FACULTY OF SCIENCE AND TECHNOLOGY

Savitribai Phule Pune University
Maharashtra, India

Curriculum for
Second Year Master of Computer
Applications (MCA)

FOR

POST GRADUATE ROGRAMME IN
Master of Computer Applications (2020 Course)

With Effect from Year 2021-22

Savitribai Phule Pune University
Master of Computer Applications
Program Outcomes

Students are expected to know and be able to-

PO1. Apply knowledge of mathematics, computer science, computing specializations appropriate for real world applications.

PO2. Identify, formulate, analyze and solve *complex* computing problems using relevant domain disciplines.

PO3. Design and evaluate solutions for *complex* computing problems that meet specified needs with appropriate considerations for real world problems.

PO4. Find solutions of complex computing problems using design of experiments, analysis and interpretation of data.

PO5. Apply appropriate techniques and modern computing tools for development of complex computing activities.

PO6. Apply professional ethics, cyber regulations and norms of professional computing practices.

PO7. Recognize the need to have ability to engage in independent and life-long learning in the broadest context of technological change.

PO8. Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9. Communicate effectively with the computing community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10. Assess societal, environmental, health, safety, legal and cultural issues within local and global contexts, and the consequent responsibilities relevant to the professional computing practices.

PO11. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary environments.

PO12. Identify a timely opportunity and use innovation, to pursue opportunity, as a successful Entrepreneur /professional.

Structure for Second Year MCA (Semester III)

Year : Second   **Semester : III**

Course Code	Course	Teaching Scheme Hours/Week		Examination Scheme						Credit	
		TH	PR	Int	Ext	TW	OR	PR	Total Marks	TH	PR
410901	Data Science	3	-	30	70	-	-	-	100	3	
410902	Web Technologies	3	-	30	70	-	-	-	100	3	
410903	Cloud Computing	3	-	30	70	-	-	-	100	3	
410904	#Elective-II	3	-	30	70	-	-	-	100	3	
410905	Software Testing And Quality Assurance	3	-	30	70	-	-	-	100	3	
410906	Web Technologies Lab	-	2	-	-	50	-	-	50		1
410907	##Computer Laboratory	-	4	-	-	25		50	75		2
410908	Data Science Laboratory	-	4	-	-	25		50	75		2
410909	Project Based Learning II(Mini Project II)	-	2	-	-	50		-	50		1
	Total	15	12	150	350	150	-	100	750		21
410910	*Audit Course-3										**Grade**
410911	**Non Credit Course 3:MOOC Course-III-Swayam/Spoken Tutorial/NPTEL Course										**Grade**

##Computer Laboratory is software Testing Laboratory+ Elective II Laboratory

*410910-Audit Course 3(AC3) Options:
  410910A-AC3-I Foreign Language
  410910B-AC3-II Professional Ethics and Etiquettes
  410910C-AC3-III Mobile App Development

Structure for Second Year MCA (Semester IV)

Year : Second   **Semester : IV**

Course Code	Course	Teaching Scheme Hours/Week		Examination Scheme						Credit
		TH	PR	Int	Ext	TW	OR	PR	Total Marks	
410912	*Major Project	-	15	100	200	-	-	-	300	15
410913	Seminar on Major Project	-	2	50	-	-	-	-	50	1
	Total	-	17	150	200	-	-	-	350	16
410914	**Audit Course-4									Grade

*__Major Project with Industrial Internship__

**__410914-Audit Course 4(AC4) Options:__
     410914A -AC4-I:Entrepreneurship Development
     410914B -AC4-II: Digital and Social Media Marketing

#__Elective II (410904) Course options__

Course Code	Elective- II
410904 A	Big Data Analytics (Elective II)
410904 B	Machine Learning (Elective II)
410904 C	Object Oriented Analysis and Design (Elective II)
410904 D	Internet of Things (Elective II)
410904 E	Open Elective (Elective II)

**__Non Credit MOOC Courses:__ Non Credit course is compulsory. No grade points are associated with non-credit courses and are not accounted in the calculation of the performance indices SGPA & CGPA. Result of assessment will be PP or NP. Set of non-credit courses offered is provided. __Conduction and assessment of performance in said course is to be done at institute level.__ The selection of 3 distinct non-credit MOOC courses, one per semester (Sem I, II & III) should be decided by respective institute.
The list of non credit MOOC courses suggested is given below

Suggested MOOC Courses- Swayam /Spoken Tutorial/NPTEL

Sr. No.	Non Credit Course -1	Non Credit Course -2
1	C programming -8 weeks	Introduction To Soft Computing-8 weeks

2	Enhancing soft skill and personality – 8 wks	RDBMS Postgres SQL -6 Weeks
3	Design and analysis of algorithms -8 weeks	Privacy and Security in Online Social Media -8 weeks
4	Linux (Spoken tutorial)	Employment Communication A Lab based course – 8 weeks
5	Soft Skill Development-8 weeks	PHP and MySQL (Spoken tutorial)
6	Speaking Effectively -8 weeks	Scilab (Spoken tutorial)

** Institute may choose any one of suggested MOOC Course or decide any other MOOC course at Institute level.

SEMESTER III

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second Year of MCA (2020 Course) 410901: Data Science		Home
Teaching Scheme: TH: **03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External : 70 Marks**

Prerequisite courses, if any: Data Structures And Algorithms (310902)

Companion Course, if any: Data Science Laboratory (410908)

Course Objectives:

- To understand the need of Data Science and Big Data
- To learn about the Data Evolution and understanding the data.
- To learn Data Preprocessing Techniques and machine learning algorithms required for Data Science.
- To visualize data and use for communicating stories from data.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Explain flow process for data science problems.

CO2: Elaborate data preprocessing and warehouse.

CO3: Utilize various classification techniques for commercially available datasets.

CO4: Implement association rule mining for commercially available datasets.

CO5: Apply standard clustering methods for commercially available datasets.

CO6: Compare appropriate data visualization method for effective visualization of

data.

Course Contents		
Unit I	**Introduction to Data Science**	**06 Hours**
What is Data Science, Need of Data Science, Big data and Data Science, The current Scenario, Industry Perspective Types of Data: Structured vs. Unstructured Data, Quantitative vs. Categorical Data, Big Data vs. Little Data, Data science process, Role Data Scientist.		
Unit II	**Data Preprocessing and Warehouse**	**06 Hours**
What is Data Preprocessing, Need of Data Preprocessing, Data Preprocessing Techniques and Importance of Data Preprocessing. What is Data Warehouse, Need of Data Warehouse, Components and Types of Data Warehouse, Data Warehouse Tools, Advantages and Disadvantages of Data Warehouse, Applications of Data warehouse.		

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Unit III	Classification	06 Hours
Introduction, Classification requirements, Nearest Neighbor classifier, Naïve Bayes classifier, Decision tree, Forecasting Numeric data- Regression methods, Neural networks classifiers. Evaluating Model performance: Measuring performance for classification, Estimating future performance.			

Unit IV	Association Rule mining	06 Hours
Introduction to frequent pattern mining, Understanding association rules, Association properties, Apriori, FP-Growth, Eclat algorithm, performance evaluation of association rule mining.			

Unit V	Clustering	06 Hours
Introduction to clustering, Types of Clustering: partitional, hierarchical, and density-based clustering Applications of clustering, clustering performance evaluation.			

Unit VI	Data visualization	06 Hours
Data visualisation: Introduction, Types of data visualisation, Benefits of Data Visualisation Data visualization Techniques, Types of Graphs: Bar Graph, Stacked Bar Chart, Pie Chart, Doughnut Chart, Line Chart, Area Chart, Treemap chart, Heatmap, Waterfall Chart, Scatter Plot, Histogram, Box plot.			

Learning Resources:

Text Books:

1. Jeffrey S.Saltz,Jeffre M. Stanton, "An Introduction to Data Science", Sage Publications,2018
2. Seema Acharya ,"Data Analytics using R " , Mc Graw Hill, 2018
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
4. Jiawei Han, Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann Publisher, second edition.
5. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,Cambridge University Press

Reference Books:

1. Bharti Motwani, "Data Analytics with R", Wiley 2019.
2. Hadley Wickham, "R for Data Science: Import, Tidy, Transform, Visualize, and ModelData", First Edition,O'Reilly Media Publisher, ISBN: 9781491910399, 2017.
3. T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Springer, 2013.
4. Tom Mitchell, Machine Learning. McGraw-Hill, 1997.
5. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press, 2012.
6. Carl Edward Rasmussen and Christopher K. I. Williams, Gaussian Processes for Machine Learning. MIT Press, 2005.
7. Daphne Koller and N. Friedman, Probabilistic Graphical Models: Principles and Techniques. MIT Press, 2009.
8. Christopher Bishop, Pattern Recognition and Machine Learning. Springer, 2007.
9. Laura Igual and Santi Segui, Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications,Springer; 1st ed. 2017 edition

MOOC Courses: <web links>

1. https://nptel.ac.in/courses/106/106/106106179/

Savitribai Phule Pune University, Pune Second Year of MCA (2020 Course) **410902: Web Technologies**		Home
Teaching Scheme: **TH: 03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External: 70 Marks**

Prerequisite courses, if any: Computer Network (310913)

Companion Course: Web Technology Lab (410906)

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, learner will be able to

CO1: Design web-based application using client-side Technology.

CO2: Develop the structure of web sites using XML components.

CO3: Analyze current client-side web technologies: JavaScript in detail.

CO4: Apply recent client-side web technologies: Angular JS in detail.

CO5: Apply the server side technologies for web development

CO6: Create the effective web applications for business functionalities using ASP.NET

Course Contents		
Unit I	**Scripting Language-I** **HTML**	**06 Hours**
Introduction to Web Technology, internet and www, Web Servers, Website planning and design issues, HTML: structure of html document, HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors.		
Unit II	**Scripting Language-II** **XML**	**06 Hours**
XML: Introduction to XML, Features and applications of XML, XML key component, XML DTD, XML Schema, elements, attributes, XML Namespaces, Transforming XML into XSLT.		
Unit III	**Client-Side Technology-I** **JavaScript**	**06 Hours**
JavaScript: Overview of JavaScript (need/why JavaScript, applications, advantages, limitations), using JS in an HTML (Embedded, External), variables/ Data types, Control Structures: if..else, switch case, Loop Controls: for, while, for..in ,Functions and Dialog Boxes, page redirect, cookies, events . JS objects: JavaScript-Object Properties, Methods, JavaScript-Number Properties, Methods, JavaScript-String Properties, Methods, JavaScript-Array Properties, Methods, JavaScript-Math Properties, Methods, JavaScript-Date Properties, and Methods.		
Unit IV	**Client-Side Technology-II**	**06 Hours**

	Angular.JS	
AngularJS: Overview (what? why? Applications? advantages? limitations?), General Features, Core Features, parts of AngularJS, AngularJS environment setup, MVC architecture, simple application execution in AngularJS, How AngularJS Integrates with HTML: AngularJS directives, AngularJS: Expression, Controllers, Filters, Tables, modules, forms, includes		
Unit V	**Server-Side Technology-I: PHP**	**06 Hours**
PHP variables and operators, taking an user inputs and generating outputs, Formatting String, library function for string manipulation. Array fundamentals, Single-Dimensional Arrays, Multidimensional Arrays, Associative arrays, library functions for array manipulation, Dates and Times function, User-defined functions, Object oriented programming using PHP, File Handing in PHP, cookie and session.		
Unit VI	**Server-Side Technology-II: ASP.NET**	**06 Hours**
Introduction to ASP.NET: (what? why? Applications? advantages? limitations?), Components of ASP.NET, ASP.NET life cycle, ASP.NET page creation, Event Handling, ASP.NET: Server side objects and control, ASP.NET with Databases, ASP.NET : creating a web services.		
Learning Resources:		

Textbooks:
1. Complete reference HTML, TMH, 4th Ed.
2. Web Technologies - 2nd Edition, Tata McHill by Achut Godbole
3. HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross, BPB Pub, 3rd Ed.
4. "Angular: Up and Running", by Shyam Seshadri, O'REILLY Publication, SBN-101491999837 Edition: 1st
5. Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676
6. "ASP.NET Core 5 And Angular Fourth Edition", Author: Valerio De Sanctis, Published on 29-Jan-2021, ISBN : 9781800562219, Publisher : Packt Publishing

Reference Books:
1. CSS - Definitive Guide. By Eric Meyer, Oreilly Publication
2. Robin Nixon, "Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3
3. Sandeep Panda, "Angular JS: Novice To Ninja", SPD, First Edition 2014, ISBN-13: 978-0992279455

e-Books/online tutorials:
1. www.w3schools.com
2. https://www.tutorialspoint.com/angularjs/index.htm
3. https://www.tutorialspoint.com/javascript/index.htm

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) **410903: Cloud Computing**		Home
Teaching Scheme: **TH: 03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External : 70 Marks**

Prerequisite courses, if any: Computer Network (301913)

Course Objectives:

- 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 understand the advanced technologies in cloud computing

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand the different Cloud Computing environment

CO2: Use appropriate data storage technique on Cloud

CO3: Analyze virtualization technology

CO4: Develop and deploy applications on Cloud

CO5: Apply security in cloud applications

CO6: Use advance techniques in Cloud Computing

Course Contents		
Unit I	**Basics of Cloud Computing**	**06 Hours**
Introduction, Cloud Characteristics, Cloud computing architecture, Advantages and Disadvantages of Cloud Computing. Grids, Utility Computing, client-server model, P-to-P Computing, Cloud computing Service delivery model, Cloud Types – Private, Public and Hybrid, Cloud API.		
Unit II	**Cloud computing Services**	**06 Hours**
Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, DBaaS(Database as a services) , Comparison of various cloud computing providers/Softwares.		
Unit III	**Virtualization**	**08 Hours**
Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation. Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP),Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.		
Unit IV	**Resource Management And Applications of Cloud**	**06 Hours**

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources. Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, and Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services and Google Apps.

Unit V	Cloud Security	08 Hours

Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Hardened Virtual Server Images.
Cloud Issues: Stability, Partner Quality, Longevity, Business Continuity, Service-Level Agreements, Agreeing on the Service of Clouds, Solving Problems, Quality of Service, Regulatory Issues and Accountability.

Unit VI	Future of Cloud Computing	06 Hours

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

Learning Resources:

Text Books:
1. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922.
3. Gautam Shrof,"ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, *ISBN*: 9780511778476

Reference Books:
1. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication, ISBN10: 8126536039
2. Buyya, "Mastering Cloud Computing", Tata McGraw Hill, ISBN-13: 978-1-25-902995-0,
3. Barrie Sosinsky,"Cloud Computing", Wiley India, ISBN: 978-0-470-90356-8
4. Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press
5. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, "Cloud Computing: Concepts, Technology and Architecture", Pearson, 1st Edition, ISBN :978 9332535923, 9332535922
6. Tim Mather, Subra K, Shahid L.,Cloud Security and Privacy, Oreilly, ISBN-13 978-81-8404-815-5.

e-Books: <web links>
1. http://www.freebookcentre.net/Networking/Cloud-Computing-Books.html

MOOC Courses: <web links>
1. NPTEL course on " Cloud Computing " by By Prof. Soumya Kanti Ghosh , IIT Kharagpur https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://www.udemy.com/course/introduction-to-cloud-computing/

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune

Savitribai Phule Pune University, Pune
Second year of MCA (2020 Course)
Home
410904A: Elective: II-Big Data Analytics

Teaching Scheme: TH: **03 Hours/Week**	Credit **03**	Examination Scheme: Internal: **30 Marks** External : **70 Marks**

Prerequisite courses, if any: Database Management System (310912)

Companion Course, if any: Data Science(410901),Computer Lab (410907)

Course Objectives:

- To provide an overview of current industry of big data analytics.

- To gain knowledge of different the tools required to analyse big data like Hadoop, NoSql MapReduce.

- To study the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.

- To acquire skills to solve complex real world problems related to decision support.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand big data analytics concepts

CO2: Solve big data problems using Hadoop

CO3: Apply different Supervised learning and Unsupervised Learning algorithms

CO4: Understand different data visualization techniques.

CO5: Understand Hadoop Architecture

CO6: Solve Complex real world problems in various applications like recommender systems, social media applications, etc.

Course Contents

Unit I	Introduction to Big Data	06 Hours

Big Data: Definition of Big Data, Characteristics of Data and Big Data, Evolution of Big Data, Challenges with Big Data.
Big Data Analytics: Introduction to big data analytics, Classification of Analytics, Big Data Technologies.
Data Analytics Life Cycle: Need of Data analytic lifecycle, Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, various phases of Communicating Results, Operationalization.

Unit II	Supervised learning and Unsupervised Learning	06 Hours

Supervised Learning: Structure of Regression Model, Linear Regression, Logistics Regression, Time series analysis, Support Vector Machine.
Association Rule: Structure of Association Rule, Apriori Algorithm, evaluation of candidate rules
Clustering: Clustering Methods, Partition Methods, Hierarchical Methods.

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Unit III	Recommendation Systems and Mining Social-Network Graphs	06 Hours

A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering. Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities.

Unit IV	Big Data Visualization	06 Hours

Introduction to Data visualization, Challenges to Big data visualization, Conventional datavisualization tools, Techniques for visual data representations, Types of data visualization,Visualizing Big Data,Tools used in data visualization, Analytical techniques used in Big dataVisualization

Unit V	Introduction of Hadoop	06 Hours

Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

Unit VI	Hadoop Architecture	06 Hours

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.

Learning Resources:

Text Books:
1. David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications, 2012.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data ", McGraw Hill, 2012.
3. Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press
4. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012

Reference Books:
1. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
2. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
3. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013.
4. Business Intelligence – Data Mining and Optimization for Decision Making – Carlo Vercellis – Wiley Publications.
5. Big Data & Analytics – Seema Acharya & Subhashini Chellappan – Wiley Publications
6. Big Data (Black Book) – DT Editorial Services – Dreamtech Press.
7. Data Mining: Concepts and Techniques Second Edition – Jiawei Han and Micheline Kamber – Morgan KaufMan Publisher
8. Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press
9. Ashutosh Nandeshwar , "Tableau Data Visualization Codebook", Packt Publishing, ISBN 978-1-84968-978-6

e-Books: <web links>
1. http://www.bigdatauniversity.com/
2. http://index-of.co.uk/Big-Data Technologies/Hadoop%20in%20Practice%202nd%20Edition%20%7BPRG%7D.pdf
3. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf

MOOC Courses: <web links>
1. https://nptel.ac.in/courses/106/107/106107220/
2. https://nptel.ac.in/courses/106/104/106104189/

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune
Second year of MCA (2020 Course)
410904C: Elective: II- Object Oriented Analysis and Design

Teaching Scheme: **TH: 03 Hours/Week**	Credit **03**	Examination Scheme: **Internal: 30 Marks** **External : 70 Marks**

Prerequisite courses, if any: Software Engineering & Project Management (310904)

Companion Course, if any: Computer Lab (410907)

Course Objectives:

- To transform requirement document to appropriate design.

- To study static and dynamic modelling

- To understand Object Oriented Analysis and Design Concepts.

- To acquaint with different software architectures.

- To understand use of design pattern in the applications.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Analyze the problem statement (SRS) and choose proper design technique for designing

   web-based/ desktop application

CO2: Apply static modeling design to applications.

CO3: Understand application of UML in different systems

CO4: Apply dynamic modeling design to applications.

CO5: Evaluate software architectures

CO6: Understand various software design patterns

Course Contents		
Unit I	**Introduction**	**06 Hours**
Introduction to software design, design methods-procedural / structural and object oriented, Requirement Vs Analysis Vs. Architecture Vs. Design Vs. Development 4+1 Architecture, case study of transferring requirement to design, Unified Process, COMET use case based software life cycle, Introduction to UML -Basic building blocks, Reusability, Use case modelling, Use case template Case study – Transferring requirements into design using advanced tool.		
Unit II	**Static Modelling**	**06 Hours**
Analysis Vs. Design, Class diagram- Analysis - Object & classes finding analysis & Design- design classes, refining analysis relationships, Relationship among classes: Associations, Dependencies, Generalizations, Aggregation. Adornments on Association: association names, association classes, qualified association, n-ary associations, ternary and reflexive association. Dependency relationship among classes, notations. Object diagram.		
Unit III	**Component, Deployment and Package**	**06 Hours**

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Component diagram- Interfaces & components, deployment diagram, Package diagram, Applications of UML in embedded systems, web applications, commercial applications.

Unit IV	Dynamic Modeling	06 Hours

Interaction & Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram, Advanced state machine diagram, Activity diagram.

Unit V	Architecture Design	06 Hours

Introduction to Architectural design, overview of software architecture, Object oriented software architecture, Client server Architecture, Service oriented Architecture, and Component based Architecture, Real time software Architecture.

Unit VI	Design Patterns	06 Hours

Introduction to Creational design pattern – singleton, Factory, Structural design pattern- Proxy design pattern, Adapter design pattern, Behavioral – Iterator design pattern, Observer design pattern.

Learning Resources:

Text Books:
1. Jim Arlow, IlaNeustadt, ―UML 2 and the unified process –practical object-oriented analysis and design‖ Addison Wesley, Second edition, ISBN978-0201770605
2. Hassan Gomaa, ―Software Modeling and Design- UML, Use cases, Patterns and Software Architectures‖ Cambridge University Press, 2011, ISBN978-0-521-76414-8

Reference Books:
1. Eric J. Braude, ―Software Design: from Programming to Architecture‖, J. Wiley, 2004, ISBN 978-0- 471-20459-6
2. GardyBooch,JamesRambaugh,IvarJacobson,―The unified modeling language user guide ,Pearson Education, Second edition, 2008, ISBN0-321-24562-8

e-Books: <web links>
1. http://bedford-computing.co.uk/learning/wp-content/uploads/2015/10/UML-Distrilled-3nd.pdf
2. https://edutechlearners.com/download/books/OOSE/OOAD.pdf

MOOC Courses: <web links>
1. Object Oriented analysis and Design by By Prof. Partha Pratim Das, Prof. Ansuman Banerjee, Prof. Kausik Datta | IIT Kharagpur

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) 410904D: Elective: II- Internet of Things		Home
Teaching Scheme: **TH: 03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal:　30 Marks** **External : 70 Marks**

Prerequisite courses, if any: Computer Network (310913)

Course Objectives:
- To understand fundamentals of IoT system including essence, basic design strategy and process modelling.
- To apply the concept of Internet of Things in the real-world scenario.
- To understand fundamentals of privacy and its breach in IoT.
- To develop comprehensive approach towards building small low cost IoT system.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand general concepts of Internet of Things (IoT)

CO2: Analyze various M2M and IoT architectures

CO3: Implement an architectural design for IoT for specified requirement

CO4: Analyze applications of IoT in real time scenario

CO5: Analyze the challenges of IoT architectures.

CO6: Recognize various devices, sensors and applications

Course Contents		
Unit I	**Introduction to Embedded System and Internet of Things**	**08 Hours**
Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real time scheduling, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks.		
Unit II	**IoT & M2M**	**06 Hours**
M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.		
Unit III	**IoT Architectures**	**06 Hours**
IoT Architecture -State of the Art – Introduction, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.		
Unit IV	**IoT Protocols**	**06 Hours**
Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols,		

Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer.

Unit V	IoT Privacy, Security and Governance	06 Hours

Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities.

Unit VI	Applications of IoT & Case Studies	04 Hours

Home automation, Industry applications, Surveillance applications, IoT applications for industry: Future Factory Concepts, Other IoT application (Adhar Card, Health Services, Smart Parking Systems, Smart City)

Learning Resources:

Text Books:
1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515
2. Michael Miller "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", 1st Edition, Pearson Publication 2015
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012. ISBN : 9781439892992

Reference Books:
1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014, ISBN: 978-1-118-43063-7

e-Books: <web links>
1. https://www.leverege.com/iot-ebook/introduction

MOOC Courses: <web links>
1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.coursera.org/specializations/uiuc-iot

<table>
<tr><td colspan="3">

Savitribai Phule Pune University, Pune
Second year of MCA (2020 Course)
410904B: Elective: II- Machine Learning

Home
</td></tr>
<tr>
<td>**Teaching Scheme:**
TH: 03 Hours/Week</td>
<td>**Credit**
03</td>
<td>**Examination Scheme:**
Internal: 30 Marks
External : 70 Marks</td>
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Prerequisite courses, if any: Discrete Mathematics and Statistics (310901)	
Companion Course, if any : Data Science (410901)	

Course Objectives:

- To study fundamentals of machine learning
- To acquaint with various machine learning algorithms
- To become aware of various logic based and algebraic models in machine learning
- To study trends in machine learning

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand basic concepts of Machine Learning.

CO2: Understand classification concepts.

CO3: Apply different regression and generalization techniques.

CO4: Apply various logic Based and algebraic algorithms for real world applications.

CO5: Use probabilistic models for machine learning

CO6: Understand trends In Machine Learning

Course Contents		
Unit I	**Introduction To Machine Learning**	**06 Hours**

Introduction: What is Machine Learning, Examples of Machine Learning applications, Training versus Testing, Positive and Negative Class, Cross-validation. Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection, Introduction to Principal Component Analysis.

Unit II	**Classification**	**06 Hours**

Binary and Multiclass Classification: Assessing Classification Performance, Handling more than two classes, Multiclass Classification-One vs One, One vs Rest Linear Models: Perceptron, Support Vector Machines (SVM), Soft Margin SVM, Kernel methods for non-linearity

Unit III	**Regression And Generalization**	**06 Hours**

Regression: Assessing performance of Regression – Error measures, Overfitting and Underfitting, Catalysts for Overfitting, VC Dimensions Linear Models: Least Square method, Univariate Regression, Multivariate Linear Regression, Regularized Regression - Ridge Regression and Lasso Theory of

Generalization: Bias and Variance Dilemma, Training and Testing Curves Case Study of Polynomial Curve Fitting.

Unit IV	Logic Based And Algebraic Models	06 Hours

Distance Based Models: Neighbors and Examples, Nearest Neighbor Classification, Distance based clustering algorithms - K-means and K-medoids, Hierarchical clustering. Rule Based Models: Rule learning for subgroup discovery, Association rules mining – Apriori Algorithm, Confidence and Support parameters. Tree Based Models: Decision Trees, Minority Class, Impurity Measures – Gini Index and Entropy, Best Split

Unit V	Probabilistic Models	06 Hours

Conditional Probability, Joint Probability, Probability Density Function, Normal Distribution and its Geometric Interpretation, Naïve Bayes Classifier, Discriminative Learning with Maximum Likelihood. Probabilistic Models with Hidden variables: Expectation-Maximization methods, Gaussian Mixtures

Unit VI	Trends In Machine Learning	06 Hours

Ensemble Learning: Combining Multiple Models, Bagging, Randomization, Boosting, Stacking Reinforcement Learning: Exploration, Exploitation, Rewards, Penalties Deep Learning: The Neuron, Expressing Linear Perceptron as Neurons, Feed Forward Neural Networks, Linear Neurons and their Limitations, Sigmoid, Tanh and ReLU Neurons

Learning Resources:

Text Books:
1. Ethem Alpaydin: Introduction to Machine Learning, PHI 2nd Edition-2013.
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.

Reference Books:
1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition.
3. Parag Kulkarni: Reinforcement Learning and Systemic Machine Learning for Decision Making, IEEE Press, Reprint 2015.
4. Nikhil Buduma: Fundamentals of Deep Learning, O'Reilly Media, June 2017.
5. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012.
6. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.

MOOC Courses: <web links>
1. https://www.coursera.org/learn/machine-learning

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) 410904E: Elective: II- OPEN ELCTIVE		Home
Teaching Scheme: **TH: 03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External : 70 Marks**
Open elective proposal can be offered by the college along-with Industry partner. A proposal with syllabus, (Program educational Outcomes) PEO's be forwarded to the Chairman BOS, before June / December every year. Approved syllabus through appropriate procedure can be taught in various colleges. Industry person and Teacher appointed together conduct the course.		

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) 410905: Software Testing and Quality Assurance		Home
Teaching Scheme: TH: **03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External : 70 Marks**

Prerequisite courses, if any: Software Engineering & Project Management (310904)

Course Objectives:

- To know the importance of software testing and quality assurance

- To study white box and black box testing techniques

- To get acquainted with various testing types

- To study tools used for automation testing

Course Outcomes:

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

CO1: Illustrate different approaches of quality management, assurance, and quality standard to software system

CO2: Create test plan, test cases and defect repository using case study.

CO3: Apply the concept of white box and block box testing techniques

CO4: Analyze various testing types

CO5: To analyze recent automation tools for software testing.

CO6: Apply software testing automation concepts using Selenium

Course Contents		
Unit I	**Fundamentals of Software Quality Assurance**	**06 Hours**

FUNDAMENTALS OF SOFTWARE QUALITY:

Definition of Quality, QA, QC, SQA, SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.

QUALITY ASSURANCE MODELS:

Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM

SOFTWARE QUALITY ASSURANCE TRENDS:

Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their effect on Software Quality.

TESTING SOFTWARE SYSTEM SECURITY:

Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss

Function, Cost of Quality.

Unit II	Essentials of Software Testing	06 Hours

SOFTWARE TESTING BASICS:

Definition & Objectives of testing, testing life cycle, Software testing principles, The tester's role in a software development organization

TEST PLAN AND TEST CASES:

Preparation, Management and execution of Test Plan, Definition, Test Case Designing of Test Cases, prepared Test report.

DEFECT MANAGEMENT:

Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.

Unit III	Software Testing Techniques	06 Hours

WHITE-BOX TESTING METHODOLOGIES:

Static testing: by humans, using static analysis tools, Structural Testing: unit/code functional testing, Code coverage Testing, Code Complexity testing, Mutation Testing

BLACK-BOX TESTING METHODOLOGIES:

Requirement based testing, Positive and negative testing, Boundary Value analysis, Equivalence Partitioning, State based or Graph-based Testing, Compatibility Testing, User Documentation Testing, Domain Testing

Unit IV	Testing Strategies	06 Hours

Integration testing, System and Acceptance testing, Scenario testing, Performance Testing, Regression testing, Ad hoc Testing, Usability and Accessibility Testing, GUI testing, Validation testing, Specification-based testing, Testing Object Oriented Software, Testing Web Based Applications, Database Testing

Unit V	Software Test Automation	06 Hours

INTRODUCTION TO AUTOMATION TESTING:

Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging, Difference between manual testing and automated testing,

UI Automation Tools :

Cypress, Testcafe, Protractor, Case studies of automation testing

Unit VI	Selenium Tool	06 Hours

Introduction of Selenium, Brief History of The Selenium Project, Selenium"s Tool Suite, Selenium IDE, Selenium RC, Selenium WebDriver, Selenium Grid, Test Design Considerations

Learning Resources:

Text Books:

1. Srinivasan Desikan, Gopalaswamy Ramesh,Software Testing: Principles and Practices Pearson.
2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson Addison Wesley.
3. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
4. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008.
5. Software Quality Assurance – From Theory to Implementation, Daniel Galin, Pearson

Education, 2009.

Reference Books:
1. Software Testing and Quality Assurance – Theory and Practice, Kshirasagar Naik, Priyadashi Tripathy,Wiley India, 2010
2. Rajani & Oak, "Software Testing: Methodology, Tools and Processes" Tata McGraw-Hill, 2007
3. Software Automation Testing Tools for Beginners, Rahul Shende, Shroff Publishers and Distributors, 2012
4. Software Testing Techniques Boris Beizer, dreamTech pub,2nd Edition

e-Books: <web links>
1. Selenium 1.0 Testing Tool beginners guide by David Burns, ISBN: 1849510261, ISBN 13: 9781849510264
2. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X

MOOC Courses: <web links>
1. https://www.my-mooc.com/en/mooc/software-testing-fundamentals/
2. https://nptel.ac.in/courses/106/105/106105150/
3. https://onlinecourses.nptel.ac.in/noc19_cs71/preview

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second Year of MCA (2020 Course) 410906: Web Technologies Lab		Home
Teaching Scheme: **TH: 02 Hours/Week**	**Credit** **01**	**Examination Scheme:** **TW: 50 Marks**

Companion Course: Web Technologies(410902)

Course Objectives:
- To understand the principles and methodologies of web-based applications development process.
- To understand popularly used scripting languages to develop web applications.
- To understand current client-side web technologies.
- To understand current server-side web technologies.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Design web-based application using client-side Technology.

CO2: Develop the structure of web sites using XML components.

CO3: Analyze current client-side web technologies: JavaScript in detail.

CO4: Understand recent client-side web technologies: Angular JS in detail.

CO5: Understand current server-side web technologies and uses.

CO6: Analyze ASP.NET in detail.

Guidelines for Instructor's Manual

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

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept/technology/tool in brief, design, test cases, 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 may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments

performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open-source software is to be encouraged.

Suggested List of Laboratory Assignments

Based on Unit I:HTML

Assignment 1

a) Design and develop a suitable static web site for student admission process using HTML and CSS.
b) Design and develop a suitable web site using HTML components based on a suitable topic.
   Write external, internal and inline CSS to design the web pages

Based on Unit II:XML

Assignment 2

a) Design and deploy a suitable web application using XML by consulting with your course instructor.
b) Create XML file for a student or customer or employee. Next create the document type definition for the xml structure and finally create the schema document for the xml document.

Based on Unit III: JavaScript

Assignment 3

a) To build simple calculator in JavaScript.
b) Write a JavaScript program to find an area of different geometric shapes.

Based on Unit IV: Angular JS

Assignment 4

a) Design and Implement Login Application OR Notepad Application using angular JS, HTML, CSS.
b) Design and Implement Timer Application using angular JS, HTML, CSS.

Based on Unit V: PHP

Assignment 5

a) Create HTML page that contain textbox, submit / reset button. Write PHP program to display this information and store into text file.
b) Write a PHP Script for login authentication. Design an html form which takes username and password from user and validate against stored username and password in file.

Based on Unit VI: ASP.NET

Assignment 6

a) Any application that shows implementation of ASP.NET with database connectivity.
b) Implementation of ASP.NET web service.

Learning Resources:

Textbooks:
1. Complete reference HTML, TMH, 4th Ed.
2. Web Technologies - 2nd Edition, Tata McHill by Achut Godbole
3. HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross, BPB Pub, 3rd Ed.
4. "Angular: Up and Running", by Shyam Seshadri, O'REILLY Publication, SBN-101491999837 Edition: 1st
5. Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676.
6. "ASP.NET Core 5 And Angular Fourth Edition", Author: Valerio De Sanctis, Published on 29-Jan-2021, ISBN : 9781800562219, Publisher : Packt Publishing

Reference Books:
1. CSS - Definitive Guide. By Eric Meyer, Oreilly Publication
2. Robin Nixon, "Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3
3. Sandeep Panda, "Angular JS: Novice To Ninja", SPD, First Edition 2014, ISBN-13: 978-0992279455

e-Books/online tutorials:
1. www.w3schools.com
2. https://www.tutorialspoint.com/angularjs/index.htm
3. https://www.tutorialspoint.com/javascript/index.htm
4. https://www.programiz.com/javascript/examples

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) 410907: Computer Laboratory (Software Testing Laboratory + Elective II Laboratory)			Home
Teaching Scheme: **PR: 04 Hours/Week**	**Credit** **02**		**Examination Scheme:** **Internal: 25 Marks** **External: 50 Marks**

Prerequisite courses, if any: Software Engineering & Project Management (310904)

Companion Course, if any : Software Testing And Quality Assurance (410905),
　　　　　　　　Big Data Analytics (410904 A),
　　　　　　　　Machine Learning (410904 B),
　　　　　　　　Object Oriented Analysis and Design (410904   C),
　　　　　　　　Internet of Things(410904 D),
　　　　　　　　Open Elective (410904 E).

Course Objectives:
- Introduce basic concepts of software testing and get aware of white box and block box testing techniques
- To learn the importance of software quality and assurance software systems development.
- Know in details automation testing and tools used for automation testing.
- To acquire skills to solve complex real world problems related to decision support.

Course Outcomes:

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

CO1: Implement white box and block box testing techniques for any software systems

CO2: Create Test plan and test cases using case studies.

CO3: Apply automation testing using tools

CO4: Interpret business models and scientific computing paradigms, and apply software tools

　　　for big data analytics.

CO5: Design and develop machine learning model for a real time applications

CO6: Implement an architectural design for IoT for specified requirement

CO7: Interpret the importance of Computational Intelligence for solving the different problems

Guidelines for instructor's Manual

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

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The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, 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 may be avoided. Use of DVD Containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

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

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Set of Suggested Assignment List

Part A: Software Testing and Quality Assurance

1. Prepare test plan for an identified Mobile Application

2. Design test cases for any E-Commerce website

3. Manual Testing a) Write black box test cases for an application using Test Director tool. b) Perform white box testing – Cyclomatic complexity, data flow testing, control flow testing

4. Automated Testing Perform Black Box testing using automated testing tool on an application. Testing Points to be covered – data driven wizard, parameterization, exception handing

5. Defect Tracking : a. Log the test results in Test Director b. Prepare a Defect Tracking Report / Bug Report using MS-Excel or Defect Tracking Tool like BugZilla

Part B: Elective- II

A. Big Data Analytics

B. Machine Learning

C. Object Oriented Analysis and Design

D. Internet of Things

E. Open Elective

Suggested List for Big Data Analytics(Elective-II:410904 A)

1. To draw and explain Hadoop Architecture and Ecosystem with the help of a case study using WorkCount example. To define and install Hadoop.

2. To implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files

3. To run a basic Word Count MapReduce program to understand MapReduce Paradigm: To count words in a given file, To view the output file, and To calculate execution time.

4. To study and implement basic functions and commands in R Programming.

5.	To build WordCloud, a text mining method using R for easy to understand and visualization than a table data.

Suggested List for Machine Learning (Elective-II:410904 B)

1.	Generate a proper 2-D data set of N points. Split the data set into Training Data set and Test Dataset.
2 .	Download the open source software like WEKA or R or rJava. Document the distinct features and functionality of the software platform.
3.	Implement Naïve Bayes Classifier and K-Nearest Neighbor Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.
4.	Implement K-Means Clustering and Hierarchical clustering on the proper data set of your choice. Compare their Convergence
5.	Design and implement SVM for classification with the proper data set of your choice. Comment on Design and Implementation for Linearly non separable Dataset.

Suggested List for Object Oriented Analysis and Design(Elective-II:410904 C)

1.	Construct UML Class Diagram and Object Diagram for Online Transaction Management System(e-shopping)
2.	Design UML Sequence and Activity Diagram using UML FOR Order processing Management System
3.	Draw UML Activity and Sequence Diagram for Event Management System (arranging seminar /workshop/conference sports/ cultural / annual social gathering etc)
4.	Design UML Use case and Object Diagram for Feedback Management System
5.	Construct UML State Machine Diagram for Placement Agency Management System

Suggested List for Internet of Things (Elective-II:410904 D)

1.	Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)
2.	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs
3.	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.
4.	Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor
5.	Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.

Suggested List for Open Elective (Elective-II:410904 E)

1.	Lab Incharge will be set list of assignments based on Open Elective Syllabus

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second Year of MCA (2020 Course) **410908: Data Science Laboratory**			 Home
Teaching Scheme: **PR: 04 Hours/Week**	**Credit** **02**	**Examination Scheme:** **Term Work: 25 Marks** **Practical: 50 Marks**

Companion Course, if any: Data Science (410901)

Course Objectives:

- To learn basics about Data Analytics Tool for Data Science

Course Outcomes:

On the completion of the Course learners will be able to:

CO1: Describe framework of any Data Analytics Tool

CO2: Write basic applications using the fundamentals of any Data Analytics Tool.

CO3: Apply Modeling techniques using any Data Analytics Tool.

CO4: Implement Mining techniques using any Data Analytics Tool

CO5: Employ data analysis using graphs.

CO6: Implement Data Visualization

Suggested list of assignments

1. Installation and study of any one Data Analytics Tool Frame work.

2. Design and develop at least 10 problem statements which demonstrate the use of data structure, functions, Importing / Exporting Data in any data analytics tool.

3. Design and develop at least 5 problem statements which demonstrate the use of Control Structures of any data analytics tool.

4. Implement any 2 Classification techniques using any data analytics tool.

5. Implement any 2 Clustering   techniques using any data analytics tool.

6. Implement any 2 Association Rule Mining techniques using any data analytics tool.

7. Visualize all the statistical measures (mean, mode, median, range, inter quartile range, etc.) using Histograms, Boxplots, scatter plots, etc.

8. Design and Develop real-time Data Science Application (e.g. Image Recognition/ Intelligent Assistant/ Recommendation System/ Fake News Detection/Emotion Recognition/Chatbot/Other)

Savitribai Phule Pune University, Pune Second Year of MCA (2020 Course) 410909: Project Based Learning –II (Mini Project- II)		
Teaching Scheme: **PR: 02 Hours/Week**	**Credit** **01**	**Examination Scheme:** **Term work : 50 Marks**

Prerequisite courses, if any: Data Structures and Algorithms Laboratory (310906),
　　　　　　　　　　OOP Laboratory (310907),
　　　　　　　　　　Python Programming Laboratory (310908),
　　　　　　　　　　Business Communication Lab (310909)

Companion Course, if any: Computer Laboratory (410907), Data Science Laboratory (410908)

Course Objectives:

- To develop critical thinking and problem solving ability by exploring and proposing solutions to realistic /social Problems.

- To understand software/system development life cycle

- To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism

- To develop an ecosystem that promotes entrepreneurship and research culture among the students

Course Outcomes:

On completion of the course, learner will be able to

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological
　　　perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Inculcate the habit of lifelong learning.

CO6: Design and develop technical documentation

Course Execution details

Preamble: Project-based learning is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world. PBL is more than just projects. With PBL students "investigate and respond to an authentic, engaging, and complex problem, or challenge" with deep and sustained attention. PBL is "learning by doing." The truth is, many in education are recognizing we live in a modern world sustained and advanced through the successful completion of projects. In short, If students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Project based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development. The PBL model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It Brings what students should academically know, understand, and

be able to do and requires students to present their problems, research process, methods, and results. Project based learning (PBL) requires regular mentoring by faculty throughout the semester for successful completion of the idea/project tasks selected by the students per batch. For the faculty involved in PBL, teaching workload of 2 Hrs/week/batch needs to be considered. The Batch should be divided into sub-groups of 4 to 5 students. Idea implementation /Real life problem/Complex assignments / activities / projects. under project based learning is to be carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester

1. **Formulation of Team and Topic Finalization:** Students should form a group of 3 to 4 members Staff and Students should discuss the relevant problem statement.(Prefer real world problems having some social impact and application) Each team should be allocated a guide. Students should submit Synopsis(should contain Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution)

2. **Development Select any suitable programming platform** (Open source, window, web, mobile applications or any other suitable) Prefer open source technologies for development. Students can select any programming language they have learnt or in which they are competent.

3. **Design and Documentation SDLC has to be followed for design and development** Prepare Analysis Specification Document, Input Specification and Design Specification Documents(use Data Design, DFD, Flowcharts, UML diagrams, Data Dictionary, ER dig etc.) Follow SDD, SRS Provide Test Specifications (test cases, test results, test methodology etc.) Report Generations if needed.

4. **Report and Presentation** Students should present the working model of the project to the guide and panel of the college. They should prepare a report comprising the above mentioned terminologies. Submit Hard copy/Soft copy of the report which should contain certificate signed by guide , HOD and principal (prefer soft copy)

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem/project within an articulated interdisciplinary or subject frame. A problem can be theoretical, practical, social, technical, symbolic, cultural, and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases. By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry. There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content, and structure of the activity.

• A few hands-on activities that may or may not be multidisciplinary.

• Use of technology in meaningful ways to help them investigate, collaborate, analyse, synthesize, and present their learning.

 • Activities may include- Solving real life problem, investigation, /study and Writing reports of in depth study, field work

Assessment: The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness. Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation of the individual and the team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities. Students must maintain an institutional culture of authentic collaboration, self-motivation, peer learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs

and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes. Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

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

. Documentation and presentation Evaluation and Continuous Assessment: It is recommended that all activities should to be recorded regularly, regular assessment of work need to be done and proper documents need to be maintained at college end by both students as well as mentor (PBL work book). Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes. Recommended parameters for assessment/evaluation and weightage:

3. Idea Inception and Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (10%)
4. Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (Individual assessment and team assessment) (40%)
5. Documentation (Gathering requirements, design and modeling, implementation/execution, use of technology and final report, other documents) (15%)
6. Demonstration (Presentation, User Interface, Usability) (20%)
7. Contest Participation/ publication (15%) PBL workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. It will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken. Note: While planning for the assessment, choose a valid method based on your context. It should be able to understand by both the students as well as the faculty. The student group must follow the principles of Software Engineering (Scoping out the problem, the solution implementation and related documentation). Researching the problem and outlining various approaches is key here and should be emphasized by the tutor and the mentor. Aspects of design thinking (from the point of view of the person facing the problem) are very important. Students should not jump into the technology aspects first. The team can follow the principles of Agile Software Development. The weekly meetings could be used as a Scrum meeting. The tutor and mentor should actively help the students to scope the work and the approach. They must validate the technology choices. If the implementation code is well documented, the project can be continued by subsequent batch – which will help solve a bigger problem

Note: While planning for the assessment, choose a valid method based on your context. It should be able to understand by both the students as well as the faculty. The student group must follow the principles of Software Engineering (Scoping out the problem, the solution implementation and related documentation). Researching the problem and outlining various approaches is key here and should be emphasized by the tutor and the mentor. Aspects of design thinking (from the point of view of the person facing the problem) are very important. Students should not jump into the technology aspects first. The team can follow the principles of Agile Software Development. The weekly meetings could be used as a Scrum meeting. The tutor and mentor should actively help the students to scope the work and the approach. They must validate the technology choices. If the implementation code is well documented, the project can be continued by subsequent batch – which will help solve a bigger problem.

Student's Role in PBL

Prepare students for PBL before starting the sessions. Students must have ability to initiate the task/idea .they should not be mere imitators. They must learn to think. Students working in PBL must be responsible for their own learning. Throughout the PBL process, students have to define and analyze the problem, generate learning issues and apply what they have learned to solve the problem and act for them and be free. Students must quickly learn how to manage their own learning, Instead of passively receiving instruction. Students in PBL are actively constructing their knowledge and understanding of the situation in groups. Students in PBL are expected to work in groups. They have to develop interpersonal and group process skills, such as effective listening or coping creatively with conflicts. Inquiry Skills

Students in PBL are expected to develop critical thinking abilities by constantly relating: What they read to do? What they want to do with that information? They need to analyze information presented within the context of finding answers. Modeling is required so that the students can observe and build a conceptual model of the required processes. Formative and summative questions for evaluation: How effective is …….? How strong is the evidence for ………? How clear is ……? What are the justifications for thinking? Why is the method chosen? What is the evidence given to justify the solution?

Information Literacy Information literacy is an integral part of self- directed learning Information literacy involves the ability to: Know when there is a need for information Identify the information needed to solve a given problem or issue Be able to locate the needed information Use the information to solve the given problem effectively. Skills required by students in information literacy include: How to prepare the search , How to carry out the research, Sorting and assessing of information in general

Collaborative learning It is an educational approach to teaching and learning that involves groups of students working together to solve a problem or complete a project In collaborative learning, learners have the opportunity to talk with peers, exchange diverse beliefs present and defend ideas, as well as questioning other ideas

Interpersonal Skills Interpersonal skills relating to group process are essential for effective problem solving and learning. It is important that students are made aware of these inter personal skills.
Consensual decision making skills, Dialogue and discussion skills, Team maintenance skills

Conflict management skills and Team leadership skills. Students who have these skills have a better opportunity to learn than students who do not have these skills and Time Management Resources Students need to have the ability to evaluate the resources used Students have to evaluate the source of the resources used by asking the following questions: How current is it?, Is there any reason to suspect bias in the source? How credible and accurate is it?

Meta-cognitive Skills Students need to reflect on the processes they are using during the learning process, Compare one strategy with another, and evaluate the effectiveness of the strategy used Reflection Skills Reflection helps students refine and strengthen their high-level thinking skills and abilities through self-assessment. Reflection gives students opportunities to think about how they answered a question, made a decision, or solved a problem. What strategies were successful or unsuccessful? , What issues need to be remembered for next time? , What could or should be done differently in the future?

Learning Resources:

Text Books:
1. A new model of problem based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017
2. Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.
3. Stem Project based learning and integrated science, Technology, Engineering and mathematics Approach By Robert Capraro, Mary Margaret Capraro

Reference Books:
1. De Graff E, Kolmos A, red: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007. 2. Gopalan," Project management core text book",
2. Indian Edition James Shore and Shane Warden, " The Art of Agile Development"

MOOC Courses: <web links>
1. https://onlinecourses.nptel.ac.in/noc19_mg30/preview

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) **410910A : AC 3-I : Foreign Language(Japanese Module 3)**	Home

About Course: With changing times, the competitiveness has gotten into the nerves and Being the Best'at all times is only the proof of it. Nonetheless, being the best differs significantly from Communicating the best. The best can merely be communicated whilst using the best suitable Language! Foreign languages like Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Metro cities like Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs. Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the resume since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages. It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it. The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcomes:

On completion of the course, student will be able to

CO1: Apply language to communicate confidently and clearly in the Japanese language

CO2: Understand and use Japanese script to read and write

CO3: Apply knowledge for next advance level reading, writing and listening skills

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

Course Contents

1. Stating existence or a presence of thing (s), person (s), Relative positions, Counters.

2. Expressing one's Desire & wants, Verb groups, Asking, Instructing a person to do something.

3. Indicating a neither action nor motion is in progress, Describing habitual action, describing a certain continuing state which resulted from a certain action in the past. Express permission & prohibition.

Books

Reference Books:

1. Minna No Nihongo, "Japanese for Everyone", Elementary Main Text book 1-1 (Indian Edition), Goyal Publishers & Distributors Pvt. Ltd.
2. http://www.tcs.com (http://www.tcs.com/news_events/press_releases/Pages/TCSInaugurates-Japan-centric-Delivery-Center-Pune.aspx

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) 410910B:AC3 – II: Professional Ethics and Etiquettes		Home

Course Objectives:

- To make aware about types of ethical challenges and dilemmas confronting members of a range of professions
- To understand various ethical dilemmas
- To identify and describe relevant theoretical concepts related to professional ethics in engineering
- To understand the basic perception of profession, professional ethics, various moral issues uses of ethical theories
- To describe workplace and interview etiquettes

Course Outcomes:

On completion of the course, learner will be able to

CO1: Describe the major elements of ethical theory.

CO2: Analyze and present results of complex ethics cases.

CO3: Develop basic life skills or etiquettes in order to succeed in corporate culture.

CO4: Acquire effective writing skills for drafting academic, business and technical documents

CO5: Demonstrate the understanding of professionalism in terms of workplace behaviors and

   relationships

CO6: Develop professional attitude

Course Contents		
Unit I	**Introduction to the concept of ethics and ethical behaviour**	**06 Hours**
What are Ethics? Value Systems, A Brief History of Ethics, Ethics: Definitions, Key Concepts , Ethics Alarms Importance of Ethical Conduct in Business , Professional Ethics , Code of Ethics		
Unit II	**Ethical Dilemmas, Sources and Their Resolutions**	**06 Hours**
What is an Ethical Dilemma, Sources of Ethical Behavior, Code of Personal Ethics for Employees, How to Resolve an Ethical Problem, How to Resolve Ethical Dilemmas.		
Unit III	**Fundamental of Communication**	**06 Hours**
Introduction to Theory of Communication, Methods of Communication, Barriers to Communication, Communication at the Workplace		
Unit IV	**Professional Correspondence**	**06 Hours**
Seven Cs of Business Correspondence- Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness. Parts of a Formal Letter and Formats, Email writing		
Unit V	**Workplace Etiquette**	**06 Hours**

Personal Appearance - Formal Dressing, Casual Dressing, Accessories for Men & Women, Footwear, General Appearance, What To Wear for Different Occasions. Using the Right Tone of Voice, Managing your volume in Business Settings, Sounding Confident. Dealing with Body Odour, Etiquette for Personal Contact- Introductions, Getting the names right, Handshakes, Facial Expressions, Eye Contact, Hand gestures & Posture, Etiquette in and around the Office- Conversations at Work, Dealing with Colleagues

Unit VI	Interview Etiquette	06 Hours

What employers are looking for , Types of interviews , Top interview tips - preparing for an interview , Recommended interview attire , Interview checklist, Preparing for a telephonic interview, Frequently Asked Questions (FAQs) during interview , Common reasons for applicant rejection

Learning Resources:

Reference Books:
1. Sanjay Kumar & Pushp Lata (2018). Communication Skills with CD. New Delhi: Oxford University Press.
2. Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ: Prentice Hall.
3. Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.
4. Nancy Mitchell, Etiquette Rules: A Field Guide to Modern Manners, Wellfleet Press

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune **Second year of MCA (2020 Course)** **410910C-Audit Course AC3-III: Mobile App development**	Home

Course Objectives:

- To understands and get familiar with different techniques and technologies of developing apps for mobile devices

Course Outcomes:

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

CO1: Install and configure Android application development tools.

CO2: Design and develop User Interfaces for the Android platform.

CO3: Understanding enterprise scale requirements of mobile applications.

CO4: Demonstrate their ability to develop software with reasonable complexity on mobile

platform.

CO5: Demonstrate their ability to deploy software to mobile devices

CO6: Apply development tools, techniques, programming languages and libraries required for

Mobile app development

Course Contents

1. The Android Platform: Introduction to the Android platform and the Android Studio IDE, Android components, Activities, activity navigation

2. User Interface Design: Intents, Activity lifecycle, UI Design: Widgets and Layouts, UI Events, Event Listeners

3. Graphics Support in Android: Drawables, Basics of Material Design, 2D graphics: Canvas/Drawing using a view

4. Multimedia in Android: Audio playback and MediaPlayer, SoundPool

Learning Resources:

Text Books:
1. Wei-Meng Lee,” Beginning Android Application Development” , 1st Ed, Wiley Publishing.
2. J. F. DiMarzio, “Android: A Programmers Guide”, McGraw Hill Education (India) Private Limited.1st Edition.

Reference Books:
1. Responsive Web Design with Html5 and Css3 by Ben Frain, second Edition
2. Lean Mobile App Development by Mike van Drongelen, Adam Dennis Richard Garabedian Alberto Gonzalez Aravind Krishnaswamy
3. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by by Mark Wickham
4. Head First Android Development: A Brain-Friendly Guide 2nd Edition

e-Books: <web links>
1. https://freecomputerbooks.com/mobileAndroidProgrammingBooks.html

MOOC Courses: <web links>
1. https://onlinecourses.nptel.ac.in/noc20_cs52/preview

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University,
Second year of MCA (2020 Course)

410911: NCC3: MOOC Course-III- Swayam/Spoken Tutorial /NPTEL

This course aims to create an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available.

MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills. MOOCs are courses delivered online and accessible to all for free.

- *Massive* because enrollments are unlimited and can run into hundreds of thousands.
- *Open* because anyone can enroll — that is, there is no admission process.
- *Online* because they are delivered via the internet.
- *Course* because their goal is to teach a specific subject.

MOOCs typically comprise video lessons, readings, assessments, and discussion forums.

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

NPTEL- National Programme on Technology Enhanced Learning is a project of MHRD initiated by seven Indian Institutes of Technology (**Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee**) along with the Indian Institute of Science, Bangalore in 2003, to provide quality education to anyone interested in learning from the IITs. The main goal was to create web and video courses in all major branches of engineering and physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level.

Spoken Tutorial is an initiative of national mission on education through ICT, MHRD, Govt. of India to promote IT literacy through Open Source Software. It is a multi-award winning educational content portal. Here one can learn various Free and Open Source Software all by oneself. Anybody with a computer and a desire for learning can learn from any place, at any time and in any language of their choice.

MOOCs course provider like, SWYAM, NPTEL, EDX, Coursera, Udemy, Udacity or similar ones can help students in acquiring knowledge and also advancement in career □

About Course and Grade

Non Credit course is compulsory. No grade points are associated with non-credit courses and are not accounted in the calculation of the performance indices SGPA & CGPA. Result of assessment will be PP or NP. Set of non-credit courses offered is provided. Conduction and assessment of performance in said course is to be done at institute level. PP and NP Grade - The student registered and completed non credit MOOC course shall be awarded the grade PP after satisfactory completion of credit course

and shall be included in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory internal assessment performance and secured a passing grade in that course. Student who is unable to complete MOOC course will be awarded as NP grade.

Guidelines for conduction

Students have to enrol themselves for any one course which will be on going and complete the assignments. Grades will be given on the basis of submitted assignments and marks obtained. If student wants to earn a verified certificate, he/she will have to fill the online exam registration form and take the proctored exam conducted by NPTEL/Spoken Tutorial in person at any of the designated exam centres

Suggested List of Courses (Any One)
1. Human Computer Interactions- 8 week
2. Embedded System Design with ARM - 8 weeks
3. Introduction to Blockchain Technology and Applications - 8 weeks
4. User –centric Computing for Human –Computer Interaction - 8 weeks
5. Introduction to Operations Research - 8 weeks
6. Data Mining - 8 weeks

Institute may choose any one of suggested MOOC Course or decide any other MOOC course (not opted earlier) at Institute level.

Learning Resources:
1. Swayam- https://swayam.gov.in/
2. NPTEL- https://onlinecourses.nptel.ac.in/
3. Spoken Tutorial - https://spoken-tutorial.org/tutorial-search
4. Mooc- http://mooc.org/
5. Edx - https://www.edx.org/
6. Coursera- https://www.coursera.org/

SEMESTER IV

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune
Second year of MCA (2020 Course)
410912: Major Project

Home

Teaching Scheme:	Credit	Examination Scheme:
PR: 15 Hours/Week	**15**	**Internal : 100 Marks** **External: 200 Marks**

Guidelines

Preamble

- An internship/Industrial training/Project work is the form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting. The students can opt for internship/Industrial training/Project work in any industry/academic institute/R&D/PSU/Government or semi-government organizations. This caters students, the opportunity to gain valuable applied experience and explore networks in professional fields they are considering for career paths; and give employers the opportunity to guide and evaluate talent. This will not only help students in gaining professional know-how but also benefits, corporate on fresh perspectives on business issues and even discovering future business leaders.

Course Objectives:

- To expose students to product development cycle using industrial experience, use of state of art technologies.
- Evaluate the various validation and verification methods.
- To Work in TEAM and learn professionalism
- To consolidate the work as furnished report.
- To apply communication skills to effectively promote ideas, goals or products.

Course Outcomes:

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

CO1: Learn team work and professionalism.

CO2: Apply SDLC to project

CO3: Apply communication and presentation skills

CO4: Recognize the importance of documentation.

In Major Project with Industrial Internship, the student shall undergo industrial training and work on real life application as a project work. Student shall apply Software Development Life Cycle to project, draw design diagrams using tools, implement the system and test it before deployment.

The student shall prepare and submit the report of Project work in standard format for satisfactory completion of the work that is the duly certified by the concerned guide and head of the Department/Institute.

- Progress of project work is monitored regularly on weekly project slot/project day. Regular interval presentations are to be arranged to review and assess the work. During process of monitoring and continuous assessment AND evaluation the individual and team performance is

to be measured.
- Project work is monitored and continuous assessment is done by guide and authorities.
- During university examination internal examiner and External examiners jointly, evaluate the project work.
- Recommended performance measure parameters may include-Problem definition and scope of the project, Exhaustive and Rational Requirement Analysis, Comprehensive Implementation-Design, modelling, documentation, Usability, Optimization considerations(Time, Resources, Costing), Thorough Testing, Project Presentation and Demonstration(ease of use and usability), Presentation of work in the form of Project Report(s), Understanding individual capacity, Role & involvement in the project, among other parameters.
- The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) **410913: Seminar on Major Project**			Home
Teaching Scheme: **TH: 02 Hours/Week**	**Credit** **01**	**Examination Scheme:** **Internal: 50 Marks**	

Companion Course, if any: Major Project with Industrial Internship (410912)

Course Objectives:
- Develop skills of technical presentation
- Prepare documentation
- Perform literature survey

Course Outcomes:

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

CO1: Analyze recent topic or emerging trends

CO2: Summarize literature survey

CO3: Identify, understand and discuss current real-world issues.

CO4: Suggest future scope for the topic

CO5: Use professional ethics

CO6: Develop proficiency in presentation skills and written communication

Guidelines

- Each student will make a presentation on any topic in the area of his Major Project area preferably keeping track with recent technological trends and development.
- The topic must be selected in consultation with the institute guide.
- Each student will make the seminar presentation in the term making use of audio/video aids for the duration of 30-35 minutes and submit two copies of the seminar report in a prescribed format provided by the host institution duly signed by the guide and the head of the department. Plagiarism Check can be done for Seminar report
- Attendance for all seminars for all students is compulsory. Staff members of the institute will assess the seminars internally.
- Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI or from freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, Research Gate, worldwidescience.org etc.

Recommended Format of the Seminar Report:
- Title Page with Title of the topic, Name of the candidate with Exam Seat Number / Roll Number, Name of the Guide, Name of the Department, Institution and Year & University
- Seminar Approval Sheet/Certificate
- Abstract and Keywords
- Acknowledgements
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Chapters Covering topic of discussion- Introduction with section including organization of the

report, Literature Survey/Details of design/technology/Analytical and/or experimental work, if any, Discussions and Conclusions, Bibliography/References

- Plagiarism Check report

Learning Resources:

Reference Books:

1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN :130981745, 4th Edition
2. Andrea J. Rutherfoord, Basic Communication Skills for Technology, Pearson Education Asia, 2nd Editio

MOOC Courses: <web links>

1. https://www.coursera.org/specializations/presentation-skills

Savitribai Phule Pune University, Pune
Second year of MCA (2020 Course)
410914A: Audit Course 4-I: Entrepreneurship Development

Course Objectives:

- To create entrepreneurial awareness among the students.
- To help students to develop their entrepreneurial competence.
- To develop knowledge and understanding in creating and managing new Venture.
- To help students to up bring out their own business plan.

Course Outcomes:

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

CO1: Develop awareness about entrepreneurship

CO2: Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication

CO3: Identify business opportunities.

CO4: Develop comprehensive business plans.

CO5: Understand the entrepreneurial finances and policies

Course Contents

Module-I: Introduction to Entrepreneurship
Concept and meaning of Entrepreneurship, history of entrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management.

Module-II: The Entrepreneur
Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

Module-III: Communication
Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.

Module-IV: Business Opportunity Identification
Opportunity search: Divergent Thinking Mode, Opportunity Selection, Convergent Thinking Mode Preliminary Project Report (PPR), Meaning and Importance, Objectives, Selections Contents, Marketing and Technical Feasibility, Financial Viability, Precautions to be taken by entrepreneur while preparing Business Plan

Module-V: Entrepreneurial Finance
Debt or equity financing, Sources of Finance - Commercial banks, private placements, venture capital, financial institutions supporting entrepreneurs; Lease Financing; Funding opportunities for Startups in India.

Module-VI: Institutional Support and Policies:

Institutional support towards the development of entrepreneurship in India, technical consultancy organizations, government policies for small scale enterprises.

Learning Resources:

Reference Books:

1. Taneja Satish and Gupta S.L. : Entrepreneurship Development – New Venture Creations – Galgotia Publishing Company, New Delhi
2. Jain P.C. (ed) : Handbook for New Entrepreneurs Entrepreneurship Development Institute of India.
3. Gupta C.B. & Srinivas : Entrepreneurial Development, Sultan D, Chand & sons, New Delhi.
4. Desai Vasant : Management of Small Scale Industries Himalaya Publishing House.

e-Books: <web links>

1. https://www.freebookcentre.net/business-books-download/Entrepreneurship-and-Small-Scale-Businesses.html

MOOC Courses: <web links>

1. https://nptel.ac.in/courses/127/105/127105007/
2. https://www.udemy.com/course/business-development-in-e-business-era/

Curriculum for Second Year MCA 2020 Course(Under Engineering)

Savitribai Phule Pune University, Pune Second year of MCA (2020 Course) **410914B:AC4-II Digital and Social Media Marketing**	Home

Preamble: This course provides an introduction to digital and social media marketing. It is built around a proven eight-step social media planning model provides you with a cumulative learning experience, showing you how to construct social media strategies that achieve desired marketing goals. These marketing goals shape the development of tailored social media strategies. Special attention is given to the most effective techniques for identifying targeted marketing on the social web, with emphasis on the creation of personas that represent the critical online market segments for a company. You will discover how to put these well-defined personas to work in selecting the optimal social media platforms for reaching an organization's marketing goals.

With these guidelines in mind, the most productive marketing tactics for each type of major social media platform are examined in depth. These platform-specific tactics are brought together to create a comprehensive social media marketing plan, with detailed explanations and illustrations from a real world plan.

Course Objectives

- Understand the landscape of traditional, digital, and social media marketing

Course Outcomes:

On completion of the course, learner will be able to

CO1: Understand social media marketing

CO2: Define social media marketing goal setting necessary to achieve successful online

campaigns.

CO3: Understand digital marketing concepts

Course Contents

Module-I: Introduction to social media marketing

Introduction and importance of social media and its types, Define social media marketing, Explain the 7 myths of social marketing, History of social media marketing, characteristics of a successful social media marketer, careers in social media marketing

Module-II: Goal setting in a social environment

social media plan, social media marketing planning cycle, step in the social media marketing planning cycle, set social media marketing goals, social media objectives, 8 C's of Strategy Development

Module-III: Introduction to Digital Marketing

Concept of Digital Marketing, characteristics of digital marketing, difference between traditional marketing and digital marketing, Importance, Trends and scenario of the digital marketing

Learning Resources:

Text Books:

1.An Introduction to Scoical Media Marketing, Alan Charlesworth
2. Digital Marketing, Dave Chaffey, Fiona Ellis-Chadwick

Reference Books:

1. Digital Marketing An Overview, Dr. Antony Puthussery
2. Social Media Marketing Tracy L. Tuten, Michael R. Solomon

Curriculum for Second Year MCA 2020 Course(Under Engineering)