributes where the last attribute is "Class attribute" having values 0 and 1. (1="Positive for Diabetes", 0="Negative")

- **A.** Load the dataset in the program. Define the ANN Model with Keras. Define at least two hidden layers. Specify the ReLU function as activation function for the hidden layer and Sigmoid for the output layer.
- **B.** Compile the model with necessary parameters. Set the number of epochs and batch size and fit the model.
- **C.** Evaluate the performance of the model for different values of epochs and batch sizes.
- **D.** Evaluate model performance using different activation functions Visualize the model using ANN Visualizer.

Reference Books:

1. Ethem Alpaydin, Introduction to Machine Learning, PHI 2nd Edition-2013
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012
4. Tom M. Mitchell , Machine Learning, 1997, McGraw-Hill, First EditionC. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
5. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition
6. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012.
7. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.
8. Shalev-Shwartz S., Ben-David S., Understanding Machine Learning: From Theory to Algorithms, CUP, 2014
9. Jack Zurada: Introduction to Artificial Neural Systems, PWS Publishing Co. Boston, 2002

Virtual Laboratory :

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314448 (A) : Laboratory Practice-I (Design of Analysis Algorithm)

Teaching Scheme:	Credit Scheme	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credits	PR: 25 Marks TW: 25 Marks

Prerequisites:

1. Data Structures and Algorithms.
2. Discrete Structures.
3. C/C++ programming

Course Objectives:

1. To learn the various algorithmic design strategies.
2. To apply efficiently in problem solving.

Course Outcomes:

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

CO1: Implement the various algorithmic design strategies and use it to solve real time problems/ applications

CO2: Apply Divide & Conquer as well as Greedy approach to design algorithms.

CO3: Understand and analyze optimization problems using dynamic programming.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

1. Students should submit term work in the form of a handwritten journal based on a specified list ofassignments.
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 and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratories should be As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in a journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student programs should be attached to the journal by every student and the same to be maintained by the department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Laboratory Conduction
1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. **2.** The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications. **3.** All the assignments should be conducted on multicore hardware and 64-bit open-source software
Guidelines for Practical Examination
1. 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. **2.** 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. **3.** The evaluation should be done by both external and internal examiners.
List of Laboratory Assignments
1. Write a program to implement Fractional knapsack using Greedy algorithm and 0/1 knapsack using dynamic programming. Show that Greedy strategy does not necessarily yield an optimal solution over a dynamic programming approach. **2.** Write a program to implement Bellman-Ford Algorithm using Dynamic Programming and verify the time complexity **3.** Write a recursive program to find the solution of placing n queens on the chessboard so that no two queens attack each other using Backtracking. **4.** Write a program to solve the travelling salesman problem and to print the path and the cost using LC Branch and Bound.
Reference Books :
1. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia.,ISBN : 81-7371-612-

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314448 (B) : Laboratory Practice-I (ADBMS)

Teaching Scheme:	Credit Scheme	Examination Scheme:
Practical (PR) :4 hrs/week	02 Credits	PR : 25 Marks TW : 25 Marks

HOME

Prerequisites:

1. Database Management System

Course Objectives:

1. To learn and understand Database Modeling, Architectures.
2. To learn and understand Advanced Database Programming Frameworks.
3. To learn NoSQL Databases (Open source) such as MongoDB.
4. To design and develop application using NoSQL Database.
5. To design data warehouse schema for given system.

Course Outcomes:

On completion of the course, students will be able to

CO1: Understand Advanced Database Programming Languages.

CO2: Master the basic concepts of NoSQL Databases.

CO3: Install and configure database systems.

CO4: Populate and query a database using MongoDB commands.

CO5: Design data warehouse schema of any one real-time: CASE STUDYC

CO6: Develop small application with NoSQL Database for back-end.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

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

Guidelines for Lab /TW Assessment

1. Examiners will assess the student based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member.
3. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student's programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Laboratory Conduction

1. Group A assignments are compulsory and should be performed by individual student.
2. Group B case study may be performed in group of 3/4.
3. Mini project of Group C can be implemented using any suitable front-end. But back-end must be MongoDB.

Guidelines for Practical Examination

1. Practical Examination will be based on the all topics covered.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.

List of Laboratory Assignments

Group A : MongoDB

1. Create a database with suitable example using MongoDB and implement

- Inserting and saving document (batch insert, insert validation)
- Removing document
- Updating document (document replacement, using modifiers, up inserts, updating multipledocuments, returning updated documents)
- Execute at least 10 queries on any suitable MongoDB database that demonstrates following:
  - Find and find One (specific values)
  - Query criteria (Query conditionals, OR queries, $not, Conditional semantics)
  - Type-specific queries (Null, Regular expression, Querying arrays)
  - $ where queries
  - Cursors (Limit, skip, sort, advanced query options)

2. Implement Map-reduce and aggregation, indexing with suitable example in MongoDB. Demonstrate the following:

- Aggregation framework
- Create and drop different types of indexes and explain () to show the advantage of the indexes.

3. Case Study: Design conceptual model using Star and Snowflake schema for any one database.

4. Mini Project

Pre-requisite: Build the mini project based on the requirement document and design prepared as a part of Database Management Lab in second year.

1. Form teams of around 3 to 4 people.

2. Develop the application:

Build a suitable GUI by using forms and placing the controls on it for any application. Proper data entry validations are expected.

Add the database connection with front end. Implement the basic CRUD operations.

3. Prepare and submit report to include: Title of the Project, Abstract, List the hardware and software requirements at the backend and at the front end, Source Code , Graphical User Interface, Conclusion.

Reference Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 6thEdition, McGraw Hill Publishers, ISBN 0-07-120413-X.

2. Kristina Chodorow, MongoDB The definitive guide, O'Reilly Publications, ISBN:978-93-5110-269-4,2nd Edition.

3. Jiawei Han, Micheline Kamber, Jian Pei "Data Mining: concepts and techniques", 2nd Edition, Publisher: Elsevier/Morgan Kaufmann.

4. http://nosql-database.org/.

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314448 (C) : Laboratory Practice-I (Design Thinking)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credits	PR : 25 Marks TW: 25 Marks

Prerequisites: NA

Course Objectives:

1. To identify the opportunities and challenges for design thinking innovation and empathize And ideate for it.
2. To describe the solution by prototyping the design.

Course Outcomes:

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

CO1: Frame and Design Challenge by performing STEEP Analysis, Conduct Interviews, design and ask 5x Why and 5W+H questions.

CO2: Demonstrate the activities to empathize with the users by creation of Empathy Map, Persona Development, Customer Journey Map.

CO3: Define and ideate process of design thinking and perform brainstorming, selection of ideas, create a storyboard and design paper prototyping or digital prototyping for chosen design challenge.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

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

Guidelines for Lab /TW Assessment

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

HOME

Guidelines for Laboratory Conduction

1. Students should be asked to form a group of 3 to 4 students and identify design challenge to provide the solution to real life engineering problems within the social, environmental and economic context.
2. All the assignments should be conducted using the templates provided in the reference books.
3. The faculty member should help student to identify Online free or open source tools like diagrams.net, LucidChart, Draw.io, Creatly, Openboard, Microsoft whiteboard etc. which will help students to collaborate and draw diagram.
4. After every assignment, student group should be asked to demonstrate their design and discuss findings.

Guidelines for Practical Examination

1. Students will be provided with 2 problem statements options covering the detail design challenge statements and student will have to perform any one.
2. All the problem statements carry equal weightage.

List of Laboratory Assignments

Group A- CO1, C02,CO3

Assignment-I- Inspiration Phase:
Perform STEEP analysis by using MAKING SENSE OF STEEP ANALYSIS & STRATEGIC PRIORITIES TEMPLATE and Frame Your Design Challenge. Conduct Interviews, design and ask 5x Why and 5W+H questions

Assignment-II-Empathize Phase:
Observe the user and design Empathy Map, Generate persona/User profile and Customer Journey map

Assignment-III- Define and Ideate:
Share Stories and learning from research- Cluster Insights into themes, Create Insights statements, create 'How might we' questions

Assignment-IV Prototype Phase:
Brainstorm, select your ideas, create a storyboard, determine what to prototype, start prototyping, Design Paper Prototype/digital Prototype, test your prototype and get feedback, Create your Action plan, create pitch, share your solution, perform reflection

Reference Books:

1. Michael Lewrick, Patrick Link, Larry Leifer , "The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods", March 2020 edition, ISBN: 978-1-119-62921-4, WILEY Publication.
2. Mr Lee Chong Hwa (Lead Facilitator), "The Design Thinking: Guidebook"
3. IDEO (Firm), "The Field Guide to Human-centered Design: Design Kit", 1st edition, ISBN-978099140631-9, IDEO 2015.
4. https://www.innovationtraining.org/

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314448 (D) : Laboratory Practice-I (Internet of Things)

Teaching Scheme:	Credit Scheme	Examination Scheme:
Practical (PR) :4 hrs/week	02 Credits	TW: 25 Marks PR: 25 Marks

HOME

Prerequisites:

1. Programming Skill Development Lab.

Course Objectives :

1. To learn interfacing of sensor and actuators using Arduino Uno/Raspberry Pi
2. To learn and understand IoT platforms and its significance for real time applications
3. To learn and understand the steps involved in python programming for IoT applications

Course Outcomes:

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

CO1: Design and implement real time applications with sensors and actuators.

CO2: Design and develop real time IoT based application by cloud interfacing.

Guidelines for Instructor's Manual

Faculty Member should prepare lab manual by taking the review of latest IoT devices with specifications and made it available for students/Lab assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work after the completion of entire assignment, only.
2. Practical Examination will be fully based on entire assignment set as per the given instructor manual.
3. Student should know the theory involved in the experiment.
4. Student will be eligible for practical examination only after the submission of term work in stipulated time.

Guidelines for Lab /TW Assessment

1. Instructor/Examiners will assess the student only based on performance of students considering the parameters such as timely submission of assignment, use of proper methodology for implementation of assignment.
2. Student must have appropriate basics and fundamental of software and hardware usage and its relevance with submitted assignment. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal andthe same will be submitted for future reference to Lab Instructor.

Guidelines for Laboratory Conduction

1. All assignments are compulsory and should be performed by individual student.

Guidelines for Practical Examination

1. Practical Examination will be fully based on entire laboratory assignments.
2. Examiners will judge the students based on practical performed in the examination and by asking some questions related to implementation of experiments, which he/she has carried out.

Group A

1. Design and implement IoT system using Arduino Uno/ Raspberry Pi using 'Ultrasonic sensor and Servo motor' such as 'Door opener in home automation'.
2. Design and implement parameter monitoring IoT system keeping records on Cloud such as 'environment humidity and temperature monitoring'.
3. Design and implement real time monitoring system using android phone (Blynk App.) such as'soil parameter monitoring'.
4. Design and implement IoT system for one of the applications like: Traffic Application, Medical/Health application, Social Application etc.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach" , 2014, Universities Press (India) Pvt Ltd., ISBN: 9788173719547
2. Matt Richardson & Shawn Wallac, "Getting Started with Raspberry Pi", 2014, O'Reilly (SPD), ISBN: 9789350239759
3. Rushi Gajjar, "Raspberry Pi Sensors", 2015, Packt Publishing, ISBN : 978-1-78439-361-8

Reference Books:

1. Peter Waher, "Learning Internet of Things", 2015, Packt Publishing, ISBN: 978-1-78355-353-2
2. Simon Monk, "Raspberry Pi Cookbook, Software and Hardware Problems and solutions", 2019, O'Reilly, ISBN 9781492043225
3. Simon Monk,"Programming Arduino-Getting Started with Sketches", 2012, ISBN: 978-0-07-178423-8, McGraw Hill

E- Books / E- Learning References :

1. Introduction to Arduino and its Setup : https://www.arduino.cc/en/software
2. Introduction to Raspberry Pi and its OS (Raspbian Lit) : https://www.raspberrypi.org/software/operating-systems/
3. Introduction to header files and support : https://github.com/
   Cloud for IoT - ThingSpeak : https://thingspeak.com/
4. Cloud for IoT - Ubidots : https://ubidots.com/stem/
5. Overall IoT Course Contents: https://onlinecourses.nptel.ac.in/noc21_cs17/preview

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314449 : Seminar

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 01 hrs/week	01 Credits	TW : 50 Marks

HOME

Prerequisites:

1. Project Based Learning
2. Software Engineering

Course Objectives:

Seminar should make the student attain skills like:

1. To gather the literature of specific area in a focused manner.
2. To summarize the literature to find state-of-the-art in proposed area.
3. To identify scope for future work.
4. To present the case for the intended work to be done as project.
5. To report literature review and proposed work in scientific way.

Course Outcomes:

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

CO1: Understand, interpret and summarize technical literature.

CO2: Demonstrate the techniques used in the paper.

CO3: Distinguish the various techniques required to accomplish the task. CO4: Identify intended future work based on the technical review.

CO5: Prepare and present the content through various presentation tools and techniques in effective manner.

CO6: Keep audience engaged through improved interpersonal skills.

Guidelines for Seminar Selection and Presentation

1) Student shall identify the area or topics in Information Technology referring to recent trends and developments in consultation with industry (for their requirement) and institute guide.
2) Student must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc.) in relevant area on their topic as decided.
3) Seminar topics should be based on recent trends and developments. Guide should approve the topic by thoughtfully observing different techniques, comparative analysis of the earlier algorithms used or specific tools used by various researchers in the domain.
4) Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI orfrom freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, JRD Tata Memorial Library, citeseerx.ist.psu.edu, getcited.org, arizona.openrepository.com, Open J-Gate, Research Gate, worldwidescience.org etc.
5) Student shall present the study as individual seminars in 20 – 25 minutes in English which is followed by Question Answer session.
6) Guide should ensure that students are doing literature survey and review in proper manner.
7) Guide should give appropriate instructions for effective presentation.
8) Attendance of all other students in the class for presentation is mandatory.

Timeline is suggested to follow throughout the semester:

1) **Week– 01:** Discussion to understand what is technical paper, how to search, where to search?
2) **Week– 02:** Download technical papers (minimum four), getting approved from Guide and Prepare abstract summary of all papers downloaded.
3) **Week– 03 & 04:** Read and understand in detail the decided research papers about the problem statement, techniques used, experimental details and results with conclusion from identified papers.
4) **Week– 05:** Review of the studied papers by Guide / Panel.
5) **Week – 06 & 07:** Search / Find equivalent techniques (other than the one proposed in technical paper) so performance / complexities can be improved (by amortized analysis, not actual implementation).
6) **Week – 08 & 09:** Prepare presentation with outline as The topic, its significance, The research problem, Studied solutions (through research papers) with strengths and weaknesses of each solution, comparison of the solutions to research problem, future directions of work, probable problem statement of project, tentative plan of project work
7) **Week – 10:** Write Seminar report.
8) **Week – 11:** Deliver Presentation to Guide/ Panel.
9) **Week –12:** Verification of Seminar report and Submission.

Guidelines for Seminar report

1. Each student shall submit two copies of the seminar report in appropriate text editing tool/software as per prescribed format duly signed by the guide and Head of the department/Principal.
2. Broad contents of review report (20-25 pages) shall be
   - **a)** Title Page with Title of the topic, Name of the candidate with Exam Seat Number / Roll Number, Name of the Guide, Name of the Department, Institution, Year & University.
   - **b)** Seminar Approval Sheet/Certificate.
   - **c)** Abstract and Keywords.
   - **d)** Acknowledgments.
   - **e)** Table of Contents, List of Figures, List of Tables and Nomenclature.
   - **f)** Chapters need to cover topic of discussion-
     - **i.** Introduction with section including organization of the report,
     - **ii.** Literature Survey
     - **iii.** Motivation, purpose and scope and objective of seminar
     - **iv.** Details of design/technology/Analytical and/or experimental work, if any/
     - **v.** Discussions and Conclusions,
     - **vi.** Bibliography/References (in IEEE Format),
     - **vii.** Plagiarism Check report,
3. Students are expected to use open source tools for writing seminar report, citing the references and plagiarism detection.

Guidelines for Lab /TW Assessment:

1. A panel of reviewers constituted by seminar coordinator (where guide is one of the member of the panel) will assess the seminar during the presentation.
2. Student's attendance for all seminars is advisable.
3. Rubric for evaluation of seminar activity:
   - **i.** Relevance of topic - 05 Marks
   - **ii.** Relevance + depth of literature reviewed - 10 Marks
   - **iii.** Seminar report (Technical Content) - 10 Marks
   - **iv.** Seminar report (Language) - 05 Marks
   - **v.** Presentation Slides - 05 Marks
   - **vi.** Presentation & Communication Skills - 05 Marks
   - **vii.** Question and Answers - 10 Marks

   TOTAL: **50 Marks**

Reference Book:

1. Andrea J. Rutherfoord, Basic Communication Skills for Technology, Pearson Education Asia, 2ndEdition.
2. Lesikar, Lesikar's Basic Business Communication, Tata McGraw, ISBN: 256083274, 1st Edition.

Text Book :

1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN: 130981745, 4thEdition.

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

Mandatory Audit Course 5

314450 (A) : Banking and Insurance

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 1 hrs/week	No Credits	Audit Course

HOME

Prerequisite Courses : If any

Course Objectives: -

1. To understand banking system in India.

2. To understand negotiable instruments.

3. To learn attributes of different types of insurance policies.

4. To create awareness about nature and functioning of annuities.

Course Outcomes: -

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

CO1: Differentiate between types of banks and their working.

CO2: Carry out banking transactions on their own.

CO3: Decide which insurance policy they should buy.

CO4: Handle investing in annuities and claim settlements.

COURSE CONTENTS

Unit I	INTRODUCTION TO BANKING	(03 hrs)

Definition of Bank - Basic functions of Banker

Banking System in India : Banker and Customer: Relationship between Banker and Customer, Special Types of Customers, Retail & Wholesale Banking, Deposit Accounts – Savings Accounts, Current Accounts, Fixed Deposit Accounts, Opening and operation of Accounts, Nomination, KYC requirements, Pass Book, Minors, Partnerships & Companies.

Mapping of Course Outcomes for Unit I	CO1

Unit II	BANK FUNDS AND INSTRUMENTS	(03 hrs)

Employment of Bank Funds: Liquid Assets-Cash in Hand, Cash with RBI & Cash with other Banks, Investment in securities, Advances - Secured and Unsecured, Loans, Term Loans, Cash Credit, Overdraft, Discounting of Bills of Exchange, Modes of creating charge on Securities, Types of Securities.

Negotiable Instruments: Definition & Characteristics of Cheques, Bills of Exchange & Promissory Notes, Crossings, Endorsements, Collection and payment of Cheques, Liabilities of Parties.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**INTRODUCTION TO INSURANCE**	**(03 hrs)**

Concept of Insurance, Need for Insurance.

Brief history of Insurance industry in India: (a) Enactment of Insurance Act, 1938. (b) Nationalization of Life Insurance Companies in 1955. (c) Nationalization of General insurance Companies in 1972. (d) Malhotra Committee Report – Opening up of Insurance sector to Private Companies in 2000. (e) Setting up of Insurance Regulatory and Development Authority in 1999.

Life Insurance: Present Organizational set-up of Insurance Companies in India – L.I.C. and Private Companies with foreign joint ventures, selling Insurance through Agents and Banks.

Objectives of Life Insurance – Protection and Investment, Different types of Life Insurance Policies – Chief characteristics and similarity. Online vs Offline policies

Basic Pre-requites for Life Insurance – Insurable Interest and utmost Good Faith.

Procedure for taking a policy: (a) Selection of the Plan. (b) Consultation of Premium tables. (c) Filling up of Proposal Form. (d) Document regarding proof of age. (e) Important clauses of the Policy – eg. Suicide Clause. (f) Nomination

Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**ULIPs AND POLICY MATTERS**	**(03hrs)**

Annuities and Unit Linked Policies: Concept of Annuity, Objectives of Annuity, Procedure followed for obtaining Annuities, Meaning of Unit Linked Insurance Policies, Procedure for obtaining Unit linked insurance Policies.

General Insurance: General Insurance companies, types of general insurance

Post - Issue Matters: Lapse of the Policy due to Non-Payment of Premium, Revival of the Lapsed Policies, Surrender of the Policy – Payment of surrender value, Assignment of the Policies, Settlement of claims – Procedure to be followed.

Mapping of Course Outcomes for Unit IV	**CO4**

Text Books:

1. Sunil Kumar, Essentials of Banking and Insurance, JSR PUBLISHING HOUSE LLP; 2ndEd edition, ISBN-10 :938768461X.
2. D.D. Chaturvedi, Arun Mittal, Saumya Chaturvedi, Banking and Insurance, Scholar Tech Press, ASIN : B08S3H36K1

E- Books / E- Learning References:

1. https://onlinecourses.swayam2.ac.in/cec21_ge04/preview

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

Mandatory Audit Course 5

314450 (B) : Startup Ecosystems

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 1 hrs/week	No Credits	Audit Course

Prerequisite Courses: NA

Course Objectives:

To familiarize students-

1. New venture creation opportunities, its resources, and requirements for Enterprise Startup
2. Legal requirements for new ventures
3. Financial issues and strategies related to startups

Course Outcomes:

completion of the course, students will be able to–

CO1: Identify Startup opportunities

CO2: Explain legal and other requirements for new ventures

CO3: Analyze financial Issues of startups

COURSE CONTENTS

Unit I	STARTUP OPPORTUNITIES	(04 hrs)

Current industrial revolution, Idea Generation with brainstorming, Business Startup, ideation, choices of venture, the rise of Startup economy, forces of change, startup equation, the entrepreneurial ecosystem, Indian government initiatives, Entrepreneurship in India, Case Study: MEITY Startup Hub

Mapping of Course Outcomes for Unit I	CO1

Unit II	STARTUP ECOSYSTEM	(04 hrs)

Startups ecosystem: Support organizations, big companies, universities, funding organizations, service providers, research organizations, Startup development phases: Ideating, conception, committing, validating, scaling, establishing, Startup business partnering, Startup culture, Co-founders, FFF (Fools, friends and family), Angels

Mapping of Course Outcomes for Unit II	CO2

Unit III	STARTUP CAPITAL REQUIREMENTS AND LEGAL ENVIRONMENT	(04 hrs)

Identification of capital resource requirements of startup, estimating startup finance requirements, deciding a process map, Positioning the venture in the value chain – Framing risk reduction strategy, Startup financing metrics, Legal perspectives- New Ventures approval procedures- Taxes or duties payable for new ventures, Case Study: Technology Incubation and Development of Entrepreneurs (TIDE)

Mapping of Course Outcomes for Unit III	**CO3**

Text Books:

1. Kathleen R Allen, "Launching New Ventures, An Entrepreneurial Approach", Cengage Learning, 2016.
2. Anjan Raichaudhuri, Managing New Ventures Concepts and Cases, Prentice Hall International, 2010.
3. S.R. Bhowmik and M. Bhowmik, Entrepreneurship, New Age International, 2007.
4. Steven Fisher, Ja-nae Duane, The Startup Equation -A Visual Guidebook for Building Your Startup, Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.

Reference Books:

1. Donald F Kuratko, Jeffrey S. Hornsby, New Venture Management: The Entrepreneurs Road Map, 2e, Routledge, 2017.
2. Vijay Sathe, Corporate Entrepreneurship, 1e, Cambride, 2009.
3. Bruce R. Barringer, R.Duane Ireland, Entrepreneurship successfully, launching new ventures.Pearson,2019

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

Mandatory Audit Course 5

314450 (C) :Foreign Language- (Japanese Language-III)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) :1 hrs/week	Non Credit	Audit Course

HOME

Prerequisite Courses, if any:

1. Students must have already studied can read/write Hiragana and Katakana script
2. Students must have studied Japanese for beginners that includes the syllabus of Audit course Module 1 and 2

Course Objectives:

To familiarize students with-

1. Japan Market needs: To meet the needs of ever growing industry with respect to the Japanese language support.
2. Japanese Culture and Mindset: To get introduced to Japanese society and culture through language.
3. Career opportunities: To know more about Higher studies, Career opportunities in Japan / Japanese companies across the world.
4. Soft skills and self-development: To learn the manners, business culture and develop the confidence by gaining the knowledge of global perspective and cross-cultural studies.

Course Outcomes:

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

CO1: Ability of basic communication.

CO2: Knowledge of Japanese script (reading, writing and listening skills).

CO3: Knowledge about Japanese culture, life style, manners and etiquettes.

CO4: Develop interest to pursue professional Japanese Language course.

COURSE CONTENTS

Unit I	JAPANESE-BEGINNERS LEVEL	(3 hrs Lecture + 3 hrs Self-study)

Greeting, Self-introduction, Nationality, Languages, Hiragana, Katakana rules, History of Kanji, Numbers, Days and Dates, Time, Age, Mobile number, Places, Relatives, Colors, Things, Vehicles. Introduction to grammar of basic particles, verbs and adjectives, Culture/Others: Business card exchange, Seasons and festivals in Japan, Kanjis: 1 to 10, Listening practice, Vocabulary and conversation practice.

Reference:

- **a.** Revision of beginner level studied in Module1-2
- **b.** Nihongo Challenge Kanji - Lesson 1

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**JAPANESE SCRIPT**	
Introduction to Demonstrative pronouns (ko-so-a-do),Asking/requesting for something, Making sentences using various question words, Stating/asking age, nationality, profession ,Culture/Others: Information about Japanese standardized test (JLPT, NAT etc.),Kanjis:11 to 20,Listening practice Vocabulary and conversation practice. Reference: **a.** Minna no Nihongo I: Lesson 1 and 2 (Text book + Audio and Video) **b.** Nihongo Challenge Kanji - Lesson 2		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**BASIC JAPANESE GRAMMAR**	**(3 hrs Lecture + 3 hrs Self-study)**
Conversation at the shop, asking price, location, Telling time and scheduling tasks, Introduction to Verb groups (root, present, past, negative), Culture/Others: Conversation and Behavior at the shop, How to buy train tickets, Train manners, Introduction to social issues and Japanese society,Kanjis:21to 30,Listening practice Vocabulary and conversation practice. Reference: **a.** Minna no Nihongo I : Lesson 3 and 4 (Text book + Audio and Video) **b.** Nihongo Challenge Kanji - Lesson 3		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**JAPANESE FOR DAILY COMMUNICATION**	**(3 hrs Lecture + 3 hrs Self-study)**
Directions and heading towards (use of particle de, he and relevant vocabulary) , Actions (use of particle wo and relevant vocabulary),Types of adjectives (root, negative, past, past negative),Culture/Others: Party, gifts related conversation, Gifting culture in Japan, Introduction to Japanese economy and market needs ,Kanjis:31 to 40,Listening practice, Vocabulary and conversation practice. Reference: **a.** Minna no Nihongo I : Lesson 5 and 6 (Text book + Audio and Video) **b.** Nihongo Challenge Kanji - Lesson 4		

Mapping of Course Outcomes for Unit IV	**CO4**

Text Books:

1. Minna no Nihongo I –Main Text book with audio and video files (Books by Goyal Publishers - Available in shops / Online)
2. Minna no Nihongo - Translation and grammatical notes for self-study (Books by Goyal Publishers - Available in shops / Online)
3. Nihongo Challenge – Kanji (Available with Japanese Language schools/teachers)

Reference Books:

1. Nihongo Shoho: For better understanding and practice of Basic Japanese Grammar
2. Marugoto : For scenario based Japanese conversation practice

E -Books / E- Learning References :

1. nihongo ichiban
   a. https://nihongoichiban.com/home/jlpt-n5-study-material/
2. jlpt sensei
   a. https://jlptsensei.com/how-to-pass-jlpt-n5-study-guide/

SEMESTER – VI

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314451: Computer Network and Security

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Basics of Computer Network

Companion Course:

1. Cyber Security

Course Objectives:

To familiarize students with-

1. The application layer services, responsibilities and protocol.
2. Fathom wireless network and different wireless standards
3. Differences in different wireless networks and to learn different mechanism used at layers of wireless network.
4. The concept of network security.
5. Basic cryptographic techniques in application development.
6. Cyber security vulnerabilities & study typical threats to modern digital systems.

Course Outcomes:

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

CO1: Know Responsibilities, services offered and protocol used at application layer of network

CO2: Understand wireless network and different wireless standards.

CO3: Recognize the Adhoc Network's MAC layer, routing protocol and Sensor networkarchitecture.

CO4: Define the principal concepts of network security and Understand network security threats,security services, and countermeasures

CO5: Apply basic cryptographic techniques in application development.

CO6: Gain a good comprehension of the landscape of cyber security Vulnerabilities & describe typical threats to modern digital systems.

COURSE CONTENTS

Unit I	APPLICATION LAYER	(06 hrs)

Client Server Paradigm: Communication using TCP and UDP, Peer to Peer Paradigm, Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME, DHCP, TELNET.

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**WIRELESS STANDARDS**	**(06 hrs)**
Wireless LANs: Fundamentals of WLAN, Design goals, Characteristics, Network Architecture, IEEE 802.11: components in IEEE 802.11 network, Physical Layer, **MAC Sub Layers :** DCF, PCF, Hidden and exposed station problem, Frame format, Addressing Mechanism, IEEE 802.15.1 **Bluetooth:** Architecture, Layers, operational states, **IEEE 802.16 WiMax:** Services, Architecture, Layers, comparisonbetween Bluetooth, IEEE 802.11 and IEEE 802.16.		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**ADHOC AND WSN**	**(06 hrs)**
Infrastructure Network and Infrastructure-less Wireless Networks, Issues in Adhoc Wireless Network, Adhoc Network MAC Layer: Design Issues, Design Goal, Classification, MACAW, **Adhoc Network Routing Layer:** Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks – Classifications of Routing Protocols, DSDV, AODV, DSR, **Applications of Sensor Network**, Comparison with Ad Hoc Wireless Network, Sensor node architecture Issues and Challenges in Designing a Sensor Network, Classification of sensor network protocols, SENSOR NETWORK ARCHITECTURE: Layered Architecture, Clustered Architecture,		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**INTRODUCTION TO NETWORK SECURITY**	**(06 hrs)**
Importance and Need for Security, Network Attacks- Passive, Active Network Security Threats: Unauthorized access, Distributed Denial of Service (DDoS) attacks, Man in the middle attacks, **Concept of Security Principles:** Confidentiality and Privacy , Authentication, Authorization and Access Control, Integrity, Non- repudiation, Stream Ciphers: Substitution Cipher – Mono alphabetic Cipher, Polyalphabetic Substitution Cipher., Transposition Cipher: Rail-Fence **Block Ciphers modes:** Electronic Code Book (ECB) Mode., Cipher Block Chaining (CBC) Mode., Cipher Feedback Mode (CFB) , Output Feedback (OFB) Mode.		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**CRYPTOGRAPHIC ALGORITHM**	**(06 hrs)**
Mathematical preliminaries: Groups, Rings, Fields, Prime numbers, Symmetric key algorithms: Data Encryption Standards, Advanced Encryption Standard, **Public Key Encryption and Hash function:** RSA, Digital signatures, Digital Certificates and Public Key Infrastructure: Private Key Management, Diffie-Hellman key exchange, The PKIX Model		

Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**INTRODUCTION TO CYBER SECURITY**	**(06 hrs)**
Introduction to Cyber Security: Basic Cyber Security Concepts, Layers of security, Vulnerability,Threat, Harmful Acts-Malware, Phishing, MIM Attack, DOS Attack, SQL Injection, Internet Governance – Challenges and Constraints, Computer Criminals, Assets and Threat, Motive of Attackers, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber Stalking, Cyber Terrorism, Cyber Espionage, Comprehensive Cyber Security Policy		
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. C. Siva Ram Murthy, B. S. Manoj, Adhoc Wireless Networks: Architecture and Protocols,Pearson Education, ISBN: 978-81-317-0688-6, 1st Edition.
3. Atul Kahate Cryptography and Network Security, 3e, McGraw Hill Education,
4. B. A. Forouzan Cryptography and Network Security McGraw Hill Education
5. William Stallings Cryptography and Network Security: Principles and Practice, 4th Edition.
6. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

Reference Books:

1. Kazem Sohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Networks: Technology, Protocolsand Applications, Wiley India, ISBN: 9788126527304
2. Schneir, Bruce, "Applied Cryptography: Protocols and Algorithms"
3. Charles E. Perkins, Adhoc Networking, Pearson Education, 978-81-317-2096-7
4. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3.
5. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878-
6. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN- 978-81-203-5082-3

E- Books / E- Learning References :

1. https://nptel.ac.in/courses/106/105/106105160/
2. https://nptel.ac.in/courses/106/105/106105031/
3. An Introduction to Cyber Security A Beginner's Guide

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314452: Data Science and Big Data Analytics

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) :03 Hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisites:

1. Engineering and discrete mathematics.
2. Database Management Systems, Data warehousing and Data mining.
3. Programming skill.

Companion Course:

1. Machine Learning
2. Advance Database Management

Course Objectives:

1. To introduce basic need of Big Data and Data science to handle huge amount of data.
2. To understand the basic mathematics behind the Big data.
3. To understand the different Big data processing technologies.
4. To understand and apply the Analytical concept of Big data using Python.
5. To visualize the Big Data using different tools.
6. To understand the application and impact of Big Data.

Course Outcomes:

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

CO1: Understand Big Data primitives.
CO2: Learn and apply different mathematical models for Big Data.
CO3: Demonstrate Big Data learning skills by developing industry or research applications.
CO4: Analyze and apply each learning model comes from a different algorithmic approach and it will perform differently under different datasets.
CO5: Understand, apply and analyze needs, challenges and techniques for big data visualization.
CO6: Learn different programming platforms for big data analytics.

COURSE CONTENTS

Unit I	INTRODUCTION: DATA SCIENCE AND BIG DATA	(06 Hrs)

Introduction to Data science and Big Data, Defining Data science and Big Data, Big Data examples, **Data Explosion:** Data Volume, Data Variety, Data Velocity and Veracity. Big data infrastructure and challenges, **Big Data Processing Architectures:** Data Warehouse, Re-Engineering the Data Warehouse, shared everything and shared nothing architecture, Big data learning approaches. **Data Science** – The Big Picture: Relation between AI, Statistical Learning, Machine Learning , Data Mining and Big Data Analytics.

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**MATHEMATICAL FOUNDATION OF BIG DATA**	**(07 Hrs)**
Probability: Random Variables and Joint Probability, Conditional Probability and concept of Markov chains, Tail bounds, Markov chains and random walks, Pair-wise independence and universal hashing, Approximate counting, Approximate median. **Data Streaming Models and Statistical Methods:** Flajolet Martin algorithm, Distance Sampling and Random Projections, Bloom filters, Mode, Variance, standard deviation, Correlation analysis and Analysis of Variance.		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**BIG DATA PROCESSING**	**(06 Hrs)**
Big Data Analytics- Ecosystem and Technologies, Introduction to Google file system, Hadoop Architecture, **Hadoop Storage:** HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration, Introduction to NOSQL, Textual ETL processing.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**BIG DATA ANALYTICS**	**(06 Hrs)**
Big Data Analytics- Architecture and Life Cycle, Types of analysis, Analytical approaches, Data Analytics with Mathematical manipulations, Data Ingestion from different sources (CSV, JSON, html, Excel, mongoDB, mysql, sqlite), Data cleaning, Handling missing values, data imputation, Data transformation, Data Standardization, handling categorical data with 2 and more categories, statistical and graphical analysis methods, Hive Data Analytics.		
Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**BIG DATA VISUALIZATION**	**(06 Hrs)**
Introduction to Data visualization, Challenges to Big data visualization, Conventional datavisualization tools, Techniques for visual data representations, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Propriety Data Visualization tools, Open – source data visualization tools, **Case Study:** Analysis of a business problem of Zomato using visualization, Analytical techniques used in Big data visualization, Data Visualization using Tableau Introduction to: Candela, D3.js, Google Chart API		

Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**BIG DATA TECHNOLOGIES APPLICATION AND IMPACT**	**(05 Hrs)**
Social media analytics, Text mining, Mobile analytics, Data analytics life cycle of case studies, Organizational impact, understanding decision theory, creating big data strategy, big data value creation drivers, Michael Porter's valuation creation models, Big data user experience ramifications, Identifying big data use cases, Big Data Analytics Challenges and Research directions.		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition.
2. DT Editorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016Edition.

Reference Books:

1. Mitzenmacher and Upfal, Probability and Computing: Randomized Algorithms and ProbabilisticAnalysis, Cambridge University press, ISBN :521835402 .
2. Dana Ron, Algorithmic and Analysis Techniques in Property Testing, School of EE.
3. Graham Cormode, Minos Garofalakis, Peter J. Haas and Chris Jermaine, Synopses for Massive Data: Samples, Histograms, Wavelets, Sketches, Foundation and trends in databases, ISBN:10.1561/1900000004.
4. Alex Holmes, Hadoop in practice, Dreamtech press, ISBN:9781617292224.
5. AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends forToday's Business, Wiely CIO Series.
6. ArvindSathi, Big Data Analytics: Disruptive Technologies for Changing the Game, IBMCorporation, ISBN:978-1-58347-380-1.
7. EMC Education Services, Data Science and Big Data Analytics- Discovering, analyzing Visualizingand Presenting Data.
8. Li Chen, Zhixun Su, Bo Jiang, Mathematical Problems in Data Science, Springer, ISBN :978-3-319-25127-1.
9. Philip Kromer and Russell Jurney, Big Data for chips, O'Reilly, ISBN :9789352132447.
10. EMC Education services, Data Science and Big Data Analytics, EMC2 Wiley, ISBN :978812655653-
11. Mueller Massaron, Python for Data science, Wiley, ISBN :9788126557394.
12. EMC Education Services, Data Science and Big Data Analytics, Wiley India, ISBN:9788126556533
13. Benoy Antony, Konstantin Boudnik, Cheryl Adams,,Professional Hadoop, Wiley India,ISBN :9788126563029
14. Judith Hurwitz, Alan Nugent, Big Data For Dummies, Wiley India, ISBN : 9788126543281

E Books / E Learning References :
1. Zomato dataset Link: https://www.kaggle.com/shrutimehta/zomato-restaurants-data **2.** Link for dataset: https://www.kaggle.com/tanmoyie/us-graduate-schools-admission-parameters

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314453: Web Application Development

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Programming languages C++, Java.

Companion Course:

1. Advanced Database Management system
2. Design Thinking

Course Objectives: -

1. To familiarize students with Web Programming basic concepts
2. To learn and understand Web scripting languages.
3. To explore the Front end& Back end web programming skills.
4. To understand and learn Mobile web development.
5. To understand and learn Web application deployment.

Course Outcomes: -

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

CO1: Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap.
CO2: Demonstrate the use of web scripting languages.
CO3: Develop web application with Front End & Back End Technologies.
CO4: Develop mobile website using JQuery Mobile.
CO5: Deploy web application on cloud using AWS.

COURSE CONTENTS

Unit I	INTRODUCTION TO WEB TECHNOLOGIES	(06 hrs)

HTML: Getting started with HTML, Why HTML, Tags and Elements, Attributes, Properties, Headings list, Links, Tables, Images, HTML Form, Media (Audio, Video), Semantic HTML5 Elements.

CSS: Why CSS, Types of CSS, How to use CSS, Properties, Classes, Child-Class (Nested CSS), Colors, Text, Background, Border, Margin, Padding, Positioning (flex, grid, inline, block), Animation, Transition.

BOOTSTRAP: Why Bootstrap, CSS over Bootstrap, How to Use Bootstrap, Bootstrap Grid System, Bootstrap Responsive, Bootstrap Classes, Bootstrap Components (i.e., Button, Table, List, etc.),Bootstrap as a Cross Platform.

W3C: What is W3C , How W3C handles/Supports Web Technologies.

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**WEB SCRIPTING LANGUAGES**	**(06 hrs)**

JavaScript: Introduction to Scripting languages, Introduction to JavaScript (JS), JS Variables and Constants, JS Variable Scopes, JS Data Types, JS Functions, JS Array, JS Object, JS Events.

Advanced JavaScript: JSON - JSON Create, Key-Value Pair, JSON Access, JSON Array, JS Arrow Functions, JS Callback Functions, JS Promises, JS Async-Await Functions, JS Error Handling.

AJAX: Why AJAX, Call HTTP Methods Using AJAX, Data Sending, Data Receiving, AJAX Error Handling.

JQUERY : Why JQuery, How to Use, DOM Manipulation with JQuery, Dynamic Content Change with JQuery, UI Design Using JQuery.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**FRONT END TECHNOLOGIES**	**(06 hrs)**

Front-End Frameworks: What is web framework? Why Web Framework? Web Framework Types.

MVC: What is MVC, MVC Architecture, MVC in Practical, MVC in Web Frameworks.

TypeScript: Introduction to TypeScript (TS), Variables and Constants, Modules in TS.

AngularVersion 10+: Angular CLI, Angular Architecture, Angular Project Structure, Angular Lifecycle, Angular Modules, Angular Components, Angular Data Binding, Directives and Pipes, Angular Services and Dependency Injections (DI), Angular Routers, Angular Forms.

ReactJS: Introduction to ReactJS, React Components, Inter Components Communication, Components Styling, Routing, Redux- Architecture, Hooks- Basic hooks, useState() hook, useEffect() hook, useContext() hook.

Mapping of Course Outcomes For Unit III	**CO3**	
Unit IV	**BACK END TECHNOLOGIES**	**(06 hrs)**

Node.JS: Introduction to Node.JS, Environment Setup, Node.JS Events, Node.JS Functions, Node.JS Built-in Modules, File System, NPM, Install External Modules, Handling Data I/O in Node.JS, Create HTTP Server, Create Socket Server, Microservices- PM2.

ExpressJS: Introduction to ExpressJS, Configure Routes, Template Engines, ExpressJS as Middleware, Serving Static Files, REST HTTP Method APIs, Applying Basic HTTP Authentication, Implement Session Authentication.

MongoDB: NoSQL and MongoDB Basics, MongoDB-Node.JS Communication, CURD Operations using Node.JS, Mongoose ODM for Middleware, Advanced MongoDB.

Mapping of Course Outcomes for Unit IV	**CO3**	
Unit V	**MOBILE WEB DEVELOPMENT**	**(06 hrs)**
Mobile-First: What is Mobile-First? What is Mobile Web? Understanding Mobile Devices and Desktop. **JQuery Mobile:** Introduction to the jQuery Mobile Framework, Set-up jQuery Mobile, Pages, Icons, Transitions, Layouts Widgets, Events, Forms, Themes, Formatting Lists, Header and Footer, CSS Classes, Data Attributes, Building a Simple Mobile Webpage.		
Mapping of Course Outcomes for Unit V	**CO4**	
Unit VI	**WEB APPLICATION DEPLOYMENT**	**(06 hrs)**
Cloud: AWS Cloud, AWS Elastic Compute, AWS Elastic Load Balancer and its types, AWS VPC and Component of VPC, AWS storage, Deploy Website or Web Application on AWS, Launch an Application with AWS Elastic Beanstalk.		
Mapping of Course Outcomes for Unit VI	**CO5**	

Text Books:

1. Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook, Dreamtech Press, Second Edition, ISBN: 9788177228496.

2. Raymond Camden, Andy Matthews, JQuery Mobile Web Development Essentials, Packt Publishing, Second Edition, 9781782167891.

Reference Books:

1. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition,978- 81-265-1635-3

2. Dr.HirenJoshi, Web Technology and Application Development, DreamTech, First,ISBN:978-93-5004-088-1

3. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition,978- 81-265-1635-3

4. Ivan Bayross,”Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,BPB Publications,4th Edition,ISBN:978-8183330084.

5. Brain Fling, Mobile Design and Development, O'REILLY, First Edition, ISBN: 13:978-81- 8404-817-9

6. Adam Bretz& Colin J Ihrig, Full Stack Javascript Development with MEAN, SPD, First Edition, ISBN:978-0992461256.

7. JavaScript: The Definitive Guide - Master The World's Most-Used Programming Language, Seventh Edition

8. Java Script, D.Flanagan, O’Reilly, SPD.

9. Programming Typescript: Making Your JavaScript Applications Scale, Boris Cherny

E- Books / E- Learning References :

1. Learning Amazon Web Services AWS - A Hands-on Guide to the Fundamentals of AWS Cloud Author: Mark Wilkins.
2. https://www.meanacademy.in/web-technologies
3. https://www.meanacademy.in/angular
4. https://www.meanacademy.in/ mongodb
5. https://www.meanacademy.in/ nodejs
6. https://www.meanacademy.in/ aws
7. https://www.w3schools.com/Css
8. https://www.javatpoint.com/angularjs-tutorial
9. https://www.tutorialspoint.com/reactjs/index.htm
10. https://www.tutorialspoint.com/web_development_tutorials.htm
11. https://www.tutorialspoint.com/angular_material/index.htm
12. https://www.javaguides.net/2020/07/angular-10-example-tutorial.html
13. https://www.javatpoint.com/reactjs-tutorial
14. https://www.tutorialspoint.com/jquery_mobile/index.htm
15. https://www.tutorialspoint.com/nodejs/index.htm
16. https://www.tutorialspoint.com/expressjs/index.htm
17. https://www.tutorialspoint.com/mongodb/index.htm
18. https://www.tutorialspoint.com/mongodb/mongodb_tutorial.pdf
19. https://www.tutorialspoint.com/ajax/index.htm.
20. https://www.udemy.com/ajax/online-course.

Savitribai Phule Pune Universisty, Pune
Third Year Information Technology (2019 Course)
314454 (A): Elective-II (Artificial Intelligence)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

HOME

Prerequisite Courses:

1. Discrete Mathematics, 2. Machine Learning, 3. Data Structures and Algorithms 4. Any Programming Knowledge (Java, Python)

Companion Course:

1. Lab Practice - II

Course Objectives:

1. To understand Fundamental concepts of Artificial Intelligence and different search strategies.
2. To explore Various knowledge representations and reasoning schemes.
3. To understand Fundamentals of NLP and Game Theory.
4. To explore of AI applications.

Course Outcomes:

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

CO1: Understand the fundamental concepts of Artificial Intelligence

CO2: Identify and apply appropriate search strategies for any AI problem

CO3: Explore knowledge reasoning and knowledge representation methods (for solving real world problems)

CO4: Analyze the suitable techniques of NLP to develop AI applications

CO5: Correlate the appropriate methods of Game Theory to design AI applications

CO6: Understand the concept of deep learning and AI applications

COURSE CONTENTS

Unit I	INTRODUCTION TO AI And SEARCH	(06 hrs)

Artificial Intelligence: Introduction, Components of Artificial Intelligence, Characteristics of Artificial Intelligence Systems, Intelligent Agents, Types of Intelligent Agents

Statistical Analysis: Correlation coefficient, Rank Correlation, Residual Error, Mean Square Error, RMSE, Probability Distributions, Concept of Discrete PD and Continuous PD

Search Strategies: Problem spaces (states, goals and operators), problem solving by search, Uninformed search (breadth-first, depth-first, depth first with iterative deepening)

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**PROBLEM SOLVING**	**(06 hrs)**
Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best-first Search; Problem Reduction. **Constraint Satisfaction problem:** Interference in CSPs; Backtracking search for CSPs; Local Search for CSPs; structure of CSP Problem. **Beyond Classical Search:** Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments.		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**KNOWLEDGE REPRESENTATION AND REASONING**	**(06 hrs)**
Knowledge Representation: Introduction to Knowledge Representation, Knowledge agent, Predicate logic, WFF, Inference rule & theorem proving: forward chaining, backward chaining, resolution; Propositional knowledge, Boolean circuit agents. Rule Based Systems, **Knowledge Reasoning:** Forward reasoning: Conflict resolution, backward reasoning: Use of backtracking, **Structured Knowledge Reasoning:** Semantic Net - slots, inheritance, Frames- exceptions and defaults attached predicates, Conceptual Dependency formalism, **Reasoning Under Uncertainty:** Source of Uncertainty, Probabilistic Reasoning and Uncertainty; Probability theory; Bayes Theorem and Bayesian networks, Certainty Factor, Dempster-Shafer theory, Non Monotonic Reasoning, Truth maintenance Systems, Overview of Fuzzy Logic.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**UNDERSTANDING Of NLP**	**(06 hrs)**
Introduction: What is NLP, Steps in Natural Language Processing, Syntactic Analysis(Parsing): Grammars and Parsers, Augmented Transition Networks, Unification grammars **Semantic Analysis:** Semantic grammar, Case grammars, Conceptual parsing, Approximately Compositional Semantic Interpretation. **Discourse and Pragmatic Processing:** Using focus in Understanding, Modeling Beliefs, Using Goals and Plans for Understanding, Speech Acts, Conversational Postulates Text classification (Spell Checking), Probabilistic Language Models, Implementation aspects of Syntactic Analysis(Parsing)		

Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**INTRODUCTION TO GAME THEORY**	**(06 hrs)**
Game Playing: Overview and Examples. **Domain: Overview**, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems.		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**RECENT AND FUTURE TRENDS IN AI**	**(06 hrs)**
Deep Learning: Introduction, Why to go deep? Architecture of Deep Network, Restricted Boltzmann Machines, Deep belief Network, Tensor Flow, Deep Learning libraries, Deep Learning platform, The no, Caffe, Deep Learning Use Cases. **Applications:** Overview of Artificial Intelligence Domains, AI-Robotics, AI-Neural Networks, AI-IOT, Computer Vision in AI **Case Studies:** Automatic Bird Identification using Deep Learning, Tukmur monitoring using Computer VIsion, Text to Speech Conversion using APIs		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Stuart Russel, Peter Norvig, “AI – A Modern Approach”, Third Edition, Pearson Education, 2009
2. Elaine Rich, Kevin Knight and Shivashankar B Nair, ”Artificial Intelligence “, Tata McGraw Hill Edition 3rd Edition, 2009
3. James Allen, Natural Language Understanding. Benjamin/Cummings, 2ed, 1995

Reference Books:

1. Algorithmic Game theory Edited by N Nishan, T Roughgarden; Cambridge University Press
2. Allen B. Downey, "Think Stats", Second Edition, O’Reilly Media, ISBN: 978-1-491-90733-7
3. Game Theory - D Fudenberg& J Tirole; MIT Press
4. K. Boyer, L. Stark, H. Bunke, “Applications of AI, Machine Vision and Robotics, World Scientific PubCo, 1995

E- Books / E- Learning References :

1. http://onlinestatbook.com/Online_Statistics_Education.pdf
2. https://london.ac.uk/sites/default/files/study-guides/introduction-to-natural-language-processing.pdf
3. https://www.deeplearningbook.org/contents/TOC.html
4. https://cvlesalfabegues.com/search/natural-language-understanding-2nd-edition/

SavitribaiPhule Pune University, Pune
Third Year Information Technology (2019 Course)
314454 (B): Elective-II (Cyber Security)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH): 3 hrs/week	03 Credit	Mid_ Semester: 30 Marks End_ Semester: 70 Marks

HOME

Prerequisite Courses: if Any

Companion Course:

1. Computer Networks & Security

Course Objectives:

1. To learn fundamental concepts of cyber security
2. To learn different types of threats and cyber-crimes.
3. To understand the basics cyber forensics, network forensics, Email forensics, web forensicsand crypto currency forensics.
4. To understand the basic digital forensics concepts and techniques for conducting the forensic examination on different digital devices.
5. To analyze how particular social engineering attacks take advantage of specific features ofthe Internet and of human nature.
6. To learn the IT laws and cyber-crime basics.

Course Outcomes:

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

CO1: To develop basic understanding of cyber security.

CO2: Differentiate among different types of cyber threats and cyber-crimes.

CO3: Illustrate cyber forensic techniques to identify the criminal activities.

CO4: Apply forensic analysis tools to recover important evidence for identifying computercrime

CO5: Distinguish and classify the forms of cybercriminal activity and the technological and social engineering' methods used to undertake such crimes

CO6: Evaluate the effectiveness of cyber-security, cyber-laws and other countermeasures against cybercrime

COURSE CONTENTS

Unit I	INTRODUCTION TO CYBER SECURITY	(06 hrs.)

Introduction: Introduction to Cyber Security, Need, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber-warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**CYBER CRIMES AND HACKING**	**(06 hrs)**
Overview of Cyber-Attacks and Vulnerabilities, **Types of Threats** – Malware, spyware, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors. **Types of Cyber Crime -** cyber stalking, forgery, software piracy, cyber terrorism, phishing, computer vandalism, computer hacking, creating and distributing viruses over internet, spamming, cross site scripting, online auction fraud, cyber-squatting, logic bombs, web jacking, internet time thefts, DoS attack, salami attack, data diddling, email spoofing. **Types of Hacker** Hacking and Cracking, Hacking: Ethical issues, Ethical Hacking.		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**CYBER FORENSICS**	**(06 hrs)**
Introduction to Cyber Forensics: What are cyber forensics, cyber forensics investigation process,digital evidence, challenges in cyber forensics; **Web Attack Forensics:** Intrusion forensics, database forensics, preventive forensics; Anti-forensics practices, Anti-forensics detection techniques, Network forensics analysis tools; **Malware Forensics:** Malware types, Malware Analysis, Tools for analysis; **Email Forensics:** e-mail Protocols, e-mail crimes, email forensics; Bitcoin **Forensics:** crypto currency, crimes related to bitcoin; **Case Study:** A detailed case study on cyber forensics and its Investigation Reports.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**DIGITAL FORENSICS**	**(06 hrs)**
Introduction to Digital Forensics, Cyber Forensics vs Digital Forensics, the role of digital forensics and its environment, Forensic Software and Hardware, properties of digital evidence, recovering and preserving digital evidence, Advanced forensic Tools, selecting and analyzing digital evidence, validating the evidence, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis **Case Study:** A detailed case study on Digital Forensics		
Mapping of Course Outcomes for Unit IV	**CO3, CO4**	
Unit V	**SOCIAL ENGINEERING**	**(06 hrs)**
Introduction of social engineering and cyber security, social engineering conceptual evolution, defining social engineering-categories, Phases, attack spiral model, Attack Vendors-social approach, socio-technical approach. Advanced social engineering attack, Phishing Attack, Insider Attack, Identity Theft, Preventing Insider Threats, Social Engineering Targets and Defense Strategies. Case Study: Phishing and Identity Theft Online Scams		

Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**CYBER ETHICS AND LAWS**	**(06 hrs.)**
Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under ISO 27001, IT Act 2000, Positive Aspects and weak areas of ITA 2000, **Digital signatures and the Indian ITA act**, ITA 2008, and International Standards maintained for Cyber Security, Security Audit, Investigation by Investing Agency, Intellectual Property Rights in Cyberspace.		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1
2. Practical Cyber Forensics an Incident-Based Approach to Forensic Investigations, Niranjan Reddy, Apress, ISBN-13: 978-1-4842-4459-3
3. Practical Digital forensics – Richard Boddingtion, PACKT Publishing ISBN 978-1-78588-710-9

Reference Books:

1. William Stallings, Computer Security: Principles and Practices, Pearson 6th Ed, ISBN: 978-0-13-335469-0
2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81- 315-1349-1
3. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN- 978-81-203-5082-3

E- Books / E- Learning References:

1. Z. Wang, L. Sun and H. Zhu, "Defining Social Engineering in Cyber security," in IEEE Access, vol.8, pp. 85094-85115, 2020, Doi: 10.1109/ACCESS.2020.2992807.
2. Eoghan Casey, “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet”, ELSVIER, May 2011, ISBN 978-0-12-374268-1

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314454 (C): Elective-II-(Cloud Computing)

HOME

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

Prerequisite Courses:

1. Basics of Computer Networks
2. Operating Systems

Course Objectives:

1. To provide students with the fundamentals and essentials of cloud computing
2. To learn basics of virtualization and its importance
3. To provide students a sound foundation of the cloud computing so that they are able to startusing and adopting cloud computing services and tools in their real life scenarios
4. To enable students exploring some important cloud computing driven commercial systems and applications
5. To understand cloud storage technologies and relevant file systems
6. To be exposed to Ubiquitous Cloud and Internet of Things

Course Outcomes:

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

CO1: Articulate the main concepts, key technologies and fundamentals of cloud computing.

CO2: Understand cloud enabling technologies and virtualization.

CO3: Analyze various cloud programming models and apply them to solve problems on the cloud.

CO4: Explain data storage and major security issues in the cloud.

CO5: Understand trends in ubiquitous cloud and internet of things.

CO6: Explore future trends of cloud computing.

COURSE CONTENTS

Unit I	FUNDAMENTALS Of CLOUD COMPUTING	(06 hrs)

Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Federated Cloud/Intercloud, Types of Clouds.

Mapping of Course Outcomes for Unit I	CO1

Unit II	CLOUD-ENABLING TECHNOLOGY AND VIRTUALIZATION	(06 hrs)

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**COMMON STANDARDS AND CLOUD PLATFORMS**	**(06 hrs)**

Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application **Developers:** Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.

Amazon web services: Compute services Storage Services Communication Services Additional services **Google AppEngine:** Architecture and core concepts, Application life cycle, Cost model

Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance

Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**DATA STORAGE AND SECURITY IN CLOUD**	**(06 hrs)**

Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Datastore and Simple DB Gautam Shrauf, Cloud Storage-Overview, Cloud Storage Providers.
Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.

Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**UBIQUITOUS CLOUDS AND THE INTERNET Of THINGS**	**(06 hrs)**

Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management, Cyber-Physical System), Online Social and Professional Networking.

Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**FUTURE OF CLOUD COMPUTING**	**(06 hrs)**

How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing. **Docker at a Glance:** Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, The Docker Workflow

Mapping of Course Outcomes for Unit VI	**CO6**

Text Books:

1. Thomas Erl, ZaighamMahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1 st Edition
2. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.

Reference Books:

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.
2. GautamShrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476
3. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.
4. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.
5. Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128.
6. Kris Jamsa, Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security, and More, Jones and Bartlett, ISBN :9789380853772.
7. John W. Ritting house, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press, ISBN : 978 1439806807, 1439806802.
8. Karl Matthias, Sean P. Kane, Docker: Up and Running, OReilly, ISBN:9781491917572,1491917571.
9. Barrie Sosinsky, Cloud Computing Bible, Wiley, ISBN: 978 8126529803.
10. Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.
11. Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson, OpenStack:Cloud Application Development, Wrox, ISBN :9781119194316.
12. KailashJayaswal, JagannathKallakurchi, Donald J. Houde, Cloud Computing Black Book ,Wiley Dreamtech,ISBN:9789351194187

SavitribaiPhule Pune University, Pune

Third Year Information Technology (2019 Course)

314454 (D): Elective –II (Software Modeling and Design)

HOME

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 3 hrs/week	03 Credit	Mid_Semester : 30 Marks End_Semester : 70 Marks

Prerequisite Courses:

1. Basic Knowledge of Object-oriented Programming
2. Software Engineering
3. DatabaseManagement System

Course Objectives:

1. To understand and use of UML to arrive at a design solution for real world problems.
2. To understand basics of object-oriented Modeling.
3. To learn Design concepts to Model for real world problems using object modeling.
4. To explore Interaction and behavior modeling.
5. To understand Software design principles and patterns.
6. To explore the architectural design guidelines in various type of application development.

Course Outcomes:

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

CO1: Understand basics of object oriented methodologies and Unified Modeling Language (UML).

CO2: Understand and apply analysis process, use case modeling, domain/class modeling

CO3: Design and apply interaction and behavior modeling on a given system.

CO4: Comprehend OO design process and business, access and view layer class design.

CO5: Recognize the software design principles and patterns to be applied on system.

CO6: Get started on study of architectural design principles and guidelines in the various type of application development.

COURSE CONTENTS

Unit I	INTRODUCTION TO OOM AND UML	(06 hrs)

Introduction to Object Oriented Methodology- Study of various design methodologies like Object Oriented Design by Booch, Object Modelling Techniques by Rumbaugh, Object-Oriented Analysis by Codd Yourdon and Object-Oriented Software Engineering by Ivar Jacobson

Unified Approach – Unification of Booch, Rumbaugh and Jacobson methodologies, Object - Oriented Analysis, Object Oriented Design, Iterative Development & Continuous Testing, Modellingbased on UML , Layered Approach

Unified Modeling Language – Introduction to Modeling and UML2.0, MDA, UML2.0 Structure, UML Building Blocks, UML common Mechanisms, Introduction to all UML2.0 Diagram notational Techniques, 4+1View

Mapping of Course	**CO1**	
Outcomes for Unit I		
Unit II	**OBJECT ORIENTED ANALYSIS**	**(06 hrs)**
Object Oriented Analysis Process : Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Case Identification, Uses/Include/Extend Association, Writing a formal use case, Forward Engineering (Use case realization) **Class Modeling:** Approach for identifying class, Approaches for identifying classes, Class pattern approach, Class Responsibilities, Collaboration Approach, Naming Classes, Class associations Generalization specialization relationship, Aggregation and Composition Relationships		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**INTERACTION AND BEHAVIOR MODELING**	**(06 hrs)**
Activity Diagram: Activity and Actions, Activity Edge, Decision and Merge Points, Fork-Join, Control Flow, Constraints on Action, Swim Lanes. **Sequence Diagram:** Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, delete object, Modelling Interactions. **Collaboration Diagram:** Objects and Links, Messages and stimuli, Active Objects, Communication Diagram,Iteration Expression, Parallel Execution, Guard Expression, Timing Diagram. **State Diagram:** State Machine, Triggers and Ports, Transitions and conditions, Initial and Final State, nestedstate, Composite States, Submachine States.		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**OBJECT ORIENTED DESIGN PROCESS**	**(hrs)**
Object Oriented Design Process: Designing Business Layer: Object Oriented Constraints Language (OCL), **Designing Business Classes:** The Process, Designing Well Defined Class Visibility, Attribute Refinement, Method Design Using UML Activity Diagram, Packaging and Managing Classes. **Designing Access Layer:** Object Relational Systems, Object Relation Mapping, Table Class Mapping,Table — Inherited Classes Mapping, Designing the Access Layer Classes: create mirror classes, identify access layer class relationships, eliminate redundant classes, create method classes. **Designing View Layer:** View Layer Classes Design, Identifying View Classes by Analyzing Use Cases, Macro-Level Design Process – identify view layer objects, and build prototype for view layer Interface. **Test Usability and User satisfaction:** Component and Deployment Design using Component and Deployment Diagram.		

Mapping of Course Outcomes for Unit IV	**CO4**	
Unit V	**SOFTWARE DESIGN PRINCIPLES AND PATTERNS**	**(06 hrs)**
Introduction and need of Design Principles: General Responsibility Assignment Software Patterns (GRASP): Introduction, Creator, Information Expert, Low coupling, Controller, High Cohesion, Polymorphism, Pure fabrication, Indirection, Protected Variations. **Introduction to GOF design patterns :** Types of design patterns: Creational Pattern: Singleton, Factory **Structural Pattern:** Adapter, Façade Behavioral Patterns: Strategy, State		
Mapping of Course Outcomes for Unit V	**CO5**	
Unit VI	**SOFTWARE ARCHITECTURAL DESIGN**	**(06 hrs)**
Anatomy of Software Architecture, Quality attributes in architecture design, Designing Object-Oriented Software Architecture, Designing Client/Server Software Architecture, Designing Service-Oriented Architectures, Designing Component-Based Software Architectures, Designing Concurrent and Real-Time Software Architectures. Product Line Architecture design		
Mapping of Course Outcomes for Unit VI	**CO6**	

Text Books:

1. Ali Bahrami, Object Oriented systems Development using Unified Modelling Language McGraw – Hill, International Editions 1999, ISBN: 0-07-1160090-6
2. Erich Gamma et al, Design Patterns: Elements of Reusable Object, Pearson, First Edition,ISBN:9789332555402, 9332555400
3. Erich Gamma et al, Design Patterns: Elements of Reusable Object, Pearson, First Edition, ISBN:9789332555402, 9332555400.

Reference Books:

1. Dan Pilone, Neil Pitman, UML in Nutshell, O'reilly Pub., ISBN:8184040024, 9788184040029.
2. Object-Oriented Analysis and Design with Applications, Third Edition by Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli Houston, 2007.
3. An introduction to Software Architecture by Shaw & Garlan, http://sunnyday.mit.edu/16.355/intro_softarch.pdf
4. Hassan Gomaa, Software Modeling And Design UML, Use Cases, Pattern, & Software Architectures, Cambridge University Press, ISBN: 978-0-521-76414-8.
5. JIM Arlow, Ila Neustadt, UML 2 and the Unified Process, Pearson, Second Edition, ISBN: 9788131700549 Tom Pender, UML 2 Bible, Wiley India, ISBN: 9788126504527.

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314455: Internship

HOME

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 4 hrs/week	04 Credit	Team work: 100 Marks

Prerequisite Courses: if Any

Course Objectives:

- To encourage and provide opportunities for students to get professional/personal experience through internships.
- To learn and apply the technical knowledge gained from academics /classroom learning in real life/industrial situations.
- To get familiar with various tools and technologies used in industries and their applications.
- To enable students to develop professional skills and expand their professional network with thedevelopment of employer-valued skills like teamwork, communication.
- To apply the experience gained from industrial internship to the academic course completion project.
- To nurture professional and societal ethics in students
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations

Course Outcomes:

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

CO1: To develop professional competence through industry internship.
CO2: To apply academic knowledge in a personal and professional environment
CO3: To build the professional network and expose students to future employees.
CO4: To Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations.

Guidelines:

Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important as the employers are looking for employees who are properly skilled and having awareness about industry environment, practices and culture. Internship is structured, short- term, supervised training often focused around particular tasks or projects with defined time scales.

Core objective is to expose technical students to the industrial environment, which cannot be simulated/experienced in the classroom and hence creating competent professionals in the industry and to understand the social, economic and administrative considerations that influence the working environment of industrial organizations.

Engineering internships are intended to provide students with an opportunity to apply theoretical knowledge from academics to the realities of the field work/training. The following guidelines are proposed to give academic credit for the internship undergone as a part of the Third Year Engineering curriculum.

Duration:

Internship to be completed after semester 5 and before commencement of semester 6 of at least 4 to 6 weeks; and it is to be assessed and evaluated in semester 6.

Internship work Identification:

Student may choose to undergo Internship at Industry/Govt./NGO/MSME/Rural Internship/ Innovation/IPR/Entrepreneurship. Student may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/NGO's/Government organizations/Micro/Small/ Medium enterprises to makethemselves ready for the industry.

Contacting various companies for Internship and Internship work identification process should be initiated in the Vth semester in coordination with training and placement cell/ industry institute cell/ internship cell. This will help students to start their internship work on time. Also, it will allow students to work in vacation period after their Vth semester examination.

Student can take internship work in the form of Online/onsite work from any of the following but not limited to:

- Working for consultancy/ research project,
- Participation at Events (Technical / Business)/in innovation related completions like Hackathon,
- Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council/ startups cells of institute /
- Learning at Departmental Lab/Tinkering Lab/ Institutional workshop,
- Development of new product/ Business Plan/ registration of start-up,
- Participation in IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos,
- Industry / Government Organization Internship,
- Internship through Internshala,
- In-house product development, intercollegiate, inter department research internship under research lab/group, micro/small/medium enterprise/onle ineinternship,
- Research internship under professors, IISC, IIT's, Research organizations,
- NGOs or Social Internships, rural internship,
- Participate in open source development.

Internship Diary/ Internship Workbook:

Students must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary/workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries
- Adequacy & quality of information recorded
- Data recorded
- Thought process and recording techniques used
- Organization of the information

Internship Work Evaluation:

Every student is required to prepare a maintain documentary proofs of the activities done by him as internship diary or as workbook. The evaluation of these activities will be done by Programme Head/Cell In-charge/ Project Head/ faculty mentor /faculty or Industry Supervisor based on- Overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities.

Assessment and Evaluation is to be done in consultation with internship supervisor (Internal and External – a supervisor from place of internship.

Recommended evaluation parameters-Post Internship Internal Evaluation -50 Marks +Internship Diary/Workbook and Internship Report - 50 Marks

Evaluation through Seminar Presentation/Viva-Voce at the Institute-

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Depth of knowledge and skills Communication & Presentation Skills
- Team Work
- Creativity
- Planning & Organizational skills
- Adaptability
- Analytical Skills
- Attitude & Behavior at work

- Societal Understanding
- Ethics
- Regularity and punctuality
- Attendance record
- Log book
- Student's Feedback from External Internship Supervisor

After completion of Internship, the student should prepare a comprehensive report to indicate what he/she has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/Faculty/TPO for assigning special topics and problems and should prepare the final report on the student's presence physically, if the student is found absent without prior intimation to the department/institute/concern authority/T & P Cell, entire training can be cancelled.

The report shall be presented covering following recommended fields but limited to,

- Title/Cover Page
- Internship completion certificate
- Internship Place Details- Company background-organization and activities/Scope and object of the study / personal observations
- Index/Table of Contents
- Introduction
  Title/Problem statement/objectives Motivation/Scope and rationale of the study Methodological details
  Results / Analysis /inferences and conclusion
  Suggestions / Recommendations for improvement to industry, if any Attendance Record
  Acknowledgement
  List of reference (Library books, magazines and other sources)

Feedback from internship supervisor(External and Internal)

Post internship, faculty/faculty coordinator should collect feedback about student with following recommended parameters-

Technical knowledge, Discipline, Punctuality, Commitment, Willingness to do the work, Communication skill, individual work, Team work, Leadership.

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314456: Computer Network Security Lab

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 Hrs/week	02 Credit	OR: 50 Marks TW: 25 Marks

HOME

Prerequisites:

1. Fundamentals of Computer Networks.

Course Objectives:

1. To design and implement small size network and to understand various networking commands.
2. To learn various client/server environments to use application layer protocols.
3. To understand network layer routing protocols and its implementations.
4. To understand the network security by using public key cryptography algorithms.

Course Outcomes:

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

CO1: Design and configure small size network and associated networking commands.

CO2: Understand various client/server environments to use application layer protocols.

CO3: Use basic cryptographic techniques in software and system design.

CO4: Apply methods for authentication, access control, intrusion detection.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical 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 and only if the journal of the candidate is complete in all respect.

Guidelines for Lab /TW Assessment

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

Guidelines for Laboratory Conduction

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student's programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

List of Laboratory Assignments

Group A: Computer Network

1. **Using a Network Simulator (e.g. packet tracer) Configure Router for…**
   - **a)** Configure a router using router commands and Configure Routing Information Protocol(RIP).
   - **b)** Configure Access Control lists – Standard & Extended.
   - **c)** Network Address Translation: Static, Dynamic & PAT (Port Address Translation)
2. **Using a Network Simulator (e.g. packet tracer) Configure Routing Protocols,**
   - **a)** Configure EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation.
   - **b)** OSPF – Explore Neighbor-ship Condition and Requirement, Neighbor-ship states, OSPF MetricCost Calculation.
   - **c)** WLAN with static IP addressing and DHCP with MAC security and filters.
3. **Socket Programming in C/C++ on Linux.**
   - **a)** TCP Client, TCP Server
   - **b)** UDP Client, UDP Server
4. **Introduction to server administration** (server administration commands and their applications) and configuration of below Server: (Study/Demonstration Only)
   - **a)** FTP **b)** Web Server

Group B: Network Security

1. Implement a client and a server on different computers using python. Perform the communication between these two entities by using RSA cryptosystem.
2. Implement a client and a server on different computers using python. Perform the authentication of sender between these two entities by using RSA digital signature cryptosystem.
3. Implement a client and a server on different computers using python. Perform the encryption of message of sender between these two entities by using DES Algorithm and use Diffie Hellman method for exchange of keys.
4. Use the snort intrusion detection package to analyze traffic and create a signature to identify problem traffic.

Reference Books:

1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3.
2. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878-1
3. William Stallings, Cryptography and Network Security, Pearson Education, 7th Edition, ISBN 978-0-13-444428-4

Savitribai Phule Pune University, Pune **Third Year Information Technology (2019 Course)** **314457: DS & BDA Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical (PR) : 2 hrs/week	**01 Credit**	**PR : 25 Marks** **TW: 25 Marks**

HOME

Prerequisites:

1. Discrete mathematics
2. Database Management Systems, Data warehousing, Data mining
3. Programming in Python

Course Objectives:

1. To understand Big data primitives and fundamentals.
2. To understand the different Big data processing techniques.
3. To understand and apply the Analytical concept of Big data using Python.
4. To understand different data visualization techniques for Big Data.
5. To understand the application and impact of Big Data.
6. To understand emerging trends in Big data analytics.

Course Outcomes:

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

CO1: Apply Big data primitives and fundamentals for application development.

CO2: Explore different Big data processing techniques with use cases.

CO3: Apply the Analytical concept of Big data using Python.

CO4: Visualize the Big Data using Tableau.

CO5: Design algorithms and techniques for Big data analytics.

CO6: Design and develop Big data analytic application for emerging trends.

Guidelines for Instructor's Manual

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

Guidelines for Student's Lab Journal

Student should submit term work in the form of handwritten journal based on specified list of assignments.

Practical Examination will be based on the term work.

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

The practical examination should be conducted if and only if the journal of the candidate iscomplete in all respects.

Guidelines for Lab /TW Assessment
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 related to respective laboratory should be checked by the concerned faculty member.
Guidelines for Laboratory Conduction
1. All assignments of Part-A, Part-B and first assignment of Part-C should be covered in Laboratory and part of SPPU Practical examination. **2.** Part-C second assignments are a group activity to be carried out in group of 4-5 students and students should submit the document related to it as part of journal.
Guidelines for Practical Examination
1. During practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. **2.** Student 's understanding of the fundamentals, effective and efficient implementation can be evaluated by asking relevant questions based implementation of experiments he/she has carried out.
List of Laboratory Assignments
Group A: Assignments based on the Hadoop
1. Single node/Multiple node Hadoop Installation. **2.** Design a distributed application using MapReduce(Using Java) which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform. **3.** Write an application using HiveQL for flight information system which will include **a.** Creating, Dropping, and altering Database tables. **b.** Creating an external Hive table. **c.** Load table with data, insert new values and field in the table, Join tables with Hive **d.** Create index on Flight Information Table **e.** Find the average departure delay per day in 2008.

Group B: Assignments based on Data Analytics using Python

1. Perform the following operations using Python on the Facebook metrics data sets
   - **a.** Create data subsets
   - **b.** Merge Data
   - **c.** Sort Data
   - **d.** Transposing Data
   - **e.** Shape and reshape Data
2. Perform the following operations using Python on the Air quality and Heart Diseases data sets
   - **a.** Data cleaning
   - **b.** Data integration
   - **c.** Data transformation
   - **d.** Error correcting
   - **e.** Data model building
3. Integrate Python and Hadoop and perform the following operations on forest fire dataset
   - **a.** Data analysis using the Map Reduce in PyHadoop
   - **b.** Data mining in Hive
4. Visualize the data using Python libraries matplotlib, seaborn by plotting the graphs for assignment no. 2 and 3 (Group B)
5. Perform the following data visualization operations using Tableau on Adult and Iris datasets.
   - **a.** 1D (Linear) Data visualization
   - **b.** 2D (Planar) Data Visualization
   - **c.** 3D (Volumetric) Data Visualization
   - **d.** Temporal Data Visualization
   - **e.** Multidimensional Data Visualization
   - **f.** Tree/ Hierarchical Data visualization
   - **g.** Network Data visualization

Group C: Model Implementation

1. Create a review scrapper for any ecommerce website to fetch real time comments, reviews, ratings, comment tags, customer name using Python.
2. Develop a mini project in a group using different predictive models techniques to solve any real life problem. (Refer link dataset- https://www.kaggle.com/tanmoyie/us-graduate-schools- admission-parameters)

Reference Books:

1. Big Data, Black Book, DT Editorial services, 2015 edition.
2. Data Analytics with Hadoop, Jenny Kim, Benjamin Bengfort, OReilly Media, Inc.
3. Python for Data Analysis by Wes McKinney published by O' Reilly media, ISBN : 978-1-449-31979-3.
4. Python Data Science Handbook by Jake VanderPlas https://tanthiamhuat.files.wordpress.com/2018/04/pythondatasciencehandbook.pdf
5. Alex Holmes, Hadoop in practice, Dreamtech press.
6. Online References for data set

- http://archive.ics.uci.edu/ml/
- https://www.kaggle.com/tanmoyie/us-graduate-schools-admission-parameters
- https://www.kaggle.com

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314458: Laboratory Practice-II (Web Application Development)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credit	PR : 25 Marks TW : 50 Marks

HOME

Prerequisites: Programming languages C++, Java

Course Objectives:

1. To understand basic concepts of web programming and scripting languages.
2. To learn Version Control Environment.
3. To learn front end technologies and back end technologies.
4. To understand mobile web development.
5. To comprehend web application deployment.

Course Outcomes:

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

CO1: Develop Static and Dynamic responsive website using technologies HTML, CSS, Bootstrapand AJAX.
CO2: Create Version Control Environment.
CO3: Develop an application using front end and backend technologies.
CO4: Develop mobile website using JQuery Mobile.
CO5: Deploy web application on cloud using AWS.

Guidelines for Instructor's Manual

Lab Assignments: Following is a list of suggested laboratory assignments for reference. Laboratory Instructors may design a suitable set of assignments for their respective courses at their level. Beyond curriculum assignments, the mini-project is also included as a part of laboratory work. The Inclusion of few optional assignments that are intricate and/or beyond the scope of curriculum will surely be the value addition for the students and it will satisfy the intellectuals within the group of the learners and will add to the perspective of the learners. For each laboratory assignment, it is essential for students to draw/write/generate flowchart, algorithm, test cases, mathematical model, Test data set and comparative/complexity analysis (as applicable).

Guidelines for Student's Lab Journal

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD or similar media containing students programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory. 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 journals may be avoided. Submission of journal/ term work in the form of softcopy is desirable and appreciated.

Guidelines for Lab /TW Assessment
Term work is continuous assessment that evaluates a student's progress throughout the semester. Term work assessment criteria specify the standards that must be met and the evidence that will be gathered to demonstrate the achievement of course outcomes. Categorical assessment criteria for the term work should establish unambiguous standards of achievement for each course outcome. They should describe what the learner is expected to perform in the laboratories or on the fields to show that the course outcomes have been achieved. It is recommended to conduct an internal monthly practical examination as part of continuous assessment.
Guidelines for Laboratory Conduction
Following is a list of suggested laboratory assignments for reference. Laboratory Instructors may design a suitable set of assignments for respective courses at their level. Beyond curriculum assignments and mini-project may be included as a part of laboratory work. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. The Inclusion of few optional assignments that are intricate and/or beyond the scope of curriculum will surely be the value addition for the students and it will satisfy the intellectuals within the group of the learners and will add to the perspective of the learners. For each laboratory assignment, it is essential for students to draw/write/generate flowchart, algorithm, test cases, mathematical model, Test data set and comparative/complexity analysis (as applicable). Batch size for practical and tutorials may be as per guidelines of authority.
Guidelines for Practical Examination
Students' work will be evaluated typically based on the criteria like attentiveness, proficiency in execution of the task, regularity, punctuality, use of referencing, accuracy of language, use of supporting evidence in drawing conclusions, quality of critical thinking and similar performance measuring criteria.
List of Laboratory Assignments
Group A-(WAD)
Assignment 1 **a.** Create a responsive web page which shows the ecommerce/college/exam admin dashboard with sidebar and statistics in cards using HTML, CSS and Bootstrap. **b.** Write a JavaScript Program to get the user registration data and push to array/local storage with AJAX POST method and data list in new page.

Assignment 2

a. Create version control account on GitHub and using Git commands to create repository and push your code to GitHub.

b. Create Docker Container Environment (NVIDEIA Docker or any other).

c. Create an Angular application which will do following actions: Register User, Login User, Show User Data on Profile Component

Assignment 3

a. Create a Node.JS Application which serves a static website.

b. Create four API using Node.JS, ExpressJS and MongoDB for CURD Operations on assignment 2.C.

Assignment 4

a. Create a simple Mobile Website using jQuery Mobile.

b. Deploy/Host Your web application on AWS VPC or AWS Elastic Beanstalk. Mini Project

Develop a web application using full stack development technologies in any of the following domains:

1. Social Media
2. ecommerce
3. Restaurant
4. Medical
5. Finance
6. Education
7. Any other

Reference Books:

1. Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook, Dreamtech Press, Second Edition, ISBN: 9788177228496.
2. Raymond Camden, Andy Matthews, jQuery Mobile Web Development Essentials, Packt Publishing, Second Edition, 9781782167891.
3. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition, 978- 81-265-1635-3
4. Dr.HirenJoshi, Web Technology and Application Development, DreamTech, First,ISBN:978-93-5004-088-1
5. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition, 978- 81-265-1635-3
6. Ivan Bayross,”Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,BPB Publications,4th Edition,ISBN:978-8183330084.
7. Brain Fling, Mobile Design and Development, O'REILLY, First Edition, ISBN: 13:978-81- 8404-817-
8. Adam Bretz & Colin J Ihrig, Full Stack Javascript Development with MEAN, SPD, First Edition, ISBN:978-0992461256.

- Books / E- Learning References

1. https://www.meanacademy.in/web-technologies
2. https://www.meanacademy.in/angular
3. https://www.meanacademy.in/mongodb
4. https://www.meanacademy.in/nodejs
5. https://www.meanacademy.in/aws

SavitribaiPhule Pune University, Pune
Third Year Information Technology (2019 Course)
314458 : Lab Practice – II (Artificial Intelligence)

HOME

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 4 hrs/week	02 Credit	PR : 25 Marks TW : 50 Marks

Prerequisites: Programming knowledge (Python)

Course Objectives:

1. To develop real world problem solving ability
2. To enable the student to apply AI techniques in applications which involve perception, reasoning and planning
3. To work in team to build industry compliant AI applications

Course Outcomes:

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

CO1: Evaluate and apply core knowledge of AI on various real world problems.

CO2: Illustrate and demonstrate AI tools for different dynamic applications.

Guidelines for Instructor's Manual

Lab Assignments: Following is a list of suggested laboratory assignments for reference. Laboratory Instructors may design a suitable set of assignments for their respective courses at their level. Beyond curriculum assignments, the mini-project is also included as a part of laboratory work. The Inclusion of few optional assignments that are intricate and/or beyond the scope of curriculum will surely be the value addition for the students and it will satisfy the intellectuals within the group of the learners and will add to the perspective of the learners. For each laboratory assignment, it is essential for students to draw/write/generate flowchart, algorithm, test cases, mathematical model, Test data set and comparative/complexity analysis (as applicable).

Guidelines for Student's Lab Journal

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD or similar media containing student's programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory. 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 journals may be avoided. Submission of journal/ term work in the form of softcopy is desirable and appreciated.

Guidelines for Lab /TW Assessment

Term work is continuous assessment that evaluates a student's progress throughout the semester. Term work assessment criteria specify the standards that must be met and the evidence that will be gathered to demonstrate the achievement of course outcomes. Categorical assessment criteria for the term work should establish unambiguous standards of achievement for each course outcome. They should describe what the learner is expected to perform in the laboratories or on the fields to show that the course outcomes have been achieved. It is recommended to conduct an internal monthly practical examination as part of continuous assessment.

Guidelines for Laboratory Conduction

Following is a list of suggested laboratory assignments for reference. Laboratory Instructors may design a suitable set of assignments for respective courses at their level. Beyond curriculum assignments and mini-project may be included as a part of laboratory work. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. The Inclusion of few optional assignments that are intricate and/or beyond the scope of curriculum will surely be the value addition for the students and it will satisfy the intellectuals within the group of the learners and will add to the perspective of the learners. For each laboratory assignment, it is essential for students to draw/write/generate flowchart, algorithm, test cases, mathematical model, Test data set and comparative/complexity analysis (as applicable). Batch size for practical and tutorials may be as per guidelines of authority.

Guidelines for Practical Examination

Students' work will be evaluated typically based on the criteria like attentiveness, proficiency in execution of the task, regularity, punctuality, use of referencing, accuracy of language, use of supporting evidence in drawing conclusions, quality of critical thinking and similar performance measuring criteria.

List of Laboratory Assignments

Group A

1. Identify and Implement heuristic and search strategy for Travelling Salesperson Problem
2. Implement n-queens problem using Hill-climbing / simulated annealing / A* algorithm etc. Write a program for Water jug problem / Towers of Hanoi
3. Write a program for sorting algorithms using appropriate knowledge representation andreasoning techniques.
4. Write a program for the Information Retrieval System using appropriate NLP tools (such as NLTK, Open NLP, …)
   a. Text tokenization
   b. Count word frequency
   c. Remove stop words
   d. POS tagging
5. Write a program for the Tic-Tac-Toe game.

Group B (Mini Project)

Develop a Web Based Application for any one of the following:

1. Develop a Text Classification tool as a CRM task or Web Crawler application.
2. Develop a Speech to Text System with the help of POS tagging
3. E-commerce stores using Forward/backward chaining
4. Sudoku puzzle
5. Detection and recognition of object such as Face, Fruit, Finger print etc. using Deep Learning

Reference Books:

1. Natural Language Processing with Python by Steven Bird, Ewan Klein, Edward Loper
2. https://www.deeplearningbook.org/contents/TOC.html
3. https://www.nltk.org/
4. K. Boyer, L. Stark, H. Bunke, "Applications of AI, Machine Vision and Robotics, World Scientific PubCO, 1995

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314458: Lab Practice –II (Cyber Security)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02 Credit	PR : 25 Marks TW : 50 Marks

Prerequisites: Computer network and security

Course Objectives:

1. To develop and understand the placement of packet-sniffer in networking and internetworking environment.
2. To implement the cyber-attacks.
3. To implement intrusion detection and basic mail spamming.

Course Outcomes:

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

CO1: To know the different guidelines for Packet Sniffing in networking and internetworking environment.

CO2: To know the different types of cyber-attacks and will be able analyze theattacks.

CO3: Apply the knowledge of IDS to secure network and performing analysis of IDS attack on network.

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, references. Experiments to be conducted in Python/any open source language.

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by students in the form of journals. The Journal consists ofprologue, 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, printouts of the code written using coding standards, sample test cases etc. To support Go-green, printouts on paper are discouraged and should be maintained in soft copy. However, all students must submit the soft copy and should be maintained by batch teacher.
2. Practical Examination will be based on the CS theory and CS lab Assignments.
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 andcertified by concerned faculty and head of the department.
5. All the assignment mentioned in the syllabus must be conducted.

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Guidelines for Lab /TW Assessment

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

Guidelines for Laboratory Conduction

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

Guidelines for Practical Examination

Both internal and external examiners should jointly conduct practical examination. During assessment, the examiners should give the maximum weight age to the satisfactory answer of the problem statement In question. 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.

List of Laboratory Assignments

1. Write a program to sniff packet sent over the local network and analyze it.
2. Create an attack using python script and implement attack and analyze the effect of attack.
   - **a)** DDOS Attack
   - **b)** IP spoofing
   - **c)** DNS Attack
3. Write a program in python script for Spam Mail Detection (Spam Filtering Implementation).
4. IDS Use Distributed IDS Attack Information to gathers log files from users around the network and prepares reports to determine if their networks have encountered intrusion attempts.

Reference Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1.
2. Practical Cyber Forensics an Incident-Based Approach to Forensic Investigations, Niranjan Reddy, Apress, ISBN-13: 978-1-4842-4459-3.
3. Practical Digital forensics – Richard Boddingtion, PACKT Publishing ISBN 978-1-78588.

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

314458: Laboratory Practice-II (Cloud Computing)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02 Credit	PR :25 Marks TW : 50Marks

Prerequisite Courses:

- Basics of Computer Networks
- Operating Systems

Course Objectives:

1. To develop web applications in cloud.
2. To learn the design and development process involved in creating a cloud based application.

Course Outcomes:

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

CO1: To design and develop cloud based applications.

CO2: To Simulate a cloud scenario using CloudSim.

CO3: To design and deploy web applications in cloud environment.

LIST OF ASSIGNMENTS

1. Install Google App Engine. Create hello world app and other simple web applications using python/java.
2. Use GAE launcher to launch the web applications.
3. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
6. Design and deploy a web application in a PaaS environment.
7. Design and develop custom Application (Mini Project) using Salesforce Cloud.
8. Design an Assignment to retrieve, verify, and store user credentials using Firebase Authentication, the Google App Engine standard environment, and Google Cloud Data store.

CASE STUDIES

- Data storage security in private cloud
- Application of IoT/Ubiquitous based on cloud
- Tools for building private cloud

Text Books:

1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1 st Edition
2. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, 2010, The McGraw-Hill.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiS elvi, Mastering Cloud Computing: Foundationsand Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.
2. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476
3. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.
4. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.
5. Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128.
6. Kris Jamsa, Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security,and More, Jones and Bartlett, ISBN :9789380853772.
7. John W. Ritting house, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press, ISBN : 978 1439806807, 1439806802.
8. Karl Matthias, Sean P. Kane, Docker: Up and Running, OReilly, ISBN:9781491917572,1491917571.
9. Barrie Sosinsky, Cloud Computing Bible, Wiley, ISBN: 978 8126529803.
10. Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.
11. Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson, OpenStack: Cloud Application Development, Wrox, ISBN :9781119194316.
12. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Cloud Computing Black Book ,Wiley Dreamtech,ISBN:9789351194187

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
314458 :Laboratory Practice-II (Software Modeling Design)

Teaching Scheme: Hrs	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02 Credit	PR : 25 Marks TW : 50 Marks

HOME

Prerequisites:

1. Problem Solving & Object-Oriented Programming.
2. Software Engineering and Project Management.

Course Objectives:

1. To teach the student Unified Modeling Language (UML 2.0)
2. To teach the student how to identify different software artifacts at analysis and design phase.
3. To explore and analyze use case modeling.
4. To explore and analyze domain/ class modeling.
5. To develop a system with design and modeling concepts.

Course Outcomes:

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

CO1: Develop use case model with the help of UML notations.

CO2: Develop and implement analysis model and design model.

CO3: Develop and implement Interaction and behavior Model.

Guidelines for Instructor's Manual

Students should work in group of 3-4 students. Student should Identify Project title of enough complexity, which has at least 4-5 major functionalities.

Guidelines for Student's Lab Journal

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

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering theparameters 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 diagrams specified in the assignment, implementation (wherever applicable) attendance etc.
2. Examiners will judge the understanding of the practical/ oral performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware should be checked by the concerned faculty member(s).

Guidelines for Laboratory Conduction

1. The instructor is expected to frame the assignments by understanding the prerequisites, technologicalaspects, utility and recent trends related to the topic.
2. The instructor may set multiple sets of assignments and distribute among batches of students. Students should work in group of 3-4 students. Common problem statement (minimum 3-4 major functionalities it should cover) should be considered to execute all assignment.
3. It is appreciated if the assignments are based on real world problems/applications.
4. Any open-source UML designing tool like StarUML, Visual Paradigm, Umbrello, AgroUML, can be used todraw UML diagram. Languages and databases : JAVA, MySQL, MongoDB, C#.

Guidelines for Practical Examination

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

List of Laboratory Assignments

Assignment 1: Write Problem Statement and draw Use Case diagrams for Mini Project (4Hrs)
Identify Project of enough complexity, which has at least 4-5 major functionalities.
Identify stakeholders, actors and write detail problem statement for your system.
Identify Major Use Cases, Identify actors. Write formal Use Case specification for all major Use Cases.

Assignment 2: Prepare Dynamic Model for the system (4 Hrs)
Identify Activity states and Action states.
Draw Activity diagram with Swim lanes and fork-joins using UML 2.0 Notations for major Use CasesDraw Sequence Diagram Using UML 2.0 notations for major Use Cases.

Assignment 3: Prepare Static Model for the System (6 Hrs)
Draw class diagram using UML 2.0 notations.
Prepare Data Dictionary for the databases. Draw Deployment diagram UML 2.0 notations.

Assignment 4: Outputs and Code demonstration **(10 Hrs)**
Write the code for the Mini Project.
Execute the code and record the output screens

Reference Books:

1. UML2 Bible by Tom Pender, Wiley India Pvt. Limited 2011
2. Applying UML and Patterns Second Edition by Craig Larman, Pearson Education

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
Mandatory Audit Course 6
314459 (A) : Green and Unconventional Energy

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) : 1 hrs/week **Tutorial(TUT): 3 hrs/week** **(Assignments and Self-study)**	**Non Credit**	**Audit Course**

HOME

Prerequisite Courses, if any:

Course Objectives:

1. To know the importance of the energy and the the basic infrastructures for the economic development of the country.
2. To know about the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems.
3. To understand the application of non-conventional energy technologies.

Course Outcomes:

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

CO1: List and explain the main sources of energy and their primary applications in the India, and theworld.
CO2: Describe the challenges and problems associated with the use of various energy sources and itsconservation.
CO3: List and describe the primary renewable energy resources and technologies.
CO4: Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

COURSE CONTENTS

Unit I	INTRODUCTION TO GREEN AND UNCONVENTIONAL ENERGY STUDIES	(04 hrs)

Various Non-Conventional energy sources, Need, Availability, Classification, Relative merits & demerits, Global energy scenario, Indian energy scenario, Energy Storage, Distribution and Conservation

Mapping of Course Outcomes for Unit I	CO1, CO2

Unit II	SOLAR and WIND ENERGY	(04 hrs)

Solar energy: Introduction, Conservation of Solar energy

Applications: Solar Energy - solar water heater- Solar Cooker-Box type- Solar dryer-solar green house—Summer and winter greenhouse-solar electric power generation-Solar photovoltaic

Wind Energy: Introduction- Basic Principles of Wind energy conversion-The nature of wind- The power inthe wind. Wind energy conversion system (WECS), Advantages & Limitations of WECS
, Environmental aspect. Government Schemes.

Mapping of Course Outcomes for Unit II	**CO2, CO3**	
Unit III	**BIOMASS ENERGY, GEO THERMAL & TIDAL ENERGY.**	**(04 hrs)**

Biomass Energy: Introduction- Biomass conversion techniques -Biogas Generation-Factors affecting biogas Generation, urban waste to energy conversion.

Geothermal Sources: Hydro thermal Source (Vapor &Liquid dominated systems), geothermalenergy conversion

Tidal Energy-Basic Principles of Tidal Power, Schematic Layout of Tidal Power house, Advantages & Limitations of Tidal power.

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

Guidelines for Conduction (Any one or more of following but not limited to)

Guest Lectures / Group Activities / Assignments / Taking up small project for short duration Guidelines for Assessment (Any one or more of following but not limited to) / Practical Test / Presentation / Paper / (Theory assessment test) / Report

SUGGESTED LIST OF STUDENT ACTIVITYS

1. Prepare a of monthly energy consumption of your institute and find the ways how it can be conserved
2. Conduct an energy audit of your institute; suggest the ways how the conventional energy resources utilization can be minimized. Suggest the areas ,where the non-conventional energy may be used
3. Visit solar power plant /wind power plant available in your locality/ nearer to your institute and understand different elements, working, and note the power generation by these plants
4. Visit government website for renewable energy and find out different schemes run by government.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publication
2. Renewable Energy (2nd edition). Oxford University Press, 450 pages (ISBN: 0-19- 926178-4).
3. Renewable Energy Sources & Emerging Technologies, D P Kothari, K C Singal & Rakesh Ranjan, Prentice Hall India.

Reference Books:

1. http://www.ener-supply.eu/downloads/ENER_handbook_en.pdf
2. Energy opportunities and social responsibility. Satyesh C. Chakraborty, Jaico publications
3. Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press, 619 pages (ISBN: 0-19-926179-2)
4. Ashok Desai V, Non-Conventional Energy, Wiley Eastern Ltd, 1990.
5. Mittal K.M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, 1997.

E- Books / E- Learning References :

1. RENEWABLE ENERGY SOURCES AND THEIR APPLICATIONS: http://www.ifeed.org/pdf/media/BOOK_Renewable-Energy-Sources-and-their-Applications.pdf
2. http://nptel.ac.in/courses/112105051/

Savitribai Phule Pune University, Pune
Third Year Information Technology (2019 Course)
Mandatory Audit Course 6
314459 (B): Leadership and Personality Development

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) :1 hrs/week Tutorial(TUT): 3 hrs/week (Assignments and Self-study)	Non Credit	Audit Course

HOME

Prerequisite Courses: if Any

Course Objectives:

1. To develop inter personal skills and be an effective goal oriented leader.
2. To develop personalities of students in order to empower them and get better insights into self-responsibilities in personal life to build better human being.
3. To develop professionals with leadership quality along with idealistic, practical and moral values.
4. To re-engineer attitude and understand its influence on behavior.
5. To help students to evolve as leaders who can effectively handle real life challenges in and across the dynamic environment.

Course Outcomes:

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

CO1: Practice responsible decision-making and personal accountability.

CO2: Demonstrate an understanding of group dynamics and effective teamwork.

CO3: Develop a range of leadership skills and abilities such as effectively leading change, resolving conflict, and motivating others.

CO4: Develop multi-dimensional personality.

COURSE CONTENTS

Unit I	PERSONALITY DEVELOPMENT	(03 hrs)

Laws of Personality Development, Different Layers of Personality, How to Change Our Character, Influence of Thought, Take the Whole Responsibility on Yourself, Self-analysis: Johari 's Window, Attitude: Factors influencing Attitude, Challenges and lessons from Attitude, Personality Traits, Sharpening Memory Skills, Decision-Making, Negotiation and Problem-Solving. Importance of Self Confidence, Self Esteem, Creativity: Out of box thinking, Lateral Thinking

Mapping of Course Outcomes for Unit I	CO1

Unit II	TECHNIQUES IN PERSONALITY DEVELOPMENT	(03 hrs)

Techniques for better Time Management, Meditation and concentration techniques, Self- hypnotism, Self-acceptance, and self-growth, Goal setting: Wish List, SMART Goals, Blueprint for success, Short Term, Long Term, Lifetime Goals. Confidence Building: Case studies, Confidence building videos of motivational speakers.

Mapping of Course Outcomes for Unit II	**CO1, CO2**	
Unit III	**LEADERSHIP SKILLS**	**(03 hrs)**
Working individually and in a team, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation, Introduction to Interpersonal Relations, Virtual Leadership: Introduction, Essential Skills for Managing Remote Teams and challenges of virtual leadership.		
Mapping of Course Outcomes for Unit III	**CO3, CO4**	
Unit IV	**TEAM BUILDING**	**(03 hrs)**
Importance of groups in organization and Team Interactions in group, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts., How to build a good team? Teamwork & Team building Interpersonal skills, Virtual team dynamics: issues and resolutions		
Mapping of Course Outcomesfor Unit IV	**CO2 ,CO4**	

Reference Books:

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.2E, ISBN: 780199459742, ISBN: 0199459746.
2. SKILLS, 2015, Career Development Centre, Green Pearl Publications.
3. ShaliniVerma (2014); "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) & Company. ISBN: 9789325974203, ISBN: 9325974207.
4. John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc, ISBN: 9789350098714, ISBN: 9350098717.
5. Basic Managerial Skills for All by E. H. McGrath, S. J., PHI Personality Development and Soft Skill, Mitra, Barun, Oxford University Press, ISBN: 9788120343146, ISBN:812034314X.
6. Personality Development by Rajiv K. Mishra. Rupa& Co.
7. How to deal with Stress by Stephen Palmer & Cary Cooper, Kogan Page India Pvt. Ltd., South Asian Edition Successful Time Management by Patrick Forsyth, Kogan Page
8. Shiv Khera, "You Can Win", A&C Black, 2014, ISBN: 13: 9789350593783
9. Gajendra Singh Chauhan, Sangeeta Sharma: Soft Skills – An Integrated Approach to Maximize Personality, Wiley India, ISBN:13:9788126556397

E-Books/ E- Learning References:

1. Developing Soft Skills and Personality: By Prof.T.Ravichandran, IIT Kanpur https://onlinecourses.nptel.ac.in/noc19_hs32/preview
2. Leadership:Prof KalyanChakravatti, IIT Kharagpur https://nptel.ac.in/courses/122/105/122105021/
3. Virtual leadership https://youtu.be/SNeTzgBE93o
4. Motivation and Confidence building videos of motivational speakers like Shiv Khera, Sandeep Maheshwari , Sonu Sharma , Vivek Bindra , B.K.Shivani

Savitribai Phule Pune University, Pune

Third Year Information Technology (2019 Course)

Mandatory Audit Course 6

314459 (C): Foreign Language-(Japanese Language- IV)

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory (TH) :1 hrs/week Tutorial(TUT): 3 hrs/week (Assignments and Self-study)	Non Credit	Audit Course

HOME

Prerequisite Courses:

1. Students must have already studied can read/write Hiragana and Katakana script
2. Students must have studied Japanese for beginners that includes the syllabus of Audit course Module 1 to 3

Course Objectives:

1. Japan Market needs: To meet the needs of ever growing industry with respect to the Japanese language support.
2. Japanese Culture and Mindset: To get introduced to Japanese society and culture throughlanguage.
3. Career opportunities: To know more about Higher studies, Career opportunities in Japan /Japanese companies across the world.
4. Soft skills and self-development: To learn the manners, business culture and develop the confidence by gaining the knowledge of global perspective and cross-cultural studies.

Course Outcomes:

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

CO1: Do Better Communication in Japanese language.

CO2: Demonstrate knowledge of Japanese Language Scripts (Reading, Writing, etc).

CO3: Demonstrate knowledge of Japanese culture, lifestyle, etc.

CO4: Pursue advanced Professional Japanese Language course.

COURSE CONTENTS

Unit I	JAPANESE GRAMMAR	(3 hrs Lecture + 3 hrs Self-study)

Receiving and Giving, Verb past tense, Negative, Make sentences using various adjectives, Culture/Others: Conversation/Essay about some place, Introduction to the tourism in Japan, Introduction to Business/Work culture in Japan,Kanjis: 41 to 50,Listening practice, Vocabulary and conversation practice

Reference:

a. Minna no Nihongo I : Lesson 7and 8 (Text book + Audio and Video)
b. Nihongo Challenge Kanji - Lesson 5

Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**INTERACTIVE JAPANESE**	
Adverbs of degree, Stating like / dislike, Living and Non-living things, Stating wish/desire, Stating the present action (verb te form), Culture/Others: Introduction to Career Opportunities, Education and Higher studies in Japan,Kanjis: 51 to 60,Listening practice, Vocabulary and conversation practice **Reference:** **a.** Minna no Nihongo I : Lesson 9 and 10 (Text book + Audio and Video) **b.** Nihongo Challenge Kanji - Lesson 6		
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**FORMAL JAPANESE**	**(3 hrs Lecture + 3 hrs Self-study)**
Counters , Making comparisons, Past tense of verbs ,Past tense of adjectives, Combining adjectives (i + i, na+i …), Culture/Others: Information about career forums and Job Fairs Introduction about Japanese companies recruitment process, Kanjis: 61 to 70, Listening practice, Vocabulary and conversation practice **Reference:** **c.** Minna no Nihongo Lesson 11 and 12 (Text book + Audio and Video) **d**. Nihongo Challenge Kanji - Lesson 7		
Mapping of Course Outcomes for Unit III	**CO3**	
Unit IV	**LIFE IN JAPAN**	**(3 hrs Lecture + 3 hrs Self-study)**
Stating wish/desire (ga hoshi, verb tai form), Stating / combining multiple actions (verb te form), Stating the order of multiple actions (verb te kara form),Expressing "Permission" and "Prohibition" (te mo ii, te wa ikenai forms),Culture/Others: Preparation of a job interview for a Japanese company, Do's and Don'ts in a Job Interview ,Kanjis: 71 to 80,Listening practice, Vocabulary and conversation practice **Reference:** **a.** Minna no NihongoI : Lesson 13 and 14 (Text book + Audio and Video) **b.** Nihongo Challenge Kanji - Lesson 8		
Mapping of Course Outcomes for Unit IV	**CO4**	
Text Books:		
1. Minna no Nihongo I–MainText book with audio and video files(Books by Goyal Publishers – Available in shops / Online) **2.** Minna no Nihongo - Translation and grammatical notes for self-study(Books by Goyal Publishers **3.** Available in shops / Online) **4.** Nihongo Challenge – Kanji(Available with Japanese Language schools/teachers)		

Reference Books:
1. Nihongo Shoho: For better understanding and practice of Basic Japanese Grammar **2.** Marugoto : For scenario based Japanese conversation practice
E -Books / E- Learning References :
1. nihongo ichiban **a.** https://nihongoichiban.com/home/jlpt-n5-study-material/ **2.** jlpt sensei **a.** https://jlptsensei.com/how-to-pass-jlpt-n5-study-guide/