

Semester VI

Savitribai Phule Pune University

Third Year of Computer Engineering (2019 Course)

310251: Data Science and Big Data Analytics


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Teaching Scheme:

Theory: 04 Hours/Week^{\$\$}

Credit: 03

Examination Scheme:

Mid-Sem (TH) : 30 Marks

End-Sem (TH): 70 Marks

Prerequisites Courses: Discrete Mathematics (210241), Database Management Systems (310341)**Companion Course:** Data Science and Big Data Analytics Laboratory (310256)**Course Objectives:**

- To understand the need of Data Science and Big Data
- To understand computational statistics in Data Science
- To study and understand the different technologies used for Big Data processing
- To understand and apply data modeling strategies
- To learn Data Analytics using Python programming
- To be conversant with advances in analytics

Course Outcomes:

After completion of the course, learners should be able to

CO1: Analyze needs and challenges for Data Science Big Data Analytics**CO2:** Apply statistics for Big Data Analytics**CO3:** Apply the lifecycle of Big Data analytics to real world problems**CO4:** Implement Big Data Analytics using Python programming**CO5:** Implement data visualization using visualization tools in Python programming**CO6:** Design and implement Big Databases using the Hadoop ecosystem**Course Contents****Unit I****Introduction to Data Science and Big Data****07 Hours**

Basics and need of Data Science and Big Data, Applications of Data Science, Data explosion, 5 V's of Big Data, Relationship between Data Science and Information Science, Business intelligence versus Data Science, Data Science Life Cycle, Data: Data Types, Data Collection. Need of Data wrangling, Methods: Data Cleaning, Data Integration, Data Reduction, Data Transformation, Data Discretization.

#Exemplar/Case Studies

Create academic performance dataset of students and perform data pre-processing using techniques of data cleaning and data transformation.

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

CO1

Unit II**Statistical Inference****07 Hours**

Need of statistics in Data Science and Big Data Analytics, **Measures of Central Tendency:** Mean, Median, Mode, Mid-range. **Measures of Dispersion:** Range, Variance, Mean Deviation, Standard Deviation. Bayes theorem, Basics and need of hypothesis and hypothesis testing, Pearson Correlation, Sample Hypothesis testing, Chi-Square Tests, t-test.

#Exemplar/Case Studies

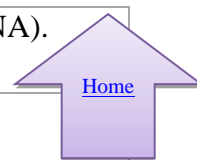
For an employee dataset, create measure of central tendency and its measure of dispersion for statistical analysis of given data.

***Mapping of Course Outcomes for Unit II**

CO2

Unit III**Big Data Analytics Life Cycle****07 Hours**

Introduction to Big Data, sources of Big Data, **Data Analytic Lifecycle:** Introduction, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model Building, Phase 5: Communication results, Phase 6: Operation alize.



#Exemplar/Case Studies	Case study: Global Innovation Social Network and Analysis (GINA).	
*Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Predictive Big Data Analytics with Python	07 Hours
<p>Introduction, Essential Python Libraries, Basic examples. Data Preprocessing: Removing Duplicates, Transformation of Data using function or mapping, replacing values, Handling Missing Data. Analytics Types: Predictive, Descriptive and Prescriptive. Association Rules: Apriori Algorithm, FP growth. Regression: Linear Regression, Logistic Regression. Classification: Naïve Bayes, Decision Trees. Introduction to Scikit-learn, Installations, Dataset, matplotlib, filling missing values, Regression and Classification using Scikit-learn.</p>		
#Exemplar/Case Studies	Use IRIS dataset from Scikit and apply data preprocessing methods	
*Mapping of Course Outcomes for Unit IV	CO4,CO2	
Unit V	Big Data Analytics and Model Evaluation	07 Hours
<p>Clustering Algorithms: K-Means, Hierarchical Clustering, Time-series analysis. Introduction to Text Analysis: Text-preprocessing, Bag of words, TF-IDF and topics. Need and Introduction to social network analysis, Introduction to business analysis. Model Evaluation and Selection: Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling, Parameter Tuning and Optimization, Result Interpretation, Clustering and Time-series analysis using Scikit-learn, sklearn. metrics, Confusion matrix, AUC-ROC Curves, Elbow plot.</p>		
#Exemplar/Case Studies	Use IRIS dataset from Scikit and apply K-means clustering methods	
*Mapping of Course Outcomes for Unit V	CO4, CO2	
Unit VI	Data Visualization and Hadoop	07 Hours
<p>Introduction to Data Visualization, Challenges to Big data visualization, Types of data visualization, Data Visualization Techniques, Visualizing Big Data, Tools used in Data Visualization, Hadoop ecosystem, Map Reduce, Pig, Hive, Analytical techniques used in Big data visualization. Data Visualization using Python: Line plot, Scatter plot, Histogram, Density plot, Box- plot.</p>		
#Exemplar/Case Studies	Use IRIS dataset from Scikit and plot 2D views of the dataset	
*Mapping of Course Outcomes for Unit VI	CO5, CO6	
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publication, 2012, ISBN0-07-120413-X 2. Jiawei Han, Micheline Kamber, and Jian Pie, “Data Mining: Concepts and Techniques” Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807 		
Reference Books :		
<ol style="list-style-type: none"> 1. EMC Education Services, “Data Science and Big Data Analytics- Discovering, analyzing Visualizing and Presenting Data” 2. DT Editorial Services, “Big Data, Black Book”, DT Editorial Services, ISBN: 9789351197577, 2016 Edition 3. Chirag Shah, “A Hands-On Introduction To Data Science”, Cambridge University Press, (2020), ISBN : ISBN 978-1-108-47244-9 4. Wes McKinney, “Python for Data Analysis ”, O' Reilly media, ISBN: 978-1-449-31979-3 5. Trent Hawk, “Scikit-learn Cookbook”, Packt Publishing, ISBN: 9781787286382 		

6. Jenny Kim, Benjamin Bengfort, “Data Analytics with Hadoop”, OReilly Media, Inc., ISBN: 9781491913703
7. Venkat Ankam, “Big Data Analytics”, Packt Publishing, ISBN: 9781785884696
8. Seema Acharya, Subhashini Chellappan, “Big Data And Analytics”, Wiley publi ISBN: 9788126579518


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e-Books :

- An Introduction to Statistical Learning by Gareth James
<https://www.ime.unicamp.br/~dias/Intoduction%20to%20Statistical%20Learning.pdf>
- Python Data Science Handbook by Jake VanderPlas
<https://tanthiamhuat.files.wordpress.com/2018/04/pythondatasciencehandbook.pdf>
- Introducing Data Science by Davy Ciele, Manning Publications
- Introducing Data Science [PDF]
- Handbook for visualizing : a handbook for data driven design by Andy krik
- A Handbook for Data Driven Design
- An introduction to data Science :
<https://docs.google.com/file/d/0B6iefdnF22XQeVZDSkxjZ0Z5VUE/edit?pli=1>
- Hadoop Tutorial :
https://www.tutorialspoint.com/hadoop/hadoop_tutorial.pdf?utm_source=7_&utm_medium=affiliate&utm_content=5f34cd37cdf1050001b09537&utm_campaign=Admitad&utm_term=761c575424fc4a6b48d02f72157eb578
- Learning with Python; How to think like a computer scientist:
<http://openbookproject.net/thinkcs/python/english3e/>
- Python for everybody:
http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf
- Scikit Learn Tutorial
<https://scikit-learn.org/stable/>

MOOCs Courses links:

- Computer Science and Engineering - NOC:Data Science for Engineers
- Computer Science and Engineering - NOC:Python for Data Science
- Computer Science and Engineering - NOC:Data Mining
- Computer Science and Engineering - NOC:Big Data Computing
- Big Data Computing - Course

@ The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Computer Engineering (2019 Course)
310252: Web Technology


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Teaching Scheme: Theory : 04 Hours/Week \$\$	Credit: 03	Examination Scheme: Mid-Sem (TH) : 30 Marks End-Sem (TH): 70 Marks
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Prerequisites Courses: Database Management Systems (310341),
Computer Networks and Security (310244)

Companion Course: Web Technology Laboratory (310257)

Course Objectives:

- To learn the fundamentals of web essentials and markup languages
- To use the Client side technologies in web development
- To use the Server side technologies in web development
- To understand the web services and frameworks

Course Outcomes:

On completion of the course, learners should be able to

CO1: Implement and analyze behavior of web pages using HTML and CSS

CO2: Apply the client side technologies for web development

CO3: Analyze the concepts of Servlet and JSP

CO4: Analyze the Web services and frameworks

CO5: Apply the server side technologies for web development

CO6: Create the effective web applications for business functionalities using latest web development platforms

Course Contents

Unit I	Web Essentials and Mark-up language- HTML	07 Hours
The Internet, basic internet protocols, the World Wide Web, HTTP Request message, HTTP response message, web clients, web servers. HTML: Introduction, history and versions. HTML elements: headings, paragraphs, line break, colors and fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, CSS features, CSS core syntax, Style sheets and HTML, Style rule cascading and inheritance, text properties. Bootstrap.		
#Exemplar/Case Studies	Create a style sheet suitable for blogging application using HTML and using style sheet	
*Mapping of Course Outcomes for Unit I	CO1	
Unit II	Client Side Technologies: JavaScript and DOM	07 Hours
JavaScript: Introduction to JavaScript, JavaScript in perspective, basic syntax, variables and data types, statements, operators, literals, functions, objects, arrays, built in objects, JavaScript debuggers. DOM: Introduction to Document Object Model, DOM history and levels, intrinsic event handling, modifying element style, the document tree, DOM event handling, jQuery, Overview of Angular JS.		
#Exemplar/Case Studies	Enhancement in created blogging application using JavaScript (Add Entry feature)	
*Mapping of Course Outcomes for Unit II	CO2	

Unit III	Java Servlets and XML	07 Hours
<p>Servlet: Servlet architecture overview, A “Hello World” servlet, Servlets generating dynamic content, Servlet life cycle, parameter data, sessions, cookies, URL rewriting, other Servlet capabilities, data storage, Servlets concurrency, databases (MySQL) and Java Servlets. XML: XML documents and vocabularies, XML declaration, XML Namespaces, DOM based XML processing, transforming XML documents, DTD: Schema, elements, attributes. AJAX: Introduction, Working of AJAX.</p>		
#Exemplar/Case Studies	Develop server-side code for blogging application	
*Mapping of Course Outcomes for Unit III	CO3	
Unit IV	JSP and Web Services	07 Hours
<p>JSP: Introduction to Java Server Pages, JSP and Servlets, running JSP applications, Basic JSP, JavaBeans classes and JSP, Support for the Model-View-Controller paradigm, JSP related technologies. Web Services: Web Service concepts, Writing a Java Web Service, Writing a Java web service client, Describing Web Services: WSDL, Communicating Object data: SOAP. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.</p>		
#Exemplar/Case Studies	Transform the blogging application from a loose collection of various resources (servlets, HTML documents, etc.) to an integrated web application that follows the MVC paradigm	
*Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	Server Side Scripting Languages	07 Hours
<p>PHP: Introduction to PHP, uses of PHP, general syntactic characteristics, Primitives, operations and expressions, output, control statements, arrays, functions, pattern matching, form handling, files, cookies, session tracking, using MySQL with PHP, WAP and WML. Introduction to ASP.NET: Overview of the .NET Framework, Overview of C#, Introduction to ASP.NET, ASP.NET Controls, Web Services. Overview of Node JS.</p>		
#Exemplar/Case Studies	Use of PHP in developing blogging application.	
*Mapping of Course Outcomes for Unit V	CO5, CO6	
Unit VI	Ruby and Rails	07 Hours
<p>Introduction to Ruby: Origins & uses of Ruby, scalar types and their operations, simple input and output, control statements, fundamentals of arrays, hashes, methods, classes, code blocks and iterators, pattern matching. Introduction to Rails: Overview of Rails, Document Requests, Processing Forms, Rails Applications and Databases, Layouts, Rails with Ajax. Introduction to EJB.</p>		
#Exemplar/Case Studies	Study of dynamic web product development using ruby and rails	
*Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035 		

2. Robert W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson education, 2008

Reference Books :

1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.
2. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.
3. Chris Bates, "Web Programming Building Internet Applications", 3rd Edition, Wiley India, 2006.
4. Xue Bai et al, "The web Warrior Guide to Web Programming", Thomson, 2003.

e-Books :

- <https://www.w3.org/html/>
- HTML, The Complete Reference <http://www.htmlref.com/>
- <http://w3schools.org/>
- <http://php.net/>
- <https://jquery.com/>
- <https://developer.mozilla.org/en-US/docs/AJAX>
- <http://www.tutorialspoint.com/css/>

MOOCs Courses link:

- <http://www.nptelvideos.in/2012/11/internet-technologies.html>
- <https://freevideolectures.com/course/2308/internet-technology/25video> lecture by Prof. Indranil Sengupta, IIT, Kharagpur
- <https://www.digimat.in/nptel/courses/video/106105191/L01.html>
- http://www.nptelvideos.com/php/php_video_tutorials.php

@ The CO-PO Mapping Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	1	1	2	1	1	-	-	-	-	-	-	-
CO2	-	2	1	3	1	-	-	-	1	-	-	-
CO3	2	-	2	1	-	1	-	-	-	-	1	-
CO4	1	3	1	2	2	1	-	1	-	-	-	1
CO5	1	1	2	-	3	-	1	1	-	1	-	-
CO6	2	1	-	2	1	1	-	1	-	-	-	-

Savitribai Phule Pune University

Third Year of Computer Engineering (2019 Course)

310253: Artificial Intelligence


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Teaching Scheme:Theory: 04 Hours/Week~~\$\$~~**Credit: 03****Examination Scheme:**

Mid-Sem (TH) : 30 Marks

End-Sem (TH): 70 Marks

Prerequisites Courses: Programming and Problem solving (110005),
Data Structures and Algorithms (210252)

Companion Course: Laboratory Practice II (310258)

Course Objectives:

- To understand the concept of Artificial Intelligence (AI) in the form of various Intellectual tasks
- To understand Problem Solving using various peculiar search strategies for AI
- To understand multi-agent environment in competitive environment
- To acquaint with the fundamentals of knowledge and reasoning
- To devise plan of action to achieve goals as a critical part of AI
- To develop a mind to solve real world problems unconventionally with optimality

Course Outcomes:

After completion of the course, students should be able to

CO1: Identify and apply suitable Intelligent agents for various AI applications

CO2: Build smart system using different informed search / uninformed search or heuristic approaches

CO3: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem

CO4: Apply the suitable algorithms to solve AI problems

CO5: Implement ideas underlying modern logical inference systems

CO6: Represent complex problems with expressive yet carefully constrained language of representation

Course Contents

Unit I	Introduction	07 Hours
Introduction to Artificial Intelligence, Foundations of Artificial Intelligence, History of Artificial Intelligence, State of the Art, Risks and Benefits of AI, Intelligent Agents, Agents and Environments, Good Behavior: Concept of Rationality, Nature of Environments, Structure of Agents.		
#Exemplar/Case Studies	Kroger: How This U.S. Retail Giant Is Using AI And Robots To Prepare For The 4th Industrial Revolution	
*Mapping of Course Outcomes for Unit I	CO1, CO4	
Unit II	Problem-solving	07 Hours
Solving Problems by Searching, Problem-Solving Agents, Example Problems, Search Algorithms, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions, Search in Complex Environments, Local Search and Optimization Problems.		
#Exemplar/Case Studies	4th Industrial Revolution Using AI, Big Data And Robotics	
*Mapping of Course Outcomes for Unit II	CO2, CO4	

Unit III	Adversarial Search and Games	07 Hours
Game Theory, Optimal Decisions in Games, Heuristic Alpha–Beta Tree Search, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms, Constraint Satisfaction Problems (CSP), Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs.		
#Exemplar/Case Studies	Machine Learning At Google: The Amazing Use Case Of Becoming A Fully Sustainable Business	
*Mapping of Course Outcomes for Unit III	CO3, CO4	
Unit IV	Knowledge	07 Hours
Logical Agents, Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic, Representation Revisited, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.		
#Exemplar/Case Studies	BBC To Launch AI - Enabled Interactive Radio Show For Amazon Echo And Google Home Chat bots	
*Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	Reasoning	07 Hours
Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Objects and Modal Logic, Reasoning Systems for Categories, Reasoning with Default Information		
#Exemplar/Case Studies	The Amazing Ways How Wikipedia Uses Artificial Intelligence	
*Mapping of Course Outcomes for Unit V	CO4, CO5	
Unit VI	Planning	07 Hours
Automated Planning, Classical Planning, Algorithms for Classical Planning, Heuristics for Planning, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Time, Schedules, and Resources, Analysis of Planning Approaches, Limits of AI, Ethics of AI, Future of AI, AI Components, AI Architectures.		
#Exemplar/Case Studies	The Amazing Ways Samsung Is Using Big Data, Artificial Intelligence And Robots To Drive Performance	
*Mapping of Course Outcomes for Unit VI	CO4, CO6	
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third edition, Pearson, 2003, ISBN :10: 0136042597 2. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1 3. Elaine Rich, Kevin Knight and Nair, “Artificial Intelligence”, TMH, ISBN-978-0-07-008770-5 		

Reference Books:

1. Nilsson Nils J , “Artificial Intelligence: A new Synthesis”, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4
2. Patrick Henry Winston, “Artificial Intelligence”, Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
3. Andries P. Engelbrecht-Computational Intelligence: An Introduction, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0
4. Dr. Lavika Goel, “Artificial Intelligence: Concepts and Applications”, Wiley publication, ISBN: 9788126519934
5. Dr. Nilakshi Jain, “Artificial Intelligence, As per AICTE: Making a System Intelligent”, Wiley publication, ISBN: 9788126579945

e-Books :

- <https://cs.calvin.edu/courses/cs/344/kvlinden/resources/AIMA-3rd-edition.pdf>
- <https://www.cin.ufpe.br/~tf12/artificial-intelligence-modern-approach.9780131038059.25368.pdf>
- <http://aima.cs.berkeley.edu/>

MOOCs Courses link:

- <https://nptel.ac.in/courses/106/102/106102220/>
- <https://nptel.ac.in/courses/106/105/106105077/>
- <https://nptel.ac.in/courses/106/105/106105078/>
- <https://nptel.ac.in/courses/106/105/106105079/>

@ The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Computer Engineering (2019 Course)
Elective II
310254(A): Information Security



Teaching Scheme: Theory: 04 Hours/Week \$\$	Credit: 03	Examination Scheme: Mid-Sem (TH) : 30 Marks End-Sem (TH): 70 Marks
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Prerequisites Courses: --Computer Networks and Security (310244)

Companion Course: --Laboratory Practice II (310258)

Course Objectives:

- To understand the fundamental approaches, principles and apply these concepts in Information Security
- To acquire the knowledge of mathematics for cryptography, understand the concepts of basic cryptography
- To learn standard algorithms and protocols employed to provide confidentiality, integrity and authenticity
- To acquire the knowledge of security protocol deployed in web security
- To study Information Security tools

Course Outcomes:

On completion of the course, learners should be able to

CO1: Model the cyber security threats and apply formal procedures to defend the attacks

CO2: Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography

CO3: Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms

CO4: Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios

CO5: Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection

Course Contents

Unit I	Introduction to Information Security	05 Hours
Foundations of Security, Computer Security Concepts, The OSI Security Architecture, Security attacks, Security services, Security mechanism, A Model for Network Security.		
#Exemplar/Case Studies	Open Source/ Free/ Trial Tools: Clam AV antivirus engine, Anti Phishing, Anti Spyware, Wireshark	
*Mapping of Course Outcomes for Unit I	CO1	
Unit II	Symmetric Key Cryptography	07 Hours
Classical Encryption Techniques: Stream Ciphers, Substitution Techniques: Caesar Cipher, Mono alphabetic Ciphers, Play fair Cipher, Hill Cipher, Poly alphabetic Ciphers, Transposition Techniques, Block Ciphers and Data Encryption standards, 3DES, Advanced Encryption standard		
#Exemplar/Case Studies	Open Source/ Free/ Trial Tools: crypt tool	
*Mapping of Course Outcomes for Unit II	CO2	
Unit III	Asymmetric Key Cryptography	07 Hours

Number theory: Prime number, Fermat and Euler theorems , Testing for primality, Chinese remainder theorem, discrete logarithm, Public Key Cryptography and RSA, Key Management, Diffie-Hellman key exchange, El Gamal algorithm, Elliptic Curve Cryptography		
#Exemplar/Case Studies	Open Source/ Free/ Trial Tools: crypt tool	
*Mapping of Course Outcomes for Unit III	CO2	
Unit IV	Data Integrity Algorithms And Web Security	09 Hours
<p>Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3, MD4, MD5. Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs. Digital Signatures: Digital Signatures, Schemes, Digital Signature standard, PKI X.509 Certificate.</p> <p>Web Security issues, HTTPS, SSH, Email security: PGP, S/MIME, IP Security : IPsec</p>		
#Exemplar/Case Studies	Open Source/ Free/ Trial Tools: Open SSL, Hash Calculator Tool : MD5, SHA1, SHA256, SHA 512	
*Mapping of Course Outcomes for Unit IV	CO3	
Unit V	Network and System Security	07 Hours
<p>The OSI Security architecture, Access Control, Flooding attacks, DOS, Distributed DOS attacks Intrusion detection, Host based and network based Honeypot, Firewall and Intrusion prevention system, Need of firewall, Firewall characteristics and access policy, Types of Firewall, DMZ networks, Intrusion prevention system: Host based, Network based, Hybrid.</p> <p>Operating system Security, Application Security, Security maintenance, Multilevel Security, Multilevel Security for role based access control, Concepts of trusted system, Trusted computing.</p>		
#Exemplar/Case Studies	Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain and Abel, iptables/ Windows Firewall, Suricata, fail2ban, Snort.	
*Mapping of Course Outcomes for Unit V	CO4	
Unit VI	Cyber Security and Tools	07 Hours
<p>Introduction, Cybercrime and Information Security, Classification of Cybercrimes, The legal perspectives-Indian perspective, Global perspective, Categories of Cybercrime, Social Engineering, Cyber stalking, Proxy servers and Anonymizers, Phishing, Password Cracking, Key-loggers and Spywares, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and Cybercrime Scenario in India, Indian IT Act.</p>		
#Exemplar/Case Studies	Study of any two network security scanners: Nmap, Metasploit, Open VAS, Aircrack,Nikito,Samurai,Safe3etc.	
*Mapping of Course Outcomes for Unit VI	CO5	
Learning Resources		
Text Books :		
<ol style="list-style-type: none"> 1. William Stallings, “Cryptography and Network Security Principals and Practice”, Seventh edition, Pearson , ISBN : 978-1-292-15858 2. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, 3rd_Edition, Pearson , ISBN : 978-0-13-3777392-7 3. Nina Godbole, Sumit Belapure, “Cyber Security”, Wiley, ISBN: 978-81-265-2179-1 		

Reference Books :

1. Atul Kahate, “Cryptography and Network Security”, 3e, McGraw Hill Education
2. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning
3. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning India, 2014, ISBN No.: 8131513491
4. JoshephKizza, “Computer Network Security and Cyber Ethics”, McFarland & Company, Inc., Publishers , Fourth Edition
5. Michael Whitman and Herbert Matford, “Principles of Information Security”, Course Technnology Ink, 7th edition
6. Neena Godbole, “Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Practices” , Wiley publication, ISBN: 9788126564057

e-Books :

- Introduction to Cyber Security, “<http://www.uou.ac.in/sites/default/files/slm/FCS.pdf>“, by Dr. Jeetendra Pande | Uttarakhand Open University, Haldwani
- “Information Security, The complete reference”, Second Edition, Mark Rhodes-Ousley, McGrawHill

MOOCs Courses link:

- NPTEL course on <https://nptel.ac.in/courses/106/106/106106129/>(IIT Madras, Prof. V.Kamakoti)
- Introduction to cyber security, “https://swayam.gov.in/nd2_nou19_cs08/preview” by Dr. Jeetendra Pande | Uttarakhand Open University, Haldwani

@ The CO-PO Mapping Matrix

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


Savitribai Phule Pune University Third Year of Computer Engineering (2019 Course) Elective II 310254(B): Augmented and Virtual Reality		
Teaching Scheme: Theory: 04 Hours/Week\$\$	Credit: 03	Examination Scheme: Mid-Semester (TH) : 30 Marks End-Sem (TH): 70 Marks
Prerequisites Courses: Computer Graphics (210244)		
Companion Course: Laboratory Practice II (310258)		
Course Objectives: <ul style="list-style-type: none"> ● To understand fundamentals of augmented and virtual reality ● To describe various elements and components used in AR/VR Hardware and Software ● To understand the methods used for representing and rendering the virtual world ● To create Augmented Reality application that allows users to interact with the immersive 3D world 		
Course Outcomes: On completion of the course, learners should be able to <ul style="list-style-type: none"> CO1: Understand the basics of Augmented and Virtual reality systems and list their applications CO2: Describe interface to the Virtual World with the help of input and output devices CO3: Explain representation and rendering system in the context of Virtual Reality CO4: Analyze manipulation, navigation and interaction of elements in the virtual world CO5: Summarize the basic concepts and hardware of Augmented Reality system CO6: Create Mobile Augmented Reality using Augmented Reality techniques and software 		
Course Contents		
Unit I	Introduction	06 Hours
Virtual Reality (VR): Introduction, Key Elements of VR, Experience, History, Applications. Augmented Reality (AR): Introduction, History, Key Aspects, and Applications.		
#Exemplar/Case Studies	Timeline of evolution of AR from VR and Case study of a single application using both VR and AR technologies	
*Mapping of Course Outcomes for Unit I	CO1	
Unit II	Interface to the Virtual World	08 Hours
Input: User Monitoring, Position Tracking, Body Tracking, Physical input Devices, Speech Recognition (Audio Input) and World Monitoring: Persistent Virtual Worlds, Bringing the Real World into the Virtual World.		
Output:		
Visual Displays: Properties of Visual Displays, Monitor-based or Fishtank-VR, Projection-based VR, Head-based VR, See-through Head-based Displays, Handheld VR.		
Aural Displays: Properties of Aural Displays, Head-based Aural Displays- Headphones, Stationary Aural Displays-Speakers.		
Haptic Displays: Properties of Haptic Displays, Tactile Haptic Displays, End-effector Displays, Robotically Operated Shape Displays, Vestibular and Other Senses.		
#Exemplar/Case Studies	Study the use of Virtual Reality at NASA	

*Mapping of Course Outcomes for Unit II	CO2	
Unit III	Representing and Rendering the Virtual World	08 Hours
<p>Representation of the Virtual World: Visual Representation in Virtual Reality, Aural Representation and Haptic Representation in Virtual Reality.</p> <p>Rendering Systems:</p> <p>Visual Rendering Systems: Visual Rendering Methods, Geometrically Based Rendering Systems, Non-geometric Rendering Systems, Rendering Complex Visual Scenes, Computer Graphics System Requirements.</p> <p>Aural Rendering Systems: Visual Rendering Methods, Rendering Complex Sounds, Sound-Generation Hardware, Internal Computer Representation.</p> <p>Haptic Rendering Systems : Haptic Rendering Methods, Rendering Complex Haptic Scenes with Force Displays, Haptic Rendering Techniques.</p>		
#Exemplar/Case Studies	GHOST (General Haptics Open Software Toolkit) software development toolkit.	
*Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Interacting with the Virtual World and Virtual Reality Experience	07 Hours
<p>User Interface Metaphors, Manipulating a Virtual World, Properties of Manipulation, Manipulation Operations, Navigating in a Virtual World-Way finding and Travelling, Classes of Travel Methods Interacting with Others-Shared Experience, Collaborative Interaction, Interacting with the VR System, Immersion, Rules of the Virtual World: Physics, Substance of the Virtual World.</p>		
#Exemplar/Case Studies	Side effects of using VR systems/ VR sickness and Study of Iterative design of any VR game.	
*Mapping of Course Outcomes for Unit IV	CO4	
Unit V	Augmented Reality	06 Hours
<p>Concepts: Computer Graphics, Dimensionality, Depth Cues, Registration and Latency, Working of Augmented Reality, Augmented Reality Hardware (Sensors, Processors, Displays), Ingredients of an AR Experience.</p>		
#Exemplar/Case Studies	<p>Augmented Reality (AR) and Virtual Reality (VR) headsets mainly find applications in gaming, movies, and other forms of entertainment. French startup Lynx has manufactured a standalone Mixed Reality (MR) headset for entertainment, medical, industrial, and defense applications. Analyze the technical specifications of Lynx – Mixed Reality Headset</p>	
*Mapping of Course Outcomes for Unit V	CO1, CO5	
Unit VI	Augmented Reality Software and Mobile Augmented Reality	07 Hours
<p>Augmented Reality Systems, Software Components, Software Tools for Content Creation, Interaction in Augmented Reality, Augmented Reality Techniques: Marker based and Marker less tracking, Mobile Augmented Reality.</p>		

#Exemplar/Case Studies	Case study of Google Maps AR navigation and its use
*Mapping of Course Outcomes for Unit VI	CO6
Learning Resources	
Text Books:	
<ol style="list-style-type: none"> 1. William R Sherman and Alan B Craig, “Understanding Virtual Reality: Interface, Application and Design”, (The Morgan Kaufmann Series in Computer Graphics), Morgan Kaufmann Publishers, San Francisco, CA, 2002 2. Alan B Craig, “Understanding Augmented Reality, Concepts and Applications”, Morgan Kaufmann Publishers, ISBN:978-0240824086 	
Reference Books:	
<ol style="list-style-type: none"> 1. Steven M. LaValle, “Virtual Reality”, Cambridge University Press, 2016 2. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009. 3. Schmalstieg / Hollerer, “Augmented Reality: Principles & Practice”, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494 4. Sanni Siltanen, “Theory and applications of marker-based augmented reality”, Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0 	
e-Books :	
<ul style="list-style-type: none"> • http://lavalle.pl/vr/book.html • https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf 	
MOOC Courses link:	
<ul style="list-style-type: none"> • https://nptel.ac.in/courses/106/106/106106138/ • https://www.coursera.org/learn/introduction-virtual-reality • https://www.coursera.org/learn/ar 	

@ The CO-PO Mapping Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	-	1
CO4	1	2	2	-	2	-	-	-	-	-	-	1
CO5	1	1	2	2	1	-	-	-	-	-	-	2
CO6	1	2	2	2	3	-	-	-	-	-	-	2

Savitribai Phule Pune University Third Year of Computer Engineering (2019 Course) Elective II 310254(C): Cloud Computing		
		
Teaching Scheme: Theory: 04 Hours/Week	Credit: 03	Examination Scheme: Mid-Semester (TH) : 30 Marks End-Sem (TH): 70 Marks
Prerequisites Courses: Computer Networks and Security(310244), Distributed Systems (310245C)		
Companion Course: Laboratory Practice II (310258)		
Course Objectives: <ul style="list-style-type: none"> ● To study fundamental concepts of cloud computing ● To learn various data storage methods on cloud ● To understand the implementation of Virtualization in Cloud Computing ● To learn the application and security on cloud computing ● To study risk management in cloud computing ● To understand the advanced technologies in cloud computing 		
Course Outcomes: On completion of the course, learners should be able to CO1: Understand the different Cloud Computing environment CO2: Use appropriate data storage technique on Cloud, based on Cloud application CO3: Analyze virtualization technology and install virtualization software CO4: Develop and deploy applications on Cloud CO5: Apply security in cloud applications CO6: Use advance techniques in Cloud Computing		
Course Contents		
Unit I	Introduction to Cloud Computing	07 Hours
Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing, Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing. Cloud Service Models: SaaS, PaaS, IaaS, Storage. Cloud Architecture: Cloud Computing Logical Architecture, Developing Holistic Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Models.		
#Exemplar/Case Studies	Cloud Computing Model of IBM	
*Mapping of Course Outcomes for Unit I	CO1	
Unit II	Data Storage and Cloud Computing	07 Hours
Data Storage: Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Network Attached Storage, Data Storage Management, File System, Cloud Data Stores, Using Grids for Data Storage. Cloud Storage: Data Management, Provisioning Cloud storage, Data Intensive Technologies for Cloud Computing. Cloud Storage from LANs to WANs: Cloud Characteristics, Distributed Data Storage.		
#Exemplar/Case Studies	Online Book Marketing Service, Online Photo Editing Service	

*Mapping of Course Outcomes for Unit II	CO2	
Unit III	Virtualization in Cloud Computing	07 Hours
<p>Introduction: Definition of Virtualization, Adopting Virtualization, Types of Virtualization, Virtualization Architecture and Software, Virtual Clustering, Virtualization Application, Pitfalls of Virtualization. Grid, Cloud and Virtualization: Virtualization in Grid, Virtualization in Cloud, Virtualization and Cloud Security. Virtualization and Cloud Computing: Anatomy of Cloud Infrastructure, Virtual infrastructures, CPU Virtualization, Network and Storage Virtualization.</p>		
#Exemplar/Case Studies	Xen: Para virtualization, VMware: Full Virtualization, Microsoft Hyper-V	
*Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Cloud Platforms and Cloud Applications	07 Hours
<p>Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB). Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine. Overview of OpenStack architecture.</p>		
#Exemplar/Case Studies	Multiplayer Online Gaming	
*Mapping of Course Outcomes for Unit IV	CO4	
Unit V	Security in Cloud Computing	07 Hours
<p>Risks in Cloud Computing: Risk Management, Enterprise-Wide Risk Management, Types of Risks in Cloud Computing. Data Security in Cloud: Security Issues, Challenges, advantages, Disadvantages, Cloud Digital persona and Data security, Content Level Security. Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements, Secure Cloud Software Testing.</p>		
#Exemplar/Case Studies	Cloud Security Tool: Acunetix.	
*Mapping of Course Outcomes for Unit V	CO5	
Unit VI	Advanced Techniques in Cloud Computing	07 Hours
<p>Future Trends in cloud Computing, Mobile Cloud, Automatic Cloud Computing: Comet Cloud. Multimedia Cloud: IPTV, Energy Aware Cloud Computing, Jungle Computing, Distributed Cloud Computing Vs Edge Computing, Containers, Docker, and Kubernetes, Introduction to DevOps. IOT and Cloud Convergence: The Cloud and IoT in your Home, The IOT and cloud in your Automobile, PERSONAL: IoT in Healthcare.</p>		
#Exemplar/Case Studies	Case studies on Dev Ops: DocuSign, Forter, Gengo.	
*Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books :

1. A. Srinivasan, J. Suresh, “Cloud Computing: A Practical Approach for Learning and Implementation”, Pearson, ISBN: 978-81-317-7651-3
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education, ISBN-13:978-1-25-902995-0

Reference Books :

1. James Bond ,“The Enterprise Cloud”, O'Reilly Media, Inc. ISBN: 9781491907627
2. Dr. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more”, Wiley Publications, ISBN: 978-0-470-97389-9
3. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, 2010, The McGraw-Hill.
4. Gautam Shrof, “ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications”, Cambridge University Press, ISBN: 9780511778476
5. Tim Mather, Subra K, Shahid L.,”Cloud Security and Privacy”, Oreilly, ISBN-13 978-81-8404-815-5
6. Dr. Kumar Saurabh, “Cloud Computing, 4ed: Architecting Next-Gen Transformation Paradigms”, Wiley publication, ISBN: 9788126570966
7. Rishabh Sharma, “Cloud Computing: Fundamentals, Industry Approach and Trends”, Wiley publication, ISBN:

e-Books :

- <https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf>
- <https://studytm.files.wordpress.com/2014/03/hand-book-of-cloud-computing.pdf>
- <https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf>
- <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.500-291r2.pdf>

MOOCs Courses link:

- Cloud Computing https://onlinecourses.nptel.ac.in/noc21_cs14/preview?
- Cloud Computing and Distributed System: https://onlinecourses.nptel.ac.in/noc21_cs15/preview?
- <https://www.digimat.in/nptel/courses/video/106105167/L01.html>
- <https://www.digimat.in/nptel/courses/video/106105167/L03.html>
- <https://www.digimat.in/nptel/courses/video/106105167/L20.html>

@ The CO-PO Mapping Matrix

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

Savitribai Phule Pune University

Third Year of Computer Engineering (2019 Course)

Elective II

310254(D): Software Modeling and Architecture


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Teaching Scheme: Theory: 04 Hours/Week	Credit: 03	Examination Scheme: Mid-Semester (TH) : 30 Marks End-Sem (TH): 70 Marks
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Prerequisites Courses: Object Oriented Programming (210243), Software Engineering (210253)

Companion Course: Laboratory Practice II (310258)

Course Objectives:

- To understand and apply Object Oriented concept for designing Object Oriented based model or application
- To transform Requirement document to appropriate design
- To acquaint with the interaction between quality attributes and software architecture
- To understand different architectural designs, transform them into proper model and document them
- To understand software architecture with case studies and explore with examples, use of design pattern application

Course Outcomes:

On completion of the course, learners should be able to

- CO1:** Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
- CO2:** Design and analyze an application using UML modeling as fundamental tool
- CO3:** Evaluate software architectures
- CO4:** Use appropriate architectural styles and software design patterns
- CO5:** Apply appropriate modern tool for designing and modeling

Course Contents

Unit I	Concepts of Software Modeling	07 Hours
<p>Software Modeling: Introduction to Software Modeling, Advantages of modeling, Principles of modeling. Evolution of Software Modeling and Design Methods: Object oriented analysis and design methods, Concurrent, Distributed Design Methods and Real-Time Design Methods, Model Driven Architecture (MDA), 4+1 Architecture, Introduction to UML, UML building Blocks, COMET Use Case–Based Software Life Cycle. Requirement Study: Requirement Analysis, SRS design, Requirements Modeling. Use Case: Actor and Use case identification, Use case relationship (Include, Extend, Use case Generalization, Actor Generalization), Use case template.</p>		
#Exemplar/Case Studies	Requirement modeling and use case modeling for Real life applications (e.g., Online shopping system)	
*Mapping of Course Outcomes for Unit I	CO1, CO2	
Unit II	Static Modeling	07 Hours
<p>Study of classes (analysis level and design level classes). Methods for identification of classes: RUP (Rational Unified Process), CRC (Class, Responsibilities and Collaboration), Use of Noun Verb analysis (for identifying entity classes, controller classes and boundary classes). Class Diagram: Relationship between classes, Generalization/Specialization Hierarchy, Composition and Aggregation Hierarchies, Associations Classes, Constraints.</p> <p>Object diagram, Package diagram, Component diagram, Composite Structure diagram, Deployment Diagram.</p>		

#Exemplar/Case Studies	UML Static Diagrams for Real life applications (e.g., Online shopping system).	
*Mapping of Course Outcomes for Unit II	CO1 ,CO2	
Unit III	Dynamic Modeling	07 Hours
<p>Activity diagram: Different Types of nodes, Control flow, Activity Partition, Exception handler, Interruptible activity region, Input and output parameters, Pins.</p> <p>Interaction diagram: Sequence diagram, Interaction Overview diagram, State machine diagram, Advanced State Machine diagram, Communication diagram, Timing diagram.</p>		
#Exemplar/Case Studies	UML dynamic Diagrams of for Real life applications.	
*Mapping of Course Outcomes for Unit III	CO1 ,CO2	
Unit IV	Software Architecture and Quality Attributes	07 Hours
<p>Introduction to Software Architecture, Importance of Software Architecture, Architectural Structure and Views. Architectural Pattern: common module, Common component-and-connector, Common allocation.</p> <p>Quality Attributes: Architecture and Requirements, Quality Attributes and Considerations</p>		
#Exemplar/Case Studies	Case study of any real-life application	
*Mapping of Course Outcomes for Unit IV	CO3	
Unit V	Architectural Design and Documentation	07 Hours
<p>Architecture in the Life Cycle: Architecture in Agile Projects, Architecture and Requirements, Designing an Architecture. Documenting Software Architecture: Notations, Choosing and Combining views, Building the documentation Package, Documenting Behavior, Documenting Architecture in an Agile Development Project.</p>		
#Exemplar/Case Studies	Air Traffic Control.	
*Mapping of Course Outcomes for Unit V	CO4 , CO5	
Unit VI	Design Patterns	07 Hours
<p>Design Patterns: Introduction, Different approaches to select Design Patterns. Creational patterns: Singleton, Factory, Structural pattern: Adapter, Proxy. Behavioral Patterns: Iterator, Observer Pattern with applications.</p>		
#Exemplar/Case Studies	Flight Simulation	
*Mapping of Course Outcomes for Unit VI	CO4, CO5	
Learning Resources		
Text Books :		
<ol style="list-style-type: none"> 1. Jim Arlow, Ila Neustadt, “UML 2 and the unified process –practical object-oriented analysis and design”, Addison Wesley, Second edition, ISBN 978-0201770605. 2. Len Bass, Paul Clements, Rick Kazman, “Software Architecture in Practice”, Second Edition, Pearson ,ISBN 978-81-775-8996-2 3. Erich Gamma, “Design Patterns”, Pearson, ISBN 0-201-63361-2. 		

Reference Books :

1. Hassan Gomaa, “Software Modeling and Design- UML, Use cases, Patterns and Software Architectures”, Cambridge University Press, 2011, ISBN 978-0-521-76414-8
2. Gardy Booch, James Rumbaugh, Ivar Jacobson, “The unified modeling language user guide” , Pearson Education, Second edition, 2008, ISBN 0-321-24562
3. Ian Sommerville, “Software Engineering”, Addison and Wesley, ISBN 0-13-703515-2

e-Books :

- <https://ebookpdf.com/roger-s-pressman-software-engineering>
- <https://dhomaseghanshyam.files.wordpress.com/2016/02/gomaa-softwaremodellanddesign.pdf>
- <https://balu051989.files.wordpress.com/2011/06/the-unified-modeling-language-user-guide-by-grady-booch-james-rumbaugh-ivar-jacobson.pdf>
- [http://index-of.co.uk/Engineering/Software%20Engineering%20\(9th%20Edition\).pdf](http://index-of.co.uk/Engineering/Software%20Engineering%20(9th%20Edition).pdf)

MOOCs Courses link

- <https://nptel.ac.in/courses/106/105/106105224/>
- https://onlinecourses.nptel.ac.in/noc20_cs59/preview
- https://onlinecourses.nptel.ac.in/noc20_cs84/preview

@ The CO-PO Mapping Matrix

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

Savitribai Phule Pune University

Third Year of Computer Engineering (2019 Course)

310255: Internship**


 Home

Teaching Scheme:

Credit: 04

Examination Scheme:

**

Term work: 100 Marks

Course Objectives:

Internship provides an excellent opportunity to learner to see how the conceptual aspects learned in classes are integrated into the practical world. Industry/on project experience provides much more professional experience as value addition to classroom teaching.

- To encourage and provide opportunities for students to get professional/personal experience through internships.
- To learn and understand real life/industrial situations.
- To get familiar with various tools and technologies used in industries and their applications.
- To nurture professional and societal ethics.
- To create awareness of social, economic and administrative considerations in the working environment of industry organizations.

Course Outcomes:

On completion of the course, learners should be able to

CO1: To demonstrate professional competence through industry internship.

CO2: To apply knowledge gained through internships to complete academic activities in a professional manner.

CO3: To choose appropriate technology and tools to solve given problem.

CO4: To demonstrate abilities of a responsible professional and use ethical practices in day to day life.

CO5: Creating network and social circle, and developing relationships with industry people.

CO6: To analyze various career opportunities and decide carrier goals.

**** 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 conceptual 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 is 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. Organizations/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 make themselves ready for the industry[1].

Students must register at Internshala [2]. Students must get Internship proposals sanctioned from college authority well in advance. 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 and before academic schedule of semester VI.

Student can take internship work in the form of the following but not limited to:

- Working for consultancy/ research project,
- 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,
- Industry / Government Organization Internship,
- Internship through Internshala,
- In-house product development, intercollegiate, inter department research internship under research lab/group, micro/small/medium enterprise/online internship,
- 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 every day by the supervisor.

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 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 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
- Diary/Work book
- Student's Feedback from External Internship Supervisor

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period.

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

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 / Supervisor details
- 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 coordinator should collect feedback about student with recommended parameters include as- Technical knowledge, Discipline, Punctuality, Commitment, Willingness to do the work, Communication skill, individual work, Team work, Leadership.....

Reference:

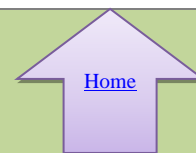
[1] <https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf>

[2] <https://internship.aicte-india.org/>

@ The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Computer Engineering (2019 Course)
310256:Data Science and Big Data Analytics Laboratory



Teaching Scheme Practical: 04 Hours/Week	Credit:02	Examination Scheme and Marks Term work: 50 Marks Practical: 25 Marks
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Companion Course: Data Science and Big Data Analytics (310251)

Course Objectives:

- To understand principles of Data Science for the analysis of real time problems
- To develop in depth understanding and implementation of the key technologies in Data Science and Big Data Analytics
- To analyze and demonstrate knowledge of statistical data analysis techniques for decision-making
- To gain practical, hands-on experience with statistics programming languages and Big Data tools

Course Outcomes:

On completion of the course, learners will be able to

- CO1:** Apply principles of Data Science for the analysis of real time problems
- CO2:** Implement data representation using statistical methods
- CO3:** Implement and evaluate data analytics algorithms
- CO4:** Perform text preprocessing
- CO5:** Implement data visualization techniques
- CO6:** Use cutting edge tools and technologies to analyze Big Data

Guidelines for Instructor's Manual

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The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, Test Data Set(if applicable), mathematical model (if applicable), conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal must be avoided. Use of DVD 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.

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Set of suggested assignment list is provided in groups- A and B. Each student must perform 13 assignments (10 from group A, 3 from group B), 2 mini project from Group C

Operating System recommended :- 64-bit Open source Linux or its derivative

Programming tools recommended: - JAVA/Python/R/Scala

Virtual Laboratory:

- ["Welcome to Virtual Labs - A MHRD Govt of india Initiative"](#)
- <http://cse20-iiith.vlabs.ac.in/List%20of%20Experiments.html?domain=Computer%20Science>

Suggested List of Laboratory Experiments/Assignments Assignments from all Groups (A,B,C) are compulsory.

Sr. No.	Group A : Data Science
1.	<p>Data Wrangling, I</p> <p>Perform the following operations using Python on any open source dataset (e.g., data.csv)</p> <ol style="list-style-type: none"> 1. Import all the required Python Libraries. 2. Locate an open source data from the web (e.g. https://www.kaggle.com). Provide a clear description of the data and its source (i.e., URL of the web site). 3. Load the Dataset into pandas data frame. 4. Data Preprocessing: check for missing values in the data using pandas <code>isnull()</code>, <code>describe()</code> function to get some initial statistics. Provide variable descriptions. Types of variables etc. Check the dimensions of the data frame. 5. Data Formatting and Data Normalization: Summarize the types of variables by checking the data types (i.e., character, numeric, integer, factor, and logical) of the variables in the data set. If variables are not in the correct data type, apply proper type conversions. 6. Turn categorical variables into quantitative variables in Python. <p>In addition to the codes and outputs, explain every operation that you do in the above steps and explain everything that you do to import/read/scrape the data set.</p>
2.	<p>Data Wrangling II</p> <p>Create an “Academic performance” dataset of students and perform the following operations using Python.</p> <ol style="list-style-type: none"> 1. Scan all variables for missing values and inconsistencies. If there are missing values and/or inconsistencies, use any of the suitable techniques to deal with them. 2. Scan all numeric variables for outliers. If there are outliers, use any of the suitable techniques to deal with them. 3. Apply data transformations on at least one of the variables. The purpose of this transformation should be one of the following reasons: to change the scale for better understanding of the variable, to convert a non-linear relation into a linear one, or to decrease the skewness and convert the distribution into a normal distribution. <p>Reason and document your approach properly.</p>

3.	<p>Descriptive Statistics - Measures of Central Tendency and variability</p> <p>Perform the following operations on any open source dataset (e.g., data.csv)</p> <ol style="list-style-type: none"> 1. Provide summary statistics (mean, median, minimum, maximum, standard deviation) for a dataset (age, income etc.) with numeric variables grouped by one of the qualitative (categorical) variable. For example, if your categorical variable is age groups and quantitative variable is income, then provide summary statistics of income grouped by the age groups. Create a list that contains a numeric value for each response to the categorical variable. 2. Write a Python program to display some basic statistical details like percentile, mean, standard deviation etc. of the species of 'Iris-setosa', 'Iris-versicolor' and 'Iris-versicolor' of iris.csv dataset. <p>Provide the codes with outputs and explain everything that you do in this step.</p>
4.	<p>Data Analytics I</p> <p>Create a Linear Regression Model using Python/R to predict home prices using Boston Housing Dataset (https://www.kaggle.com/c/boston-housing). The Boston Housing dataset contains information about various houses in Boston through different parameters. There are 506 samples and 14 feature variables in this dataset.</p> <p>The objective is to predict the value of prices of the house using the given features.</p>
5.	<p>Data Analytics II</p> <ol style="list-style-type: none"> 1. Implement logistic regression using Python/R to perform classification on Social_Network_Ads.csv dataset. 2. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset.
6.	<p>Data Analytics III</p> <ol style="list-style-type: none"> 1. Implement Simple Naïve Bayes classification algorithm using Python/R on iris.csv dataset. 2. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset.
7.	<p>Text Analytics</p> <ol style="list-style-type: none"> 1. Extract Sample document and apply following document preprocessing methods: Tokenization, POS Tagging, stop words removal, Stemming and Lemmatization. 2. Create representation of document by calculating Term Frequency and Inverse Document Frequency.
8.	<p>Data Visualization I</p> <ol style="list-style-type: none"> 1. Use the inbuilt dataset 'titanic'. The dataset contains 891 rows and contains information about the passengers who boarded the unfortunate Titanic ship. Use the Seaborn library to see if we can find any patterns in the data. 2. Write a code to check how the price of the ticket (column name: 'fare') for each passenger is distributed by plotting a histogram.
9.	<p>Data Visualization II</p> <ol style="list-style-type: none"> 1. Use the inbuilt dataset 'titanic' as used in the above problem. Plot a box plot for distribution of age with respect to each gender along with the information about whether they survived or not. (Column names : 'sex' and 'age') 2. Write observations on the inference from the above statistics.

10.	<p>Data Visualization III</p> <p>Download the Iris flower dataset or any other dataset into a DataFrame. (e.g., https://archive.ics.uci.edu/ml/datasets/Iris). Scan the dataset and give the inference as:</p> <ol style="list-style-type: none"> 1. List down the features and their types (e.g., numeric, nominal) available in the dataset. 2. Create a histogram for each feature in the dataset to illustrate the feature distributions. 3. Create a box plot for each feature in the dataset. 4. Compare distributions and identify outliers.
Group B- Big Data Analytics – JAVA/SCALA (Any three)	
1.	Write a code in JAVA for a simple Word Count application that counts the number of occurrences of each word in a given input set using the Hadoop Map-Reduce framework on local-standalone set-up.
2.	Design a distributed application using Map-Reduce which processes a log file of a system.
3.	Locate dataset (e.g., sample_weather.txt) for working on weather data which reads the text input files and finds average for temperature, dew point and wind speed.
4.	Write a simple program in SCALA using Apache Spark framework
Group C- Mini Projects/ Case Study – PYTHON/R (Any TWO Mini Project)	
1.	Write a case study on Global Innovation Network and Analysis (GINA). Components of analytic plan are 1. Discovery business problem framed, 2. Data, 3. Model planning analytic technique and 4. Results and Key findings.
2.	Use the following dataset and classify tweets into positive and negative tweets. https://www.kaggle.com/ruchi798/data-science-tweets
3.	Develop a movie recommendation model using the scikit-learn library in python. Refer dataset https://github.com/rashida048/Some-NLP-Projects/blob/master/movie_dataset.csv
4.	Use the following covid_vaccine_statewise.csv dataset and perform following analytics on the given dataset https://www.kaggle.com/sudalairajkumar/covid19-in-india?select=covid_vaccine_statewise.csv a. Describe the dataset b. Number of persons state wise vaccinated for first dose in India c. Number of persons state wise vaccinated for second dose in India d. Number of Males vaccinated d. Number of females vaccinated
5.	Write a case study to process data driven for Digital Marketing OR Health care systems with Hadoop Ecosystem components as shown. (Mandatory) <ul style="list-style-type: none"> ● HDFS: Hadoop Distributed File System ● YARN: Yet Another Resource Negotiator ● MapReduce: Programming based Data Processing ● Spark: In-Memory data processing ● PIG, HIVE: Query based processing of data services ● HBase: NoSQL Database (Provides real-time reads and writes) ● Mahout, Spark MLlib: (Provides analytical tools) Machine Learning algorithm libraries ● Solar, Lucene: Searching and Indexing
Learning Resources	

Reference Books :

1. Chirag Shah, “A Hands-On Introduction To Data Science”, Cambridge University Press,(2020), ISBN : ISBN 978-1-108-47244-9.
2. Wes McKinney, “Python for Data Analysis”, O' Reilly media, ISBN : 978-1-449-31979-3.
3. “Scikit-learn Cookbook”, Trent hawk, Packt Publishing, ISBN: 9781787286382
4. R Kent Dybvig, “The Scheme Programming Language”, MIT Press, ISBN 978-0-262-51298-5.
5. Jenny Kim, Benjamin Bengfort, “Data Analytics with Hadoop”, O'Reilly Media, Inc.
6. Jake VanderPlas, “Python Data Science Handbook”
<https://tanthiamhuat.files.wordpress.com/2018/04/pythondatasciencehandbook.pdf>
7. Gareth James, “An Introduction to Statistical Learning”
<https://www.ime.unicamp.br/~dias/Intoduction%20to%20Statistical%20Learning.pdf>
8. Cay S Horstmann, “Scala for the Impatient”, Pearson, ISBN: 978-81-317-9605-4,
9. Alvin Alexander, “Scala Cookbook”, O'Reilly, SPD, ISBN: 978-93-5110-263-2

Web Links:

- <https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article>
- <https://hadoop.apache.org/docs/current/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html>
- <https://www.edureka.co/blog/hadoop-ecosystem>
- https://www.edureka.co/blog/mapreduce-tutorial/#mapreduce_word_count_example
- <https://github.com/vasanth-mahendran/weather-data-hadoop>
- <https://spark.apache.org/docs/latest/quick-start.html#more-on-dataset-operations>
- <https://www.scala-lang.org/>

MOOCs Courses link:

- <https://nptel.ac.in/courses/106/106/106106212/>
- https://onlinecourses.nptel.ac.in/noc21_cs33/preview
- <https://nptel.ac.in/courses/106/104/106104189/>
- https://onlinecourses.nptel.ac.in/noc20_cs92/preview

@The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Computer Engineering (2019 Course)
310257:Web Technology Laboratory



Teaching Scheme
Practical: 02 Hours/Week

Credit: 01

Examination Scheme and Marks
Term Work: 25 Marks
Oral: 25 Marks

Companion Course : Web Technology (310252)

Course Objectives:

- To learn the web based development environment
- To use client side and server side web technologies
- To design and develop web applications using front end technologies and backend databases

Course Outcomes:

On completion of the course, learners will be able to

- CO1:** Understand the importance of website planning and website design issues
CO2: Apply the client side and server side technologies for web application development
CO3: Analyze the web technology languages, frameworks and services
CO4: Create three tier web based applications

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The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. Use of open source software is encouraged. Based on the concepts learned. Mini project should be implemented by the students in a group of 2-3 students.

Suggested List of Laboratory Experiments/Assignments

(All assignments are compulsory)

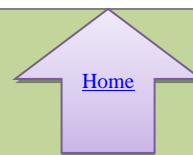
Sr. No.	Assignment Title												
1.	<p>Case study: Before coding of the website, planning is important, students should visit different websites (Min. 5) for the different client projects and note down the evaluation results for these websites, either good website or bad website in following format:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr. No.</th> <th style="text-align: center;">Website URL</th> <th style="text-align: center;">Purpose of Website</th> <th style="text-align: center;">Things liked in the website</th> <th style="text-align: center;">Things disliked in the website</th> <th style="text-align: center;">Overall evaluation of the website (Good/Bad)</th> </tr> </thead> <tbody> <tr> <td style="height: 20px;"> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>From the evaluation, students should learn and conclude different website design issues, which should be considered while developing a website.</p>	Sr. No.	Website URL	Purpose of Website	Things liked in the website	Things disliked in the website	Overall evaluation of the website (Good/Bad)						
Sr. No.	Website URL	Purpose of Website	Things liked in the website	Things disliked in the website	Overall evaluation of the website (Good/Bad)								
2.	<p>Implement a web page index.htm for any client website (e.g., a restaurant website project) using following:</p> <ol style="list-style-type: none"> a. HTML syntax: heading tags, basic tags and attributes, frames, tables, images, lists, links for text and images, forms etc. b. Use of Internal CSS, Inline CSS, External CSS 												
3.	<p>Design the XML document to store the information of the employees of any business organization and demonstrate the use of:</p> <ol style="list-style-type: none"> a) DTD b) XML Schema <p>And display the content in (e.g., tabular format) by using CSS/XSL.</p>												
4.	<p>Implement an application in Java Script using following:</p> <ol style="list-style-type: none"> a) Design UI of application using HTML, CSS etc. b) Include Java script validation c) Use of prompt and alert window using Java Script <p>e.g., Design and implement a simple calculator using Java Script for operations like addition, multiplication, subtraction, division, square of number etc.</p> <ol style="list-style-type: none"> a) Design calculator interface like text field for input and output, buttons for numbers and operators etc. b) Validate input values c) Prompt/alerts for invalid values etc. 												
5.	<p>Implement the sample program demonstrating the use of Servlet.</p> <p>e.g., Create a database table ebookshop (book_id, book_title, book_author, book_price, quantity) using database like Oracle/MySQL etc. and display (use SQL select query) the table content using servlet.</p>												
6.	<p>Implement the program demonstrating the use of JSP.</p> <p>e.g., Create a database table students_info (stud_id, stud_name, class, division, city) using database like Oracle/MySQL etc. and display (use SQL select query) the table content using JSP.</p>												
7.	<p>Build a dynamic web application using PHP and MySQL.</p> <ol style="list-style-type: none"> a. Create database tables in MySQL and create connection with PHP. b. Create the add, update, delete and retrieve functions in the PHP web app interacting with MySQL database 												

8.	Design a login page with entries for name, mobile number email id and login button. Use struts and perform following validations a. Validation for correct names b. Validation for mobile numbers c. Validation for email id d. Validation if no entered any value e. Re-display for wrongly entered values with message f. Congratulations and welcome page upon successful entries
9.	Design an application using Angular JS. e.g., Design registration (first name, last name, username, password) and login page using Angular JS.
10.	Design and implement a business interface with necessary business logic for any web application using EJB. e.g., Design and implement the web application logic for deposit and withdraw amount transactions using EJB.
11.	Mini Project: Design and implement a dynamic web application for any business functionality by using web development technologies that you have learnt in the above given assignments.

[@The CO-PO Mapping Matrix](#)

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CO3	2	-	3	-	-	1	-	-	-	1	1	-
CO4	1	2	2	1	2	1	1	-	-	-	-	1

Savitribai Phule Pune University
Third Year of Computer Engineering (2019 Course)
310258:Laboratory Practice II



Teaching Scheme
Practical: 04 Hours/Week

Credit: 02

Examination Scheme and Marks
Term Work: 50 Marks
Practical: 25 Marks

Companion Course: Artificial Intelligence (310253), Elective II (310254)

Course Objectives:

- To learn and apply various search strategies for AI
- To Formalize and implement constraints in search problems
- To understand the concepts of Information Security / Augmented and Virtual Reality/Cloud Computing/Software Modeling and Architectures

Course Outcomes:

On completion of the course, learner will be able to

- **Artificial Intelligence**
 - CO1:** Design a system using different informed search / uninformed search or heuristic approaches
 - CO2:** Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
 - CO3:** Design and develop an interactive AI application
- **Information Security**
 - CO4:** Use tools and techniques in the area of Information Security
 - CO5:** Use the cryptographic techniques for problem solving
 - CO6:** Design and develop security solution

OR
- **Augmented and Virtual Reality**
 - CO4:** Use tools and techniques in the area of Augmented and Virtual Reality
 - CO5:** Use the representing and rendering system for problem solving
 - CO6:** Design and develop ARVR applications

OR
- **Cloud Computing**
 - CO4:** Use tools and techniques in the area of Cloud Computing
 - CO5:** Use cloud computing services for problem solving
 - CO6:** Design and develop applications on cloud

OR
- **Software Modeling and Architectures**
 - CO4:** Use tools and techniques in the area Software Modeling and Architectures
 - CO5:** Use the knowledge of Software Modeling and Architectures for problem solving
 - CO6:** Design and develop applications using UML as fundamental tool

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Operating System recommended :- 64-bit Windows OS and Linux

Programming tools recommended: -

Information Security : - C/C++/Java

Augmented and Virtual Reality :- Unity, C#, Blender, VRTK, ARTK, Vuforia

VR Devices: HTC Vive, Google Daydream and Samsung gear VR.

Software Modeling and Architectures:-Front end:HTML5, Bootstarp, JQuery, JS etc.

Backend: MySQL /MongoDB/NodeJS

Virtual Laboratory:

Software Modeling and Architectures : <http://vlabs.iitkgp.ernet.in/se>

Information Security : <http://cse29-iiith.vlabs.ac.in>

Part I : Artificial Intelligence

Suggested List of Laboratory Experiments/Assignments

Sr. No.	Group A All assignments are compulsory
1.	Implement depth first search algorithm and Breadth First Search algorithm, Use an undirected graph and develop a recursive algorithm for searching all the vertices of a graph or tree data structure.
2.	Implement A star Algorithm for any game search problem.
3.	Implement Greedy search algorithm for any of the following application: <ol style="list-style-type: none"> Selection Sort Minimum Spanning Tree Single-Source Shortest Path Problem Job Scheduling Problem Prim's Minimal Spanning Tree Algorithm Kruskal's Minimal Spanning Tree Algorithm Dijkstra's Minimal Spanning Tree Algorithm
Group B	
4.	Implement a solution for a Constraint Satisfaction Problem using Branch and Bound and Backtracking for n-queens problem or a graph coloring problem.
5.	Develop an elementary catboat for any suitable customer interaction application.

Group C	
6.	Implement any one of the following Expert System <ol style="list-style-type: none"> Information management Hospitals and medical facilities Help desks management Employee performance evaluation Stock market trading Airline scheduling and cargo schedules
Part II : Elective II	
Suggested List of Laboratory Experiments/Assignments	
Sr. No.	Assignment Name
Information Security (Any five)	
1.	Write a Java/C/C++/Python program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.
2.	Write a Java/C/C++/Python program to perform encryption and decryption using the method of Transposition technique.
3.	Write a Java/C/C++/Python program to implement DES algorithm.
4.	Write a Java/C/C++/Python program to implement AES Algorithm.
5.	Write a Java/C/C++/Python program to implement RSA algorithm.
6.	Implement the different Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
7.	Calculate the message digest of a text using the MD5 algorithm in JAVA.
Cloud Computing (All assignments are compulsory)	
1.	Case study on Microsoft azure to learn about Microsoft Azure is a cloud computing platform and infrastructure, created by Microsoft, for building, deploying and managing applications and services through a global network of Microsoft-managed data centers. OR Case study on Amazon EC2 and learn about Amazon EC2 web services.
2.	Installation and configure Google App Engine. OR Installation and Configuration of virtualization using KVM.
3.	Creating an Application in Salesforce.com using Apex programming Language.
4.	Design and develop custom Application (Mini Project) using Sales force Cloud.
5.	Mini-Project
	Setup your own cloud for Software as a Service (SaaS) over the existing LAN in your laboratory. In this assignment you have to write your own code for cloud controller using open-source technologies to implement with HDFS . Implement the basic operations may be like to divide the file in segments/blocks and upload/ download file on/from cloud in encrypted form.
Augmented and Virtual Reality (Assignments 1,2, 3,7 are mandatory, any 2 from 4, 5 & 6)	
1.	Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.
2.	Demonstration of the working of HTC Vive, Google Daydream or Samsung gear VR.
3.	Develop a scene in Unity that includes:

	<p>i. A cube, plane and sphere, apply transformations on the 3 game objects.</p> <p>ii. Add a video and audio source.</p>
4.	Develop a scene in Unity that includes a cube, plane and sphere. Create a new material and texture separately for three Game objects. Change the color, material and texture of each Game object separately in the scene. Write a C# program in visual studio to change the color and material/texture of the game objects dynamically on button click.
5.	Develop and deploy a simple marker based AR app in which you have to write a C# program to play video on tracking a particular marker.
6.	Develop and deploy an AR app, implement the following using Vuforia Engine developer portal: <ul style="list-style-type: none"> i. Plane detection ii. Marker based Tracking(Create a database of objects to be tracked in Vuforia) iii. Object Tracking
7.	<p style="text-align: center;">Mini-Projects/ Case Study</p> <p>Create a multiplayer VR game (battlefield game). The game should keep track of score, no. of chances/lives, levels(created using different scenes), involve interaction, animation and immersive environment.</p> <p style="text-align: center;">OR</p> <p>Create a treasure hunt AR application which should have the following features:</p> <ul style="list-style-type: none"> i. A help button for instruction box to appear. ii. A series of markers which would give hints on being scanned. iii. Involve interaction, sound, and good UI.
<p>Software Modeling and Architectures</p> <p>(Problem statement 1, 2 , 5 are mandatory and any one from 3 and 4)</p>	
1.	Consider a library, where a member can perform two operations: issue book and return it. A book is issued to a member only after verifying his credentials. Develop a use case diagram for the given library system by identifying the actors and use cases and associate the use cases with the actors by drawing a use case diagram. Use UML tool.
2.	Consider online shopping system. Perform the following tasks and draw the class diagram using UML tool. <p>Represent the individual classes, and objects</p> <p>Add methods</p> <p>Represent relationships and other classifiers like interfaces</p>
3.	Consider the online shopping system in the assignment 2. <p>Draw the sequence diagram using UML tool to show message exchanges</p>
4.	Consider your neighboring travel agent from whom you can purchase flight tickets. To book a ticket you need to provide details about your journey i.e., on which date and at what time you would like to travel. You also need to provide your address. The agency has recently been modernized. So, you can pay either by cash or by card. You can also cancel a booked ticket later if you decide to change your plan. In that case you need to book a new ticket again. Your agent also allows you to book a hotel along with flight ticket. While cancelling a flight ticket you can also cancel hotel booking. Appropriate refund as per policy is made in case of cancellation. <p>Perform the following tasks and draw the use case diagram using UML tool.</p> <ul style="list-style-type: none"> a. Identify the use cases from a given non-trivial problem statement. b. Identify the primary and secondary actors for a system. c. Use to generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase

Mini-Projects

5. Select a moderately complex system and narrate concise requirement Specification for the same. Design the system indicating system elements organizations using applicable architectural styles and design patterns with the help of a detailed Class diagram depicting logical architecture. Specify and document the architecture and design pattern with the help of templates. Implement the system features and judge the benefits of the design patterns accommodated.

Learning Resources

Text Books:

Artificial Intelligence

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third edition, Pearson, 2003, ISBN :10: 0136042597
2. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1
3. Elaine Rich, Kevin Knight and Nair, “Artificial Intelligence”, TMH, ISBN-978-0-07-008770-5

Information Security

1. Atul Kahate, “Cryptography and Network Security”, 3e, McGraw Hill Education
2. Prakash C. Gupta, “Cryptography and Network Security”, PHI
3. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning

Cloud Computing

1. A. Srinivasan, J. Suresh,” Cloud Computing: A Practical Approach for Learning and Implementation”, Pearson, ISBN: 978-81-317-7651-3
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education, ISBN-13:978-1-25-902995-0

Augmented and Virtual Reality

1. William R Sherman and Alan B Craig, “Understanding Virtual Reality: Interface, Application and Design”, (The Morgan Kaufmann Series in Computer Graphics)”. Morgan Kaufmann Publishers, San Francisco, CA, 2002
2. Alan B Craig, “Understanding Augmented Reality, Concepts and Applications”, Morgan Kaufmann Publishers, ISBN:978-0240824086

Software Modeling and Architectures

1. Jim Arlow, Ila Neustadt, “UML 2 and the unified process –practical object-oriented analysis and design”, Addison Wesley, Second edition, ISBN 978-0201770605
2. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Second Edition, Pearson ,ISBN 978-81-775-8996-2
3. Hassan Gomaa, “Software Modeling and Design- UML, Use cases, Patterns and Software Architectures”, Cambridge University Press, 2011, ISBN 978-0-521-76414-8
4. Erich Gamma, “Design Patterns”, Pearson, ISBN 0-201-63361-2

Reference Books:

1. Nilsson Nils J , “Artificial Intelligence: A new Synthesis”, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4
2. Patrick Henry Winston, “Artificial Intelligence”, Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
3. Andries P. Engelbrecht, “Computational Intelligence: An Introduction”, 2nd Edition-Wiley India-

ISBN: 978-0-470-51250-0

Information Security

1. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, 3rd_Edition, Pearson
2. William Stallings, “Cryptography and Network Security Principals and Practice”, Fifth edition, Pearson
3. Nina Godbole, Sunit Belapure, “Cyber Security”, Wiley, ISBN: 978-81-265-2179-1

Augmented and Virtual Reality

1. Steven M. LaValle, “Virtual Reality”, Cambridge University Press, 2016
2. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.
3. Schmalstieg / Hollerer, “Augmented Reality: Principles & Practice”, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494
4. Sanni Siltanen, “Theory and applications of marker-based augmented reality”, Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

Cloud Computing

1. James Bond ,“The Enterprise Cloud”, O'Reilly Media, Inc. ISBN: 9781491907627
2. Dr. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more”, Wiley Publications, ISBN: 978-0-470-97389-9
3. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, 2010, The McGraw-Hill.

Software Modeling and Architectures

1. Gardy Booch, James Rambaugh, Ivar Jacobson, “The unified modeling language user guide” , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8.
2. Lan Sommerville, “Software Engineering”, 9th edition, ISBN-13: 978-0-13-703515-1 ISBN-10: 0-13-703515-2.

@The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)
310259: Audit Course 6



In addition to credits, it is recommended that there should be audit course, in preferably in each semester starting from second year in order to supplement students' knowledge and skills. Student will be awarded the bachelor's degree if he/she earns specified total credit [1] and clears all the audit courses specified in the curriculum. The student will be awarded grade as AP on successful completion of audit course. The student may opt for one of the audit courses per semester, starting in second year first semester. Though not mandatory, such a selection of the audit courses helps the learner to explore the subject of interest in greater detail resulting in achieving the very objective of audit course's inclusion. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course will be done at institute level itself. Method of conduction and method of assessment for audit courses are suggested.

Criteria

The student registered for audit course shall be awarded the grade AP (Audit Course Pass) and shall be included such AP grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA. Evaluation of audit course will be done at institute level itself [1]

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

- | | |
|---|---|
| <ul style="list-style-type: none"> • Lectures/ Guest Lectures • Visits (Social/Field) and reports • Demonstrations | <ul style="list-style-type: none"> • Surveys • Mini-Project • Hands on experience on focused topic |
|---|---|

Course Guidelines for Assessment (Any one or more of following but not limited to):

- Written Test
- Demonstrations/ Practical Test
- Presentations, IPR/Publication and Report

Audit Course 6 Options

Audit Course Code	Audit Course Title
310259(A)	Digital and Social Media Marketing
310259(B)	Sustainable Energy Systems
310259(C)	Leadership and Personality Development
310259(D)	Foreign Language (one of Japanese/Spanish/French/German). Course contents for Japanese (Module 4) are provided. For other languages institute may design suitably.
310259(E)	Learn New Skills - Software Development Using Agility Approach

Note: It is permitted to opt one of the audit courses listed at SPPU website too, if not opted earlier.
<http://collegecirculars.unipune.ac.in/sites/documents/Syllabus%202017/Forms/AllItems.aspx>
http://www.unipune.ac.in/university_files/syllabi.htm

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)
Audit Course 6
310259(A): Digital and Social Media Marketing



[Home](#)

Prerequisites: Internet Technologies

Course Objectives:

- To understand the importance of digital marketing
- To understand the social media and marketing

To understand the effective marketing strategies and ways

Course Outcomes:

On completion of the course, learners will be able to

CO1: Understand the fundamentals and importance of digital marketing

CO2: Use the power of social media for business marketing

CO3: Analyze the effectiveness of digital marketing and social media over traditional process

Course Contents

1. A Framework for Digital Marketing
2. Domain Names, Email, and Hosting
3. Yes, You need a Website
4. The Three Components of a Modern Website: Mobile, Fast, and Accessible
5. Lock It Down: Digital Privacy, Data Security, and the Law
6. Social Media
7. Email Marketing
8. Online Advertising

Reference Books :

1. Avery Swartz, “See You on the Internet: building your small business with Digital Marketing”, ISBN 978-1-989603-08-6.
2. Social Media Marketing Workbook (2021): How to Use Social Media for Business (2021 Social Media Marketing 1).

@The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)
Audit Course 6
310259(B): Sustainable Energy Systems



Prerequisites: General awareness of environment and natural resources of energy

Course Objectives:

- To understand the importance of sustainable energy systems development
- To create awareness about renewable energy sources and technologies
- To learn about adequate inputs on a variety of issues in harnessing renewable energy
- To recognize current and possible future role of renewable energy sources

Course Outcomes:

On completion of the course, learners will be able to

CO1: Comprehend the importance of Sustainable Energy Systems

CO2: Correlate the human population growth and its trend to the natural resource degradation and develop the awareness about his/her role towards Sustainable Energy Systems protection

CO3: Identify different types of natural resource pollution and control measures

CO4: Correlate the exploitation and utilization of conventional and non-conventional resources

Course Contents

1. **Wind Energy:** Power in the Wind, Types of Wind Power Plants (WPPs), Components of WPPs, Working of WPPs, Siting of WPPs, Grid integration issues of WPPs.
2. **Solar Pv and Thermal Systems:** Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds, Thermal Energy storage system with PCM, Solar Photovoltaic systems: Basic Principle of SPV conversion, Types of PV Systems, Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array, PV Module I-V Characteristics, Efficiency and Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.
3. **Other Energy Sources:** Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC), Hydrogen Production and Storage. Fuel cell: Principle of working, various types, construction and applications. Energy Storage System, Hybrid Energy Systems.

Reference Books :

1. Joshua Earnest, Tore Wizeliu, “Wind Power Plants and Project Development”, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan, “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt .Ltd, New Delhi, 2013.
3. A.K.Mukerjee and Nivedita Thakur, “Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011

@The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
CO1	-	-	-	-	-	-	1	-	-	-	-	-
CO2	-	-	-	-	-	-	2	-	-	-	-	1
CO3	-	-	-	-	-	-	1	-	-	-	-	-
CO4	-	-	-	-	-	2	2	-	-	-	-	2

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)

Audit Course 6

310259(C): Leadership and Personality Development



[Home](#)

Prerequisites: General awareness of communication and relationship.

Course Objectives:

- To understand the importance of communication
- To create awareness about teamwork and people skills
- To know thyself
- To recognize current and possible future of new-age thinking

Course Outcomes:

On completion of the course, learners will be able to

CO1: Express effectively through communication and improve listening skills

CO3: Develop effective team leadership abilities.

CO4: Explore self-motivation and practicing creative/new age thinking.

CO5: Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.

Course Contents

1. Communication :

Listening Skills, Communication - 7 C's, Vision and Charisma, Planning and Organizing - Complex Tasks and Ideas --> Actionable Tasks, Presentation Skills.

2. Teamwork and People Skills :

Talent Picking skills, Strong networking and Employee engagement, Coach and Mentor the team, Influencing, Delegate and Empower, Generous, open communicator, Patience and Clarity of Mind, Inspire and Motivate, Ensure Team Cohesion, Empathy, Trust and Reliability.

3. New-age Thinking :

Strategic Thinking, Critical and Lateral Thinking, Problem Solving Skills, Flexibility, Change Management – VUCA.

4. Self-Awareness :

What is Self? – Real, Ideal and Social Self, Concepts related to Self - Self Concept, Self-Presentation, Self-Regulation and Impression Management, Definition and Causes of Prejudice, Relationship between Prejudice, Discrimination and Exclusion, Application – Attitudinal Change and Reducing Prejudices, Self Esteem and Self Awareness, SWOT – JOHARI, Self Esteem Quiz, Introduce Your Partner, Self Introduction - How to sell yourself?-appearance, voice modulation, verbal(simple language), Motivation and Optimism, Positive Emotions and Success.

Reference Books :

1. Paul Sloane, “The Leader's Guide to Lateral Thinking Skills Unlocking the Creativity and Innovation in You and Your Team”, 2006
2. Ronald Bennett, Elaine Millam, “Leadership for engineers : the magic of mindset”
3. Urmila Rai and S.M. Rai, “Business Communication”, Himalay Publication House
4. Baron R, Byrne D, Branscombe N, BharadwajG (2009), “Social Psychology, Indian adaptation” , Pearson , New Delhi
5. Baumgartner S.R, Crothers M.K. (2009) “Positive Psychology”, Pearson Education.

@The CO-PO Mapping Matrix

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

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)

Audit Course 6

310259(D): Foreign Language (Japanese) Module 4



Prerequisites: We recommend that candidates should have previously completed AC3-V(210251) , AC4-V (210260) and AC-5(310250)

Course Objectives:

- To open up more doors and job opportunities
- To introduce to Japanese society, culture and entertainment

Course Outcomes:

On completion of the course, learner will be able to

CO1: Have the ability to communicate confidently and clearly in the Japanese language

CO2: Understand the nature of Japanese script

CO3: Get introduced to reading, writing and listening skills

CO4: Develop interest to pursue further study, work and leisure

Course Contents

1. Introduction to types of adjectives (i and na)
2. Formation of adjectives (according to tense / negative / affirmative)
3. Introduction to more particles
4. Making sentences using various particles / verbs / adjectives
5. Topic based vocabulary (Places / Train travel related / Technical Katakana words)
6. More verb forms (te form, ta form, nai form, root verb etc.)
7. Question words
8. Further 25 Kanjis
9. Scenario based conversation practice / skits / role plays (At the market, At the hospital etc.)

Reference Books :

1. Minna No Nihongo, “Japanese for Everyone”, Elementary Main Textbook 1-1 (Indian Edition), Goyal Publishers and Distributors Pvt.Ltd.
2. <http://www.tcs.com> (http://www.tcs.com/news_events/press_releases/Pages/TCS-Inaugurates-Japan-centric-Delivery-Center-Pune.aspx)
3. Kazuko Karasawa, Mikiko Shibuya, “Nihongo Challenge N4 N5 Kannji Tomoko Kigami”, ISBN-10 4872177576, Ask Publishing Co., Ltd.

@The CO-PO Mapping Matrix

COP O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	1	3	1	1
CO2	-	-	-	-	1	-	-	-	-	3	1	1
CO3	-	-	-	-	1	-	-	-	-	3	2	2
CO4	-	-	-	-	-	-	-	-	-	1	-	1

Savitribai Phule Pune University
Third Year of Engineering (2019 Course)

Audit Course 6

310259(E): Learn New Skill- 'Software Development Using Agility Approach'



[Home](#)

Prerequisites: Software Engineering (210253)

Course Objectives:

- To understand the fundamentals of Dev Ops
- To understand the Agility and ways of Agility
- To understand the software development using Agility approach

Course Outcomes:

On completion of the course, learner will be able to

CO1: Illustrate the agility and principles

CO2: Understand the software development using agile methodology

CO3: Apply Dev Ops for the software product development

CO4: Develop software products for early delivery through continual feedback and learning

Course Contents

1. **THE THREE WAYS** :Agile, continuous delivery and the three ways, The First Way: The Principles of Flow, The Second Way: The Principle of Feedback, The Third Way: The Principles of Continual Learning.
2. **WHERE TO START** :Selecting which value stream to start with, Understanding the work in our value stream..., How to design our organization and architecture, How to get great outcomes by integrating operations into the daily work for development.
3. **THE FIRST WAY: THE TECHNICAL PRACTICES OF FLOW** : Create the foundations of our deployment pipeline, Enable fast and reliable automated testing, Enable and practice continuous integration, Automate and enable low-risk releases, Architect for low-risk releases.
4. **THE SECOND WAY: THE TECHNICAL PRACTICES OF FEEDBACK** :Create telemetry to enable seeing and solving problems, Analyze telemetry to better anticipate problems, Enable feedback so development and operation can safely deploy code, Integrate hypothesis-driven development and A/B testing into our daily work, Create review and coordination processes to increase quality of our current work.
5. **THE THRID WAY: THE TECHNICAL PRACTICES OF CONTINUAL LEARNING** : Enable and inject learning into daily work, Convert local discoveries into global improvements, Reserve time to create organizational learning, Information security as everyone's job, every day, Protecting the deployment pipeline.

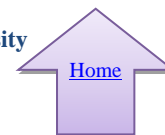
Reference Books :

1. Gene Kim, Jez Humble, Petrick Debois, "The Dev Ops Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations"
2. Len Bass, Ingo Weber, Liming Zhu, "Dev Ops: A Software Architect's Perspective " Publisher(s): Addison-Wesley Professional, ISBN: 9780134049885

Note: This is sample contents for Software Development Using Agility Approach, however the course instructor may design suitable course giving opportunity to the students for learning new skills.

@The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	1	1	2	1	3	1	-	1	-	1	-	-
CO2	-	3	2	2	1	-	-	-	1	1	-	1
CO3	2	3	1	1	-	1	1	-	-	-	-	1
CO4	2	1	1	3	1	-	1	1	-	1	1	1



Acknowledgement

It is with great pleasure and honor that I share the curriculum for Third Year of Computer Engineering (2019 Course) on behalf of Board of Studies (BoS), Computer Engineering. We, members of BoS are giving our best to streamline the processes and curricula design at both UG and PG programs.

It is always the strenuous task to balance the curriculum with the blend of core courses, current developments and courses to understand social and human values. By considering all the aspects with adequate prudence the contents are designed satisfying most of the necessities as per AICTE guidelines and to make the graduate competent enough as far as employability is concerned. I sincerely thank all the minds and hands who work adroitly to materialize these tasks. I really appreciate everyone's contribution and suggestions in finalizing the contents.

Success is sweet. But it's sweeter when it's achieved through co-ordination, cooperation and collaboration. I am overwhelmed and I feel very fortunate to be working with such a fabulous team- the Members of Board of Studies, Computer Engineering!

Even in these anxious situation, during the time of this unfortunate pandemic, each and every person, including the course coordinators and their team members, have worked seamlessly to come up with this all-inclusive curriculum for Third Year of Computer Engineering.

Thank you to all of you for delivering such great teamwork. I don't think it would have been possible to achieve the goal without each and every one of your efforts! I would like to express my deep gratitude to **Dr. Pramod D. Patil (Dr. D. Y. Patil Institute of Technology, Pimpri), member BoS, Computer Engineering**, for coordinating the complete activity and getting it to completion in a smooth manner.

I deeply appreciate and thank the managements of various colleges affiliated to SPPU for helping us in this work. These colleges have helped us by arranging sessions for preliminary discussion in the initial stage and at the same time in conducting Faculty Development Programs for various courses of the revised curriculum. All your support is warmly appreciated.

I sincerely appreciate, the hard work put in by the course coordinators and their team members, without your intellectual work and creative mind, and it would have not been possible to complete this draft. You have been a valuable member of our team!

Special thanks are due to Dr. Santosh Kumar Chobe, Dr. Jyoti Rao, Dr. Swati Nikam, Dr. C. R. Jadhav, Dr. S. S. Das, Dr. Rachna Somkunwar, Prof. Rajesh D. Bharati, Prof. Rupesh Mahajan for helping with the formatting and crisp presentation of this draft. I would like to thank you from the core of my heart. Thank you for always being your best selves and contributing to the work.

I am thankful to Prof. Abhijit D. Jadhav, Dr. D. Y. Patil Institute of Technology, Pimpri for the time he has spent in critically reading the draft and giving the final touches. I appreciate his initiative and thank him for his time, patience and hard work!

Thank you all, for not only your good work but also for all the support you have given each other throughout the drafting process, that's what makes the team stronger! You took the meaning of teamwork to a whole new level.

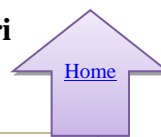
Thank you for all your efforts!

Professor (Mrs.) Dr. Varsha H. Patil, Chairman, and
Members- Dr. Shirish Sane, Dr. Sunil Bhirud, Dr. Manik Dhore, Dr. Pramod Patil, Dr. Girish Khilari, Dr. Sachin Lodha, Dr. Parikshit Mahalle, Dr. Venkatesharan, Dr. Geetanjali Kale, Dr. Suhasini Itkar, Dr. R. V. Patil and Dr. P. M. Yawalkar.

**Board of Studies (BoS), Computer Engineering, Faculty of Science and Technology,
Savitribai Phule Pune University.**

Task Force at Curriculum Design**1. Advisors, the Team of Board of Studies-**

Dr. Varsha Patil (Chairman), Dr. Shirish Sane, Dr. Sunil Bhirud, Dr. Manik Dhore, Dr. Pramod Patil, Dr. Rajesh Prasad, Dr. Girish Khilari, Dr. Sachin Lodha, Dr. Parikshit Mahalle, Dr. Venkatesharan, Dr. Geetanjali Kale, Dr. Suhasini Itkar, Dr. R. V. Patil and Dr. P. M. Yawalkar.

2. Team Leader- Dr. Pramod D. Patil, Dr. D. Y. Patil Institute of Technology, Pimpri**3. Teams, Course Design-**

Name of Course	Team Coordinator	Team Members	
Database Management Systems	Dr. Anuradha Thakare	Dr. Sarika Nitin Zaware Dr. S. B. Tambe Prof. Ranjit M. Gawande	Prof. Rahul Patil Prof. Prashant Ahire Dr. Sharmila Wagh
Theory of Computation	Dr. Sunil Dhore	Dr. Santosh Chobe Dr. Jyoti Rao Dr. G.R.Shinde Mr. Tushar Samnerkar (Industry)	Dr. Vaishali Tidake Prof. Anita Shinde Mr. Vivek Kulkarni (Industry)
Systems Programming and Operating Systems	Dr. Manisha Bhende	Dr. R.A. Satao Prof. Rupesh Mahajan Prof. Mrs.B.Mahalakshmi Prof. Mrs. Neelam Patil	Dr. V. S. Pawar Prof. S. R. Pandit Prof. Mrs. Dhanashree Patel
Computer Networks and Security	Dr. P. B. Kumbharkar	Dr. Aparna A. Junnarkar Dr. A.V. Dhumane Dr. Vinod V. Kimbahune	Prof. D. B. Gothwal Dr. M. L. Dhore
Elective I: Internet of Things and Embedded Systems	Dr. A. B. Pawar	Dr.Sandeep Chaware Dr. M.S.Chaudhari Dr. M.P. Wankhade	Mr.Rajnikant(Industry) Mr.Mahesh Aher(Industry)
Elective I: Human Computer Interface	Dr. S. D. Babar	Prof. Mrs. G. J. Chhaged Prof. D.D.Sapkal Prof. Mrs.Jayshree R. Pansare Mr. Mukesh Jain (Industry) Prof. Mrs. Shailaja N. Lohar	Prof. S. A. Thanekar Dr.Deepak Dharrao Dr. Ganesh Bhutkar Mr. Himmat Sankhala (Industry)
Elective I: Distributed System	Dr. Amar Buchade	Prof. Rajesh Bharati Dr. Suresh V. Limkar Mr. Pratik Dixit (Industry)	Dr. Swati A. Bhavsar Dr. Sonali Patil Dr. Rachna Somkunwar Mr. Vijay Bahiraji (Industry)
Elective I: Software Project Management	Dr. Sachin Sakhare	Dr. R. L. Paikrao Prof. Santosh Sambare Prof. Pimpalkar S.P.	Prof. Shinde Sushma S Prof. Mrs. Vina M Lomte Mr. Prashant Pund (Industry) Mr. Shekhar Dhupkar (Industry)
Database Management System Laboratory	Prof. Rahul Patil	Prof. Rajesh Bharati	Nitin Ghadage (Industry)
Computer Networks and Security Laboratory	Dr. Vinod V. Kimbahune	Dr. P. B. Kumbharkar Dr. Aparna A. Junnarkar Dr. A.V. Dhumane	Prof. D. B. Gothwal Dr. M. L. Dhore
Laboratory Practice I	Dr. Amol Potgantwar	Dr. Manisha Bhende Dr. M.P. Wankhade Mrs. Shailaja N. Lohar	Dr. Sonali Patil Prof. Santosh Sambare
Seminar	Dr. Swati A. Bhavsar	Mr. Rushikesh Jadhav(Industry) Mr. Krishna Auti(Industry)	Dr. (Mrs.) Nuzhat F. Shaikh Mr. Ranjit M. Gawande



Audit Course 5	Dr. Kishor Wagh	Dr. S. S. Das Dr. D. V. Patil	Dr. Sandeep Patil Dr. Bendre Mr. B. B. Gite
Data Science and Big Data Analytics	Dr. Sheetal Sonawane	Dr. H. K. Khanuja Prof. Devidas S. Thosar Dr. S. K. Shinde Mr. Anand Bhalerao (Industry) Mr. Amod Vaidya (Industry)	Dr. B. D. Phulpagar Dr. K. V. Metre Mr. Atul Bengeri (Industry) Mr. Summer Patil (Industry) Mr. Sanjeev Kumar (Industry)
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Elective II: Cloud Computing	Dr. S. K. Sonkar	Prof. Abhijit D. Jadhav Dr. Pankaj Agarkar Dr. N. M. Ranjan	Dr. A. S. Rumale Prof. Thombre B. H. Mr. Ashok Pomnar (Industry) Mr. Santosh Ugale (Industry)
Elective II: Software Modeling and Architectures	Dr. M. A. Pradhan	Prof. Mrs. Dipalee Divakar Rane Prof. Jyoti Kulkarni	Dr. Neeta Deshpande Prof. Nareshkumar Mustary Dr. Aarti D. K.
Internship	Dr. Gitanjali V. Kale	Mr. Arun Kadekodi - (Industry) Mr. Nilesh Deshmukh - (Industry) Prof. Pradnya Kulkarni	Prof. Dheeraj Agrawal Prof. Pranjali Joshi
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