Faculty of Science and Technology

Savitribai Phule Pune University

MAHARASHTRA, INDIA

Curriculum for Second Year Master of Computer Applications (MCA)

(Course 2019)

(With effect from June 2020-21)

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.

Course Structure of SY MCA (Semester 3)

Course Code	Course	Teaching Scheme Hours/Week		Examination Scheme						Credit	
		TH	PR	In-Sem	End Sem	TW	OR	PR	Total Marks	TH	PR
410901	Web Programming	3	-	30	70	-	-	-	100	3	-
410902	Banking and Finance	3	-	30	70	-	-	-	100	3	-
410903	Computer Networks	3	-	30	70	-	-	-	100	3	-
410904	Python Programming	3	-	30	70	-	-	-	100	3	-
410905	Management Information System	3	-	30	70	-	-	-	100	3	-
410906	Computer Network Laboratory	-	2	-	-	50	-		50	-	1
410907	Web Programming Laboratory	-	4	-	-	25	-	50	75	-	2
410908	Python Programming Laboratory	-	4	-	-	25	-	50	75	-	2
410909	Soft skills Laboratory	-	2	-	-	50			50	-	1
410910	Seminar and Technical Communication Skills-I	-	2	-	-	50	-	-	50	-	1
	Total	15	14	150	350	200	-	100	800	22	
410911	Audit Course 3: 410911A - AC3-I: Digital and Social Media Marketing 410911B AC3-II: Foreign Language									Grade	

Course Structure of SY MCA (Semester 4)

Course Code	Course	Teaching Scheme Hours/Week		Examination Scheme						Credit	
		TH	PR	In-Sem	End _Sem	TW	OR	PR	Total Marks	TH	PR
410912	Software Engineering & Project Management	4	-	30	70	-	-	-	100	4	-
410913	Mobile Computing	3	-	30	70	-	-	-	100	3	-
410914	Data Science with R	3	-	30	70	-	-	-	100	3	-
410915	Object Oriented Modeling and Design	3	-	30	70	-	-	-	100	3	-
410916	**Elective- I	3	-	30	70	-	-	-	100	3	-
410917	Mobile Computing Laboratory	-	4	-	-	50	-	50	100	-	2
410918	OOMD Laboratory	-	2	-	-	50	-	-	50	-	1

410919	Data Science with R Laboratory	-	4	-	-	50	-	50	100	-	2
410920	Project Based Learning -II	-	2	-	-	50	-	-	50	-	1
	Total	16	12	150	350	200	-	100	800	22	
410921	Audit Course 4: 410921A AC4-I: Professional Ethics and Etiquettes 410921B AC4-II: MOOC- Learn New Skills 410921C AC4-III: Foreign Language									Grade	

$ - Industrial Internship to be undertaken in the vacation after 4th Semester. Preferably, the same company should be continued for project work. Necessary proofs and documents to be maintained by the student and department.

**** List of Elective- I (410916) Course**

Course Code	Course
(410916)	Elective I
410916A	Artificial Intelligence
410916B	Information Security
410916C	Animation and Gaming
410916D	Internet of Things

SEMESTER III

Savitribai Phule Pune University, Pune Second Year of MCA (2019 Course) 410901:Web Programming		
Teaching Scheme: **TH: 03 Hours/Week**	**Credit** **03**	**Examination Scheme:** **Internal: 30 Marks** **External: 70 Marks**

Prerequisites: Computer Network, Database Management Systems, HTML, PHP, Basics of Web

Companion Course: Web Technology Lab

Course Objectives:

- To understand the principles and methodologies of web-based applications development process
- To understand current client side and server side web technologies
- To understand current client side and server side frameworks
- To understand web services and content management

Course Outcomes:

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

CO1:Analyze given assignment to select sustainable web development design methodology

CO2: Develop web-based application using suitable client side and server side web technologies

CO3: Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management

Course Contents		
Unit I	**Web Development Process, Front End Tools**	**06 Hours**
Introduction to web technology, internet and www, 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, XML: Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.		
Unit II	**Client Side Technologies**	**06 Hours**
JavaScript: Overview of Java Script, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.		
Unit III	**Server Side Technologies:Programming**	**06 Hours**
Introduction to Server-Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet, elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP.		
Unit IV	**Server-Side Technologies: Scripting**	**06 Hours**

PHP: Introduction to PHP, Features, sample code, PHP script working, PHP syntax, conditions & Loops, Functions, String manipulation, Arrays & Functions, Form handling, Cookies & Sessions, using MySQL with PHP, WAP & WML, AJAX: Introduction, Working of AJAX, AJAX processing steps, coding AJAX script.

Unit V	Client and Server Side Frameworks	06Hours

Angular JS : Overview, MVC architecture, directives, expression, controllers, filters, tables, modules, forms, includes views, scopes, services, dependency injection, custom directives, Internationalization, Introduction to NodeJS. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.

Unit VI	Web Services	06 Hours

Web Services: Overview, types of WS, difference between SOAP and REST, EJB: types of EJB, benefits, Architecture, EJB technology, JNDI lookup, Introduction to Content Management System (CMS), Wordpress / Joomala, Advanced Technology: Bootstrap, JSF, and Spring.

Books:

Text Books:

1. Achyut Godbole & Atul Kahate, Web Technologies: TCP/IP to Internet Application Architectures, McGraw Hill Education publications, ISBN, 007047298X,9780070472983
2. Ralph Moseley & M. T. Savaliya, ―Developing Web Applications‖, Wiley publications, ISBN 13: 9788126538676

Reference Books:

1. Adam Bretz& Colin J Ihrig, ―Full Stack Javascript Development with MEAN‖, SPD, ISBN-13: 978- 0992461256
2. GiulioZambon, ― Beginning JSP, JSF and Tomcat, Apress Publication, ISBN-10: 1430246235; ISBN-13:978-1430246237
3. Jeremy McPeak & Paul Wilton, Beginning Java Script, Wrox Publication, ISBN-13:978-0470525937
4. Black Book, ―Struts 2‖, Dreamtech Press, ISBN 13, : 9788177228700
5. Black Book, ― JDBC 4.2, Servlet 3.1 & JSP 2.3‖, Dreamtech Press, ISBN-13:978-8177228700
6. Sandeep Panda―Angular JS: Novice to Ninja‖, SPD, First Edition2014, ISBN-13:978-0992279455
7. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya ―J2EE Architecture, an illustrative gateway to enterprise solutions‖, Tata McGraw Hill Publishing Company. ISBN:9780070621633
8. Brian Fling, ―Mobile Design and Development‖, O'REILLY, ISBN:13:978-81-8404-817-9
9. Robin Nixon, ―Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5‖, O'REILLY, ISBN:13:978-93-5213-015-3

Savitribai Phule Pune University, Pune
Second Year of MCA (2019 Course)
410902: Banking and Finance

Teaching Scheme: TH: 03 Hours/Week	TH Credit:3	Examination Scheme: Internal: 30 Marks External: 70 Marks

Prerequisites: An elementary knowledge of arithmetic operation and integral calculus is required.

Course Objectives:

- To impart basic Banking and financial Accounting knowledge that is required for a Career as software Developer.

Course Outcomes:

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

CO1: Use the concepts of banking domain
CO2: Implement the basic Accounting concepts in the banking and financial applications
CO3: Apply the basic concepts of cost accounting in real world problem
CO4: Implement the working capital concepts

Course Contents

Unit I	Introduction to Banking	06 Hours

Regulatory authorities for banking in India – Reserve Bank of India, Ministry of Finance, Co-Op Registrar, DICGC, NABARD, NHB, Types of Banks.

Laws governing banks - Banking Regulation Act, Negotiable Instruments Act, etc.

Types of Accounts – Deposit, Loans, Other accounts, Control accounts, Linked Accounts, PPF, Pension & other Government Scheme accounts.

Unit II	Types of Transactions in Bank	06 Hours

Cash, Clearing and Transfer type of transactions in bank branch environment, Cheques, Dividend Warrants, Demand Drafts, Local Pay Order, Payable at Par Instruments, Standing Instructions, Straight Through Processing, Online transfers across the banks – NEFT, RTGS, SWIFT.

Unit III	E-Banking	06 Hours

Transactions -Inter Banking, Intra Banking, CBS (Core Banking System) Electronic Payments, (Payment – Gateway Example)

Securities in E-banking(SSL, Digital Signatures – Examples)

Services Provided : ATM, Smart Card ECS(Electronic Clearing System) e.g. Telephone, Electricity Bills

Unit IV	Introduction Financial Accounting	10 Hours

Financial Accounting-Definition, Scope and objectives, System of Book Keeping, Terms used in accounting, of Accounting process, Concepts and Conventions in accounting, 3 rules for book keeping.

J**ournalisation** -Rules for Journalisation, posting in a Ledger, subsidiary books, preparation of Trial balance.

Final Accounts-Preparation of Trading and profit and loss Account and Balance sheet of a Proprietary and partnership firms.

Unit V	Managerial and Cost Accounting	08 Hours

Concept of cost

Elements of Cost - Material, Labour and Expenses, Classification of cost & Types of Costs, Preparation of Cost Sheet.

Overhead - Meaning and Definition of Overhead, Classification of Overheads,

Marginal Costing – Meaning and Various Concepts – Fixed Cost, Variable Cost, Contribution, P/V Ratio, Break Even Point, Margin of Safety.

Ratio Analysis-Meaning and rationale, advantages and limitations. Types of Ratios Liquidity Ratios, Solvency Ratios, Profitability Ratios, Efficiency Ratios, Integrated Ratios

Unit VI	Working Capital Management	06 Hours

Concepts & needs, Types of working capital, Factors affecting working capital requirement, Estimation of working capital requirement, Financing the working capital requirement

Books:

Text Books:

1. Financial Management :By S.M. Inamdar , EverestPublication
2. Cost & Management Account : By S.M. Inamdar , EverestPublication
3. Book Keeping & Accounting Textbook of Standard XI :Balbharati

Reference Books:

1. Management Accounting: A.P.Rao
2. Management Accounting: Dr.SanjayPatankar
3. Management Accounting: Khan andJain
4. E – Commerce : MilindOka
5. E – Commerce : C.V.S.Murty
6. Fire Wall and Internet Security: William Cheswick ,Stevens, AvielRubin

Savitribai Phule Pune University Second year of MCA (2019 Course) 410903:Computer Networks		
Teaching Scheme: **TH: 03 Hours/Week**	**TH Credit:3**	**Examination Scheme:** **Internal: 30 Marks** **External : 70 Marks**

Prerequisites: Computer Organization

Companion Courses: Computer Network Lab

Course Objectives:

- To understand the fundamental concepts of networking standards, protocols and technologies
- To learn different techniques for framing, error control, flow control and routing.
- To learn role of protocols at various layers in the protocol stacks.
- To learn network programming.
- To develop an understanding of modern network architectures from a design and performance perspective

Course Outcomes:

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

CO1: Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies.

CO2: Demonstrate design issues, flow control and error control.

CO3: Analyze data flow between TCP/IP model using Application, Transport and Network Layer protocols.

CO4: Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.

CO5: Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.

CO6: Demonstrate different routing and switching algorithms.

Course Contents		
Unit I	**Physical Layer**	**07 Hours**
Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Design issues for Layers, Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence (DSSS)		
Unit II	**Logical Link Control**	**07 Hours**
Design Issues: Services to Network Layer, Framing, Error Control and Flow Control. Error Control: Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol, WAN Connectivity : PPP and HDLC		
Unit III	**Medium Access Control**	**07 Hours**

Channel allocation: Static and Dynamic, Multiple Access Protocols: Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats, CSMA/CD, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n and IEEE 802.15 and IEEE 802.16 Standards, CSMA/CA.		
Unit IV	**Network Layer**	**07 Hours**
Network Layer Services, Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP, OSPF, BGP, Congestion control and QoS, MPLS, Mobile IP, Routing in MANET: AODV, DSR		
Unit V	**Transport Layer**	**07 Hours**
Transport Layer Services, UDP: Datagram services, Applications, Berkley Sockets, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP: Services, Features, Segment, TCP Timer management, TCP Congestion Control, Real Time Transport protocol(RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.		
Unit VI	**Application Layer**	**07 Hours**
Client Server Paradigm: Communication using TCP and UDP, Peer to Peer Paradigm, Application Layer Protocols: Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TFTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).		
Books		
Text Books: 1. Andrew S. Tenenbaum, “Computer Networks”, PHI, ISBN81-203-2175-8. 2. Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 –7		
Reference Books: 1. Kurose, Ross “Computer Networking a Top Down Approach Featuring the Internet”, Pearson, ISBN-10:0132856204 2. Matthew S. G, “802.11 Wireless Networks”, O’Reilly publications, ISBN:81-7656-992-5 3. C.SivaRamMurthyandB.S.Manoj,“AdHocWirelessNetworks:ArchitecturesandProtocols” Prentice Hall, ISBN-10: 8131706885; ISBN-13:978-8131706886 4. Holger Karl and Andreas Willing, “Protocols and Architectures for Wireless Sensor Networks”, Wiley India , ISBN:9788126533695 5. EldadPerahia, Robert Stacey, “Next Generation Wireless LANs”, Cambridge, ISBN-10: 1107016762; ISBN-13:978-1107016767 6. Efraim Turban, Linda Volonino, Gregory R. Wood “Computer Networking a Top Down Approach Featuring the Internet”, 10th Edition, Wiley; ISBN13:978-1-118-96126-1sor		

Savitribai Phule Pune University, Pune
Second year of MCA (2019Course)
410904: Python Programming

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

Prerequisites: Students are expected to have a good understanding of basic computer principles.

Course Objectives:

- Describe the core syntax and semantics of Python programming an usage.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Indicate the use of regular expressions and built-in functions to navigate the filesystem.
- Infer the Object-oriented Programming concepts in Python.

Course Outcomes:

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

CO1: Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
CO2: Express proficiency in the handling of functions and strings
CO3: Determine the methods to create and manipulate Python programs by utilizing the data structures like dictionaries, tuples and sets.
CO4: Identify the commonly used operations involving file systems and regular expressions.
CO5: Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.

Course Contents

Unit I	**Introduction to Python Programming**	**07 Hours**

Basics of Python Programming: Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Control Flow Statements, Operators and expressions, Expressions in Python

Unit II	**Decision Control statements**	**07 Hours**

Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, The break, continue, pass, else statement used with loops. Other data types- Tuples, Lists and Dictionary.

Unit III	**Functions and Strings**	**07 Hours**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings
Lists: Creating Lists, BasicList Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement.

Unit IV	**Dictionaries**	**07 Hours**

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, **Tuples and Sets:** Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozen set

Unit V	Files	07 Hours

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, **Regular Expression Operations:** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.

Unit VI	Object Oriented Programming and Standard Library	07 Hours

Object-Oriented Programming, Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, Polymorphism

Operating System Interface –Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming

Books:

Text Books:

1. Gowri Shankar S, Veena A, "Introduction to Python Programming",
2. 1stEdition, CRC Press/Taylor &Francis, 2018. ISBN-13:978-0815394372
3. ReemaThareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN13:978-0-19-948017-6
4. R. NageswaraRao, "Core Python Programming", Dreamtech Press; Second editionISBN10: 938605230X, ISBN-13: 978-9386052308ASIN:B07BFSR3LL

Reference Books:

1. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016.ISBN-13:978-1491912058
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media, 2017. ISBN –13:978-1491962299.
3. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015.ISBN-13:978-9332555365
4. Miguel Grinberg, "Flask Web Development: Developing Web Applications with Python", 2nd Edition, O'Reilly Media, 2018.ISBN-13:978-1491991732.

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410905: Management Information System

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

Prerequisites: Basic knowledge of computer terminologies

Course Objectives:

- Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.
- Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.
- Effectively communicate strategic alternatives to facilitate decision making.

Course Outcomes:

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

CO1: Define MIS as an integrated system of man and machine for providing the information to support the operations, the management, and the decision-making function in the organization.

CO2: Describe the role of information technology and information systems in business.

CO3: Record the current issues of information technology and relate those issues to the firm.

CO4: Interpret how to use and Implement Information technology to solve business problems.

Course Contents

Unit I	**The meaning and role of MIS**	**05 Hours**
What is MIS? Decision support systems, systems approach, the systems view of business, MIS organization within the company, Managers view of Information systems.		
Unit II	**Information System in the Enterprise**	**07 Hours**
Major types of Systems in organization, Systems from functional perspectives, Integrating functions and business processes, Introduction to Enterprise applications		
Unit III	**Information Systems for Decision making**	**07 Hours**
Evolution of an information system, Basic information systems, decision making and MIS, MIS as a technique for making programmed decisions, decision assisting information systems. Communication systems basics.		
Unit IV	**Strategic and Project planning for MIS:**	**07 Hours**
General business planning, appropriate MIS response, MIS planning-general, MIS planning-details.		
Unit V	**Conceptual system design**	**07 Hours**
Define the problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual designs and select one, document the system concept, prepare the conceptual design report.		

Unit VI	Detailed system design and Implementation	09 Hours

Inform and involve the organization, aim of detailed design, project management of MIS detailed design, identify dominant and trade off criteria, define the subsystems, sketch the detailed operating subsystems and information flows, determine the degree of automation of each operation, inform and involve the organization age in, inputs, outputs, and processing, early system testing, software, hardware and tools, propose an organization to operate the system, document the detailed design, revisit the manager-user.

Implementation, evaluation and maintenance of the MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information, dissemination, develop the files, test the system, cut over, document the system, evaluate the MIS, control and maintain the system

Books:

Text Books:

1. Information systems for modern management, 3rd Edition by R.G Murdick, J.E Ross and J. R clagget, PHI-1994.

Reference Books:

1. Management information Systems, 4th edition by Robert Schultheis, Mary Sumner, PHI-1999.
2. Management Information Systems, 9/e, Laudon, V.M. Prasad, Pearson, 2005,
3. Management Information System, Oz Thomson Learning 5thedition
4. Management Information System, W.S. Javadekar, 3rd edition, TMH
5. Management Information System, James O ‘Brien, 7th edition, TMH
6. Information Systems the foundation of E-Business, Steven Alter, 4th Edition Person education

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410906: Computer Network Lab

Teaching Scheme: **TH: 02 Hours/Week**	**Credit** **01**	**Examination Scheme:** **Term work: 50 Marks**

Prerequisites: Computer Organization

Companion Courses: Computer Networks (410903)

Course Objectives:

- To establish communication among the computing nodes in P2P and Client-Server architecture
- Configure the computing nodes with understanding of protocols and technologies.
- Use different communicating modes and standards for communication
- Use modern tools for network traffic analysis
- To learn network programming.

Course Outcomes:

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

- Demonstrate LAN and WAN protocol behaviour using Modern Tools.
- Analyse data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
- Demonstrate basic configuration of switches and routers.
- Develop Client-Server architectures and prototypes by the means of correct standards and technology.

Guidelines for instructor's Manual

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

Guidelines for Student 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 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.

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.

Set of suggested assignment list is provided in groups- A and B.

Each student must perform at least 6 assignments from group A and 4 from group B Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - Open Source C,C++, JAVA, PYTHON, Programming tool like G++/GCC, Wireshark, Etheral and Packet Tracer

References:

1. Thomas D. Nadean and Ken Gray, “Software Defined Networks”, O'REILLY, ISBN: 13:978-93- 5110-264-9
2. Robert Faludi, “Building Wireless Sensor Networks”, O'REILLY, ISBN: 13:978-93-5023- 289-7

Suggested List of Laboratory Assignments
All assignments should be implemented using Open Source Linux flavors, Open Source Tools: Wireshark and Packet Tracer and C/C++, JAVA, PYTHON.

Group A

1. Lab Assignment on Unit I:

Part A: Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It

includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and demonstrate the PING packets
captured traces using Wireshark Packet Analyzer Tool. Part B: Extend the same Assignment for Wireless using Access Point

2. Lab Assignment on Unit II: (Use C/C++)
Write a Program with following four options to transfer-a. Characters separated by space b. One Strings at a time c. One Sentence at a time d. file between two RS 232D or USB ports using C/C++. (To demonstrate Framing, Flow control, Error control).

3. Lab Assignment on Unit II: (Use C/C++)
Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.(50% students will perform Hamming Code and others will perform CRC)

4. Lab Assignment on Unit II: (Use JAVA/PYTHON)
Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode and demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

5. Lab Assignment on Unit IV: (Use JAVA/PYTHON)
Write a program to demonstrate subletting and find the subnet masks.

6. Lab Assignment on Unit IV: (Use JAVA/PYTHON)
Write a program to simulate the behaviour of link state routing protocol to find suitable path for transmission.

7. Lab Assignment on Unit V: (Use C/C++)
Write a program using TCP socket for wired network for following a. Say Hello to Each other (For all students) b. File transfer (For all students) c. Calculator (Arithmetic) (50% students) d. Calculator (Trigonometry) (50% students) Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

8. Lab Assignment on Unit V: (Use C/C++)
Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

9. Lab Assignment on Unit V: (Use C/C++)
Write a program to analyze following packet formats captured through Wireshark for wired network.
1. Ethernet 2. IP 3.TCP 4. UDP

10. Lab Assignment on Unit VI: (Use JAVA/PYTHON)
Write a program for DNS lookup. Given an IP address input, it should return URL and vice- versa.

Group B

1. Lab Assignment on Unit II: (Use JAVA/PYTHON)

Write a Program to transfer- By using Bluetooth a. Characters separated by space b. One Strings at a time c. One Sentence at a time d. File

2. Lab Assignment on Unit IV: (Use JAVA/PYTHON)
Study of any network simulation tools - To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1

3. Lab Assignment on Unit V: (Use JAVA/PYTHON)
Write a program using TCP sockets for wired network to implement a. Peer to Peer Chat b. Multiuser Chat Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

4. Lab Assignment on Unit V: (Use JAVA/PYTHON)
Write a program using UDP sockets for wired network to implement a. Peer to Peer Chat b. Multiuser Chat Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

5. Lab Assignment on Unit V: (Use JAVA/PYTHON)
Write a program to prepare TCP and UDP packets using header files and send the packets to destination machine in peer to peer mode. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

6.Lab Assignment on Unit IV and Unit V:
Use network simulator NS2 to implement: a. Monitoring traffic for the given topology b. Analysis of CSMA and Ethernet protocols c. Network Routing: Shortest path routing, AODV. d. Analysis of congestion control (TCP and UDP).

Savitribai Phule Pune University, Pune
Second Year of MCA (2019 Course)
410907: Web Technology Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 04 Hours/Week	02	Practical: 50 Marks Term work: 25 Marks

Companion Course: Web Technology

Course Objectives:

- To use current client side and server side web technologies
- To implement communication among the computing nodes using current client side and server side technologies
- To design and implement web services with content management

Course Outcomes:

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

- Develop web-based application using suitable client side and server side web technologies
- Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management

Guidelines for Instructor's Manual

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

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **hand written 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 soft copy.**

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.

In addition to these, instructor may assign one real life application in the form of a mini project based on the concepts learned. Instructor may also set one assignment or mini project that is suitable to respective branch beyond the scope of syllabus.

Suggested Assignment List

Lab Assignment on Unit I:

Assignment 1a: Installation and Configuration of Web Application Servers Tomcat, Apache, WebSphere, JBoss, GlassFish.

Assignment 1b: Design and develop any suitable web application using HTML, CSS, and XML in consultation of course instructor.

Lab Assignment on Unit II:

Assignment 2: Perform validation of all fields in **assignment no.1** by using Java script/JQuery.

Lab Assignment on Unit III:

Assignment 3: Add dynamic web application essence in **assignment no. 2** using Servlet, JSP and backend.

Lab Assignment on Unit IV:

Assignment 4: Add dynamic web application essence in **assignment no. 2** using PHP, MySQL database connectivity and AJAX controls.

Lab Assignment on Unit V:

Assignment 5: Re-Design, develop and deploy **assignment no. 3 of unit –III** using Strut

Re-Design, develop and deploy **assignment no. 4 of unit –IV** using Angular JS

Lab Assignment on Unit VI:

Assignment 6: Design, Develop and Deploy separate web application using EJB/CMS/JSF/Spring/Bootstrap.

Reference Books:

1. AleksaVukotic and James Goodwill, ―Apache Tomcat 7‖, Apress, 2011, ISBN: 10:1430237236

2. Bryan Basham, Kathy Sierra, Bert Bates― JSP: Passing the Sun Certified Web Component Developer Exam‖, O'Reilly Media ISBN:978-0-596-51668-0

3. ChiragRathod, Jonathan Wetherbee, Peter Zadrozny, and Raghu R. Kodali, ―Beginning EJB 3: Java EE 7 Edition‖, Apress, 2013, ISBN :9781430246923

4. Richard Monson-Haefel, ―J2EE Web Services‖, Addison-Wesley Professional, First Edition, 2004, ISBN: 10:0321146182

5. Chuck Cavaness, ―Programming Jakarta Struts‖, O'relly Media, second edition 2004, ISBN: 978-0-596-00651-8.

6. Michael Morrison, Lynn Beighley, ―Head First PHP & MySQL: A Brain-Friendly Guide‖, O'relly Media, second edition 2008, ISBN :13:9788184046588

7. Dan Rahmel, ―Advanced Joomla!‖, Apress, First Edition, 2013, ISBN: 13:9781430216285

8. IweinFuld, Marius Bogoevici, Mark Fisher, Jonas Partner‖, Spring Integration in Action‖, Manning, 2012, ISBN : 13:9781935182436.

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410908: Python Programming Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 04 Hours/Week	02	Practical: 50 Marks Term work: 25 Marks

Prerequisites:

Course Objectives:

- To understand data types, input output statements, decision making, looping in Python.
- To Learn Syntax and Semantics and create Functions in Python.
- To Handle Strings and Files in Python.
- To implement data structure concepts in Python.

Course Outcomes:

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

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
- Demonstrate proficiency in handling Strings and File Systems
- Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python.

Guidelines for Instructor's Manual

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

Guidelines for Learner Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **hand written 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 soft copy.**

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 Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be askedat the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation.

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.

In addition to these, instructor may assign one real life application in the form of a mini project based on the concepts learned. Instructor may also set one assignment or mini project that is suitable to respective branch beyond the scope of syllabus.

Suggested list of Experiments
(Instructor may design based on these)

1	To calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions.
2	Write a Python program to compute area and circumference of a Triangle. Take input from user.
3	Write a Python program to compute area and circumference of a Triangle. Take input from user.
4	Write a program to check that a given year is Leap Year or not.
5	To simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing xy and x!.
6	Write function to compute gcd, lcm of two numbers. Each function should not exceed one line.
7	Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation "Asst Manager"
8	Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to user. Generate bill as per order.
9	Write a Python program to demonstrate working of classes and objects.
10	Write a Python program to demonstrate constructors.
11	Write a Python program to demonstrate inheritance.
12	Write a program to print each line of a file in reverse order.

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410909: Soft Skills Laboratory

Teaching Scheme:	Credit	Examination Scheme:
TH: 02 Hours/Week	01	Term work: 50 Marks

Course Objectives:

- To develop student's overall personality.
- To understand and aware about importance, role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice. To improve his writing and documentation skills.

Course Outcomes:

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

CO1: Improve communication, interaction and presentation of ideas.
CO2: Develop right attitudinal and behavioral change.

Unit I	Concepts of effective communication	07 Hours

Components of effective communication, Communication process and handling them, Keep it short and sweet in communication – Composing effective messages. , Non – Verbal Communication: its importance and nuances: Facial Expression, Posture, Gesture, Eye contact, appearance (dress code)

Unit II	Written Communication Skill Practice	07 Hours

Correction of errors, Making of Sentences, Paragraph Writing, Leave Application and simple letter writing Grammatical use Punctuation Meaning & opposites, Real Life conversations, Vocabulary building Understanding the Audience, Need analysis through pre presentation feedback form.

Unit III	Presentation Skill	07 Hours

Preparation & introduction, Presentation, Evaluation / feedback, Summarization / Conclusion Team Building games, Together Everyone Achieves Miracle (TEAM), issues when there is no team work, Leader ship emerging through team, how to identify team players.

Unit IV	Team Building	07 Hours

Team Building Practices through group exercises, team task / role play, Ability to mixing & accommodation, Ability to work together, Group ,Group Dynamics , Attendance , Discipline & Punctuality , Act in time on commitment , Quality/ Productive Time.

Unit V	Telecommunication Skills	07 Hours

Tele – etiquette, Receiving Calls, transferring calls, Taking Message/ Voice Mails, Making Outgoing Calls, Receiving Fax. Working principle of Mini exchange and its features and facilities.

Unit VI	Self-Evaluation	07 Hours

Self-Evaluation, Self-Discipline, Self-Criticism, Recognition of one's own limits and deficiencies, Independency etc., Thoughtful & Responsible, Self-Awareness, identifying one's strengths and weaknesses, Planning & Goal setting, Managing self – emotions, ego, pride.

Reference books:

1. Soft skills Training – A workbook to develop skills for employment by Fredrick H.Wentz
2. Personality Development and Soft skills, Oxford University Press by Barun K.Mitra
The Time Trap : The Classic book on Time Management by R. AlecMackenzie

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410910: Seminar and Technical Communication Skills-I

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	Term Work: 50 Marks

Course Objectives:

- To explore the basic principles of communication (verbal and non-verbal) and active listening, speaking and writing techniques.
- To expose the student to new technologies, research, products, algorithms, services

Course Outcomes:

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

CO1: Be familiar with basic technical writing concepts and terms
CO2: Improve skills to read, understand, and interpret documentation on technology.
CO3: Improve communication and writing skills

Guidelines:

- Each student should select a topic in Computer Engineering and Technology keeping track with recent technological trends and development beyond scope of syllabus avoiding repetition in consecutive years.
- The topic must be selected in consultation with the institute guide.
- Each student will make a seminar presentation using audio/visual aids for duration of 20-25 minutes and submit the seminar report prepared in Latex only.
- Active participation at classmate seminars is essential.

Guidelines for Assessment:

Panel of staff members along with a guide would be assessing the seminar work based on these parameters -Topic, Contents and Presentation, Regularity, Punctuality and Timely Completion, Question and Answers, Report, Paper presentation/Publication, Attendance and Active Participation

Recommended Format of the Seminar Report:

- Title Page with Title of the topic, Name of the candidate & Roll Number, Name of the Guide, Name of the Department, Institution and Year & University
- Seminar Approval Certificate
- Abstract and Keywords
- Acknowledgements
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Chapters Covering topic of discussion - Introduction, Literature Survey, Details of technology, Analytical and/or experimental work (if any), Discussions and Conclusions, Bibliography/References
- Plagiarism Check report

Reference Books:

1. Rebecca Stott, Cordelia Bryan, Tory Young, “Speaking Your Mind: Oral Presentation and Seminar Skills (Speak-Write Series)”, Longman, ISBN-13: 978-0582382435
2. Johnson-Sheehan, Richard, “Technical Communication”, Longman. ISBN0-321-11764-6
3. VikasShirodkar,“FundamentalskillsforbuildingProfessionals”,SPD,ISBN978-93-5213-146- 5

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410911A : Audit Course 3-I
AC3-I : Digital & Social Media Marketing

The importance of social media's role in modern marketing efforts can no longer be ignored. It is an integral component in almost all successful marketing strategies. With this increasing emphasis on integrated social media strategies, there is an Irrefutable need for marketing professionals and organizations to have end- to- end social media expertise. Through case studies, interactive sessions, and class exercises, students will learn best practices and develop the skills to connect business objectives with social media strategy, platforms and tactics. Topics will include choosing appropriate platforms, creating effective and engaging social media content, content management, social listening and creating a social media policy

Course Objectives:

- Identify best practices for Social Media Marketing, including platform level best practices.
- Connect business objectives to appropriate Social Media tactics.
- Create strong content that engages their target audience with their marketing message.

Course Outcomes:

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

CO1: Create editorial calendars to manage content distribution.
CO2: Use Social Listening tools to create timely, relevant content.
CO3: Create Social Media policies that combine business objectives with appropriate use of content.

Course Contents

- Introductions and review class objectives, discuss class goals and individual goals, fill out questionnaire, Introduction to Blogging; create a blog post for your project. Include headline, imagery, links and post.
- Introduction to Facebook and channel advertising and campaigns, Introduction to Twitter and channel advertising and campaigns, Creative Campaign examples across social channels
- Introduction to both Google+ and LinkedIn. Provide an overview on Linked In advertising, Create Google+ and LinkedIn outlines for your project and include types of posts and an example post for each platform.
- Introduction to both Instagram and Pinterest as well as channel advertising and campaigns, Create Instagram and Pinterest outlines for your project and include types of posts and an example post for each platform, review a content calendar, Lay out your own content calendar

Books

Reference Books:

1. VandanaAhuja, Digital Marketing, Oxford Press, ISBN:9780199455447,
2. Wiley, Jeanniey Mullen, David Daniels, David Gilmour "Email Marketing: An Houra Day", ISBN:978-0-470-38673-6
3. David Scott, "The New Rules of Marketing and PR", Wiley India,ISBN:978-1-119-07048

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410911B : Audit Course 3-II
AC 3-II : Foreign Language(Japanese Module 2)

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: Possess ability of basic communication.
CO2: Possess the knowledge of Japanese script.
CO3: Get introduced to reading, writing and listening skills for language Japanese.
CO4: Develop interest to pursue professional Japanese Language course

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. Indicatinganactionormotionisinprogress,Describinghabitualaction,describingacertain 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

SEMESTER IV

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410912: Software Engineering & Project Management

Teaching Scheme: **TH: 04 Hours/Week**	**Credit** **04**	**Examination Scheme:** **Internal: 30 Marks** **External: 70 Marks**

Prerequisites:

1. Fundamentals of programming languages

Course Objectives:

- To understand software development and software lifecycle process models
- To know methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand project management through life cycle of the project.
- To learn about project planning, execution and tracking.
- To introduce principles of agile software development, the SCRUM process and agile practices.

Course Outcomes:

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

CO1: Choose and apply appropriate lifecycle model of software development
CO2: Describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models
CO3: Analyze software requirements by applying various modeling techniques
CO4: Understand IT project management through life cycle of the project and future trends in IT Project Management.

Course Contents

Unit I	**Introduction to Software Engineering**	**08 Hours**

Nature of Software, Software Process, Software Engineering Practice, Software Myths, Generic Process model, Analysis and comparison of Process Models: Water fall Model, Incremental Models, Evolutionary Models, Concurrent, Specialized Process Models, Personal and Team Process Models
Advanced Process Models & Tools: Agile software development: Agile methods, Plan-driven and agile development, Extreme programming Practices, Testing in XP, Pair programming. Introduction to agile tools: JIRA, Kanban, Introduction to DevOps.

Unit II	**Requirement Engineering & Analysis**	**08 Hours**

Requirements Engineering: User and system requirements, Functional and non-functional requirements, Types & Metrics, A spiral view of the requirements engineering process. **Software Requirements Specification (SRS):** The software requirements Specification document, **Case Studies : SRS**

Requirements elicitation & Analysis: Process, Requirements validation, Requirements management.		
Unit III	**Agile Development Process**	**08Hours**
Agile Development: Agile manifesto, agility and cost of change, agility principles, myth of planned development, toolset for the agile process. Extreme Programming: XP values, process, industrial XP, SCRUM - process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting maintaining sprint backlog and burn-down chart, sprint review and retrospective. Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing		
Unit IV	**Product, process, project Metrics**	**08 Hours**
Product Metrics –Software Quality, Framework for Product Metrics, Metrics for Analysis model, Design model, Metrics for Source code, Metrics for Testing & Maintenance Metrics in the Process and Project Domains, Software Measurement: size & function-oriented metrics (FP & LOC), Metrics for Project and Software Quality		
Unit V	**Project Planning**	**08 Hours**
Project initiation, Planning Scope Management, Creating the Work Breakdown Structure, Effort estimation and scheduling: Importance of Project Schedules, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule using Gantt Charts, Adding Milestones to Gantt Charts, Using Tracking Gantt Charts to Compare Planned and Actual Dates, Critical Path Method, Program Evaluation and Review Technique (PERT) with examples. Planning Cost Management, Estimating Costs, Types of Cost Estimates, Cost Estimation Tools and Techniques, Typical Problems with IT Cost Estimates.		
Unit VI	**Project Management**	**08 Hours**
Project monitoring and control: tools for project management, Software tools like Microsoft project management or any other open source tools. The Importance of Project Quality Management: Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control (statistical control, six sigma)The Importance of Project Risk Management, Planning Risk Management, Common Sources of Risk in ITProjects. **Software Configuration Management:** The SCM repository, SCM process, Configuration management for WebApps. **Maintenance & Reengineering:** Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering		
Books:		

Text Books:

1. Roger S Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill, Seventh or Eighth Edition.
2. Ian Sommerville, " Software Engineering", Addison and Wesley, ISBN0-13-703515-2
3. Joseph Phillips, IT Project Management –On Track from Start to Finish, Tata McGraw-Hill, ISBN13: 978-0-07106727-0, ISBN-10:0-07-106727-2

Reference Books:

1. Pankaj Jalote, Software Engineering: A Precise Approach, Wiley India, ISBN: 9788126523115.
2.Marchewka, Information Technology Project Management, Wiley India, ISBN: 9788126543946
3.Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, ISBN-13: 978-8120348981

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410913: Mobile Computing

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

Prerequisites: Foundation of Communication and Computer Networks.

Companion Courses: Mobile Computing Laboratory

Course Objectives:

- To understand the fundamentals involved in technologies of Mobile computing.
- To study GSM Architecture and Services.
- To learn about mobile application development.
- To know recent and future trends in mobile computing.

Course Outcomes:

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

CO1: Acquire knowledge of GSM architecture.
CO2: Understand mobility management.
CO3: Understand working of wireless architectures and their applications.
CO4: Understand recent trends and emerging technologies.

Course Contents

Unit I	**Introduction**	**07 Hours**

Introduction – Mobile Computing, Cellular Telephony, Architecture Mobile devices: Device Overview, Input mechanism, Wireless communication, Mobile Device classification, Device Manufacturers Mobile Generations: Devices and Applications for: 1G, 2G, 2.5G, 3G Mobility Management: Handoff, Roaming Management, Roaming Management in mobile computing, Handoff Detection, Strategies for Handoff Detection, Types of Handoff, Channel Assignment.

Unit II	**Mobility Management**	**07 Hours**

Wireless multiple access protocols, Data Services, Unstructured Supplementary Service Data Mobility Management, Data management issues, Mobility Databases, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit III	**Wireless Networking**	**07 Hours**

Wireless Networking, TCP over wireless, Wireless applications, data broad casting, Mobile IP, Wireless Application Protocol (WAP): Architecture, protocol stack, application environment, applications. Introduction of Wireless Markup Language (WML).

Unit IV	**Mobile Services**	**07 Hours**

GSM: Architecture and Protocols - Air Interface, GSM Services, GSM Multiple Access Scheme, GSM Channel Organization, Control (Signaling), Channel Multiframe, Super-frames and Hyper-frames, GSM Call Setup Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber. Call Setup, Mobile Number Portability Mechanisms: Fixed Network Number Portability, Wireless intelligent network approach, service node approach, GPRS, data broadcasting.

Unit V	**Android Application**	**07 Hours**

Understanding Java SE and the Dalvik Virtual Machine, Android application development: Overview of Android, Devices running android, Why Develop for Android, Features of android, Architecture of Android, Libraries, Software development kit. Designing the user interface: Introducing views and view groups, Intents, Adapters Introducing layouts, Validating and Handling Input data.

Unit VI	**Recent and Future Trends**	**07 Hours**

Peer to peer to communication: Accessing Telephony Hardware, Introducing Android Instant Messaging, GTalk Service : Using, binding & Making connection, Managing chat Sessions, Sending and receiving Data messages, Introducing SMS Using sending and Listening SMS Messages Accessing Android Hardware: Audio, Video and Using the camera, Introducing Sensor Manager, Android Telephony, Using Bluetooth, Manage network and Wi-Fi connections.

Books:

Text Books:

1. Yi Bang Lin, “Wireless and Mobile Network Architectures”, Wiley Publications
2. Martyn Mallick, “Mobile and Wireless design essentials”, Wiley Publications.

Reference Books:

1. Johen Schiller, “Mobile communications”, Pearson Publications.
2. Asoke Talukder and Roopa Yavagal”, Mobile Computing Technology, Applications and Service Creation”, Second Edition, ISBN-13: 978-0-07-014457-6, Tata McGraw-Hill.
3. Iti Shah Mishra, “Wireless Communication and Networks 3G and Beyond”, Second Edition, ISBN-13: 978-1-25-906273-5, McGraw Hill Education
4. Theodore S. Rappaport, “Wireless Communications principles and practice”, 2nd edition, Pearson Education, ISBN –978-81-317-3186-4.
5. Ke-Lin Du & M.N. S. Swamy, “Wirless Communication Systems, From RF Subsystems to 4G Enabling Technologies, ISBN: 978-0-521-18736-7, Cambridge University Press,

Savitribai Phule Pune University
Second Year of MCA (2019 Course)
410914: Data Science with R

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

Prerequisites: Basic Mathematics

Companion Courses: Data Science with R Laboratory

Course Objectives:

- To provide strong foundation for data science and application area related to it
- To understand the underlying core concepts and emerging technologies in data science.
- To introduce R as a programming language

Course Outcomes:

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

CO1: Describe flow process for data science problems(Remembering)
CO2: Classify data science problems into standard typology(Comprehension)
CO3: Develop R codes for data science solutions(Application)
CO4: Correlate results to the solution approach followed(Analysis)
CO5: Assess the solution approach(Evaluation)
CO6: Construct use cases to validate approach and identify modifications required(Creating)

Course Contents

Unit I	**Introduction to Data Science**	**08 Hours**

Definition, Big Data and Data Science Hype, why data science, Data Scientist, Data Science Process Overview, Defining goals, Retrieving data, Data preparation, Data exploration, Data modeling, Presentation.

Unit II	**R Programming**	**07 Hours**

Basics of R Programming, Importing Data into R, R Packages, R Control Structure, R data structures, managing data with R, Exploring and understanding data, Exploring the structure of data, Exploring numeric variables, categorical variable, relationship between variables

Unit III	**Predictive Modeling**	**07 Hours**

Introduction to predictive modeling, decision tree, nearest neighbor classifier and naïve Baye's classifier, classification performance evaluation and model selection in R.

Unit IV	**Descriptive Modeling**	**07 Hours**

Introduction to clustering, partitional, hierarchical, and density-based clustering (k-means, agglomerative, and DBSCAN), outlier detection, clustering performance evaluation using R.

Unit V	**Association Rule Mining**	**07 Hours**

Introduction to frequent pattern mining, Understanding association rules, Apriori, FP-Growth, Eclat algorithm, measures for evaluating the association patterns using R

Unit VI	**Data Analysis using Visualization**	**06 Hours**

Basic R Graphics, Graphics and plots in R

Books:

Text Books:

1. G James, D Witten, T Hastie and R Tibshirani, “An Introduction to Statistical Learning with Applications in R”, Springer Texts in Statistics, Springer,2013.
2. P. Tan, M. Steinbach, AKarpatne, and V. Kumar, “Introduction to Data Mining”, 2nd Ed., Pearson Education,2018.

Reference Books:

1. G. Grolemund, H. Wickham, “R for Data Science”, 1st Ed., O’Reilly, 2017

Savitribai Phule Pune University
Second Year of MCA (2019 Course)
410915: Object Oriented Modeling and Design

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

Prerequisites: Software Engineering concepts and Project Management basics.

Course Objectives:

- To understand and apply Object Oriented (OO) concept for designing OO based model / application
- To transform requirement document to Appropriate design
- To understand different architectural designs and to transform them into proper model
- To choose and use modern design tools for project development and implementation.
- To choose and use appropriate test tool for testing web-based/desktop application

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: Design and analyze an application using UML modeling as fundamental tool
CO3: Apply design patterns to understand reusability in OO design
CO4: Decide and apply appropriate modern tool for designing and modeling
CO5: Decide and apply appropriate modern testing tool for testing web-based/desktop application

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, UP, COMET use case based software life cycle, Introduction to UML -Basic building blocks, Reusability, Use case modeling, Use case template
Case study – Transferring requirements into design using advanced tool

Unit II	Static Modeling	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. Adonrnments 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

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, 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		

Books:

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,―Theunifiedmodelinglanguageuserguide‖,Pearson Education, Second edition, 2008, ISBN0-321-24562-8

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410916A ELE - I: Artificial Intelligence

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

Course Objectives:

- To understand the concept of Artificial Intelligence
- To learn various peculiar search strategies for AI
- To acquaint with the fundamentals of mobile robotics
- To develop a mind to solve real world problems unconventionally with optimality

Course Outcomes:

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

CO1: Identify and apply suitable intelligent agents for various AI applications.

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

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

CO4: Apply the suitable algorithms to solve AI problems.

Course Contents

Unit I	**Introduction**	**08 Hours**

Artificial Intelligence: Definition, Introduction, Typical Applications, Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Unit II	**Problem Solving Approach**	**07 Hours**

State Space Search: Depth Bounded DFS, Depth First Iterative Deepening.
Heuristic Search: Heuristic Functions, Best First Search, Hill Climbing, Variable Neighbourhood Descent, Beam Search, Tabu Search.
Optimal Search: A* algorithm, Iterative Deepening A*, Recursive Best First Search, Pruning the CLOSED and OPEN Lists.

Unit III	**Knowledge Representation**	**07 Hours**

General Concepts of Knowledge, Approaches of Knowledge Representation, Predicate Logic to Represent Knowledge, Resolution, Unification algorithm, Knowledge Representation using Rules: Procedural vs. Declarative Knowledge, Logic Programming, forward vs. Backward Reasoning, Matching & Control Knowledge

Unit IV	**Natural Language Processing**	**07 Hours**

Natural Language Processing: Introduction, Stages in natural language Processing, Application of NLP in Machine Translation, Information Retrieval and Big Data Information Retrieval Learning : Supervised, Unsupervised and Reinforcement learning

Unit V	**Neural Networks**	**07Hours**

Neural networks, Artificial Neural Networks (ANNs): Concept, Feed forward and Feedback ANNs, Error Back Propagation, Boltzman Machine.

Unit VI	Learning	06 Hours
Meaning, Rote Learning, learning by taking Advice, Supervised and unsupervised learning, Learning from examples, Explanation-Based learning, Expert Systems & Its Architecture		
Books:		
Text Books: 1. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN :978-1-25-902998-1 2. Elaine Rich, Kevin Knight and Nair, "Artificial Intelligence", TMH,ISBN-978-0-07-008770-5 3. StuartRussellandPeterNorvig,"ArtifcialIntelligence:AModernApproach",Thirdedition,Pearson, 2003, ISBN :10:0136042597 4. Michael Jenkin, Gregory, " Computational Principals of Mobile Robotics", Cambridge University Press, 2010, ISBN :978-0-52-187157-0		
Reference Books: 1. Nilsson Nils J , "Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN:978-1-55-860467-4 2. PatrickHenryWinston,"ArtificialIntelligence",Addison-WesleyPublishingCompany,ISBN:0-201-53377-4		

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410916B ELE - II: Information Security

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

Prerequisites: Data Communication, Computer Network

Course Objectives:

- To offer an understanding of principle concepts, central topics and basic approaches in information security.
- To know the basics of cryptography.
- To acquire knowledge of standard algorithms and protocols employed to provide confidentiality, integrity and authenticity.
- To enhance awareness about Personally Identifiable Information (PII), Information Management, cyber forensics.

Course Outcomes:

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

CO1: Gauge the security protections and limitations provided by today's technology.
CO2: Identify information security and cyber security threats.
CO3: Analyze threats to protect or defend it in cyberspace from cyber-attacks.
CO4: Build appropriate security solutions against cyber-attacks.

Course Contents

Unit I	**Security Basics**	**08 Hours**

Introduction, Elements of Information Security, Security Policy, Techniques, Steps, Categories, operational Model of Network Security, Basic Terminologies in Network Security. Threats and Vulnerability, Difference between Security and Privacy.

Unit II	**Data Encryption Techniques and Standards**	**07 Hours**

Introduction, Encryption Methods: Symmetric, Asymmetric, Cryptography, Substitution Ciphers. Transposition Ciphers, Stenography applications and limitations, Block Ciphers and methods of operations, Feistal Cipher, Data Encryption Standard (DES), Triple DES, DES Design Criteria,Weak Keys in DES Algorithms, Advance Encryption Standard (AES).

Unit III	**Public Key and Management**	**07 Hours**

Public Key Cryptography, RSA Algorithm: Working, Key length, Security, Key Distribution, Deffie-Hellman Key Exchange, Elliptic Curve: Arithmetic, Cryptography, Security, Authentication methods, Message Digest, Kerberos, X.509 Authentication service.
Digital Signatures: Implementation, Algorithms, Standards (DSS), Authentication Protocol.

Unit IV	**Security Requirements**	**07 Hours**

IP Security: Introduction, Architecture, IPV6, IPv4, IPSec protocols, and Operations, AH Protocol, ESP Protocol, ISAKMP Protocol, Oak key determination Protocol, VPN. WEB Security: Introduction, Secure Socket Layer (SSL), SSL Session and Connection, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol. Electronic Mail Security: Introduction, Pretty Good Privacy, MIME, S/MIME, Comparison. Secure Electronic Transaction (SET).

Unit V	**Firewall and Intrusion**	**07Hours**

Introduction, Computer Intrusions. Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control. Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges.

Unit VI	**Confidentiality and Cyber Forensic**	**06 Hours**

Introduction to Personally Identifiable Information (PII), Cyber Stalking, PII impact levels with examples Cyber Stalking, Cybercrime, PII Confidentiality Safeguards, Information Protection Law: Indian Perspective.

Books:

Text Books:

1. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning India,2014, ISBN No.:8131513491
2. Nina Godbole, Sunit Belapure, “Cyber Security”, Wiley India, 2014, ISBN No.: 978-81-345-2179-1

Reference Books:

1. Eoghan Casey, “Digital Evidence and Computer Crime Forensic Science, Computers and the Internet”, ELSEVIER, 2011, ISBN978-0-12-374268-1
2. AtulKahate, “Cryptography and Network Security”, McGraw Hill Publication, 2nd Edition, 2008, ISBN :978-0-07-064823-4
3. William Stallings, “Cryptography and network security principles and practices”, Pearson, 6th Edition, ISBN :978-93-325-1877-3
4. Forouzan, “Cryptography and Network Security (SIE)”, McGraw Hill,ISBN, 007070208X, 9780070702080
5. Dr. Nilakshi Jain-Digital Forensic: The Fascinating World of Digital Evidences-Wiley India-ISBN:9788126565740

Savitribai Phule Pune University
Second Year of MCA (2019 Course)
410916C ELE - III: Animation and Gaming

Teaching Scheme: TH: 03 Hours/Week	TH Credit:3	Examination Scheme: Internal: 30 Marks External: 70 Marks

Prerequisites: Basics of Graphical Display and display systems. Basic Mathematics, Geometry, linear algebra.

Course Objectives:

- To learn the basic concepts of Computer Graphics
- To learn the various algorithms for generating graphical figures.
- To understand the meaning, purpose and tools Animation and Gaming
- To use Graphics, Animation and Gaming Basic knowledge for developing game.

Course Outcomes:

On completion of the course, learner will be able to–
CO1: Explain concept of graphics and its algorithms.
CO2: Describe the basics of types, techniques and principles required to develop animation.
CO3: Describe basics, development platform, and development life cycle of gaming.
CO4: Explain structure of game and core architecture using state controls in Java.

Course Contents

Unit I	Introduction to Computer Graphics	06 Hours

Definition, Application, Pixel and Frame buffer, Raster and Random Scan display
Display Devices-CRT, Color CRT Monitors
Conversion of line- DDA algorithm of line drawing, Circle drawing, **Scan conversion of circle**-Bresenham's line and circle drawing algorithm **Polygon Filling**- Scan line polygon filling algorithm.

Unit II	Animation Basics	06 Hours

Animation – What is Animation, Uses of animation
History of Animation-Thaumatrope, Phenakistoscope, Zoetrope, Flip book/Kineograph, Praxinoscope
Types of Animation-Traditional animation, Stop-motion –a) Puppet Animation b) Clay animation or Claymation, Cut out animation, Silhouette animation, Model Animation, Go Animation, Object Animation, Graphic Animation, Computer Animation-2D and 3D Animation
Basics Principles of animation, Techniques of animation

Unit III	Animation Development	06 Hours

Animator's Drawing Tools, Drawing, Anatomy & Body language
Design-Design, Principles of Design
Character Design-Character bible, Guidelines for character designing, Drapery, Lip Synchronization Thumbnails, Essentials & qualities of good animation characters.

Unit IV	Gaming Basics	06 Hours

Gaming - Game, History of Gaming, Game Theory, Game design, Game design process **Types of games –**Action games**,** Action-Adventure games, Adventure games ,Role- playing games, Sports games, Puzzle games, Racing games, Strategy games, Simulations games, Idle games. **Gaming platforms, Classification of Gaming**		
Unit V	**Game Development**	**06Hours**
Game programming- Languages and architecture. **Game Development -** What is game development? Game development life cycle Introduction Game AI, Introduction game API ,Introduction Game GUI		
Unit VI	**Fundamentals of Java Game Programming**	**06 Hours**
Java as a game platform–The java platform and its legacy- current java game development Basic game structure, rendering, blocks v/s non blocking loops, role of timing, core architecture using state controls, collision detection, actor management.		
Books:		
Reference Books: 1. Introduction to Game Development: Second Edition edited by Steve Rabin 2. Practical Java game programming by Dustin. Clingman, Shawn. Kendall, Syrus Mesdaghi 3. The Complete Animation course by Chris Patmore, By – Barons Educational Series 4. Anatomy of the Artist – Thompson &Thompson 5. Computer Animation : Algorithms and Techniques by Rick Parent 6.Game Design The Complete Guide by Yogindra Vaidya		

Savitribai Phule Pune University
Second year of MCA (2019 Course)
401916D ELE - IV: Internet of Things

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

Prerequisites: Basic Programming and Networking concepts

Course Objectives:

- To understand fundamentals of IoT system including essence, basic design strategy and process modeling.
- To develop comprehensive approach towards building small low cost IoT system.
- To understand fundamentals of security in IoT
- To learn to implement secure infrastructure for IoT
- To learn about the basics of IoT protocols
- To apply the concept of Internet of Things in the real world scenario.

Course Outcomes:

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

CO1: Implement an architectural design for IoT for specified requirement
CO2: Solve the given societal challenge using IoT
CO3: Choose between available technologies and devices for stated IoT challenge
CO4: Analyze various protocols for IoT
CO5: Analyze applications of IoT in real time scenario

Course Contents

Unit I	**Introduction to IoT**	**07 Hours**
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs		
Unit II	**IoT & M2M**	**07 Hours**
Introduction, Machine to Machine, Difference between IoT and M2M, Software define Network, Network Function Virtualization		
Unit III	**Network & Communication aspects**	**07 Hours**
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination		
Unit IV	**Challenges in IoT**	**07 Hours**
Design challenges, Development challenges, Security challenges, Other challenges		
Unit V	**IoT Security**	**07 Hours**
Security Requirements for IoT, Security by Design for IoT, Best Practice for Securing IoT Devices, IoT Security Attacks, IoT Security Challenges, IoT Privacy, IoT Privacy Threats, Privacy-Preserving Solutions for IoT, IoT Ethics.		

Unit VI	Case Studies and Real-World Applications	07 Hours
Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercialbuildingautomation,Smartcities-participatorysensing-DataAnalyticsforIoT–Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.		

Books:

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, ISBN: 0: 0996025510, 13:978-0996025515
2. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012. ISBN :9781439892992
3. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things”, Springer, 2011. ISBN:978-3-642-19156-5

Reference Books:

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010, ISBN:10:0521195330
2. Olivier Hersent, Omar Elloumi and David Boswarthick, “The Internet of Things: Applicationsto the Smart Grid and Building Automation”, Wiley, 2012,9781119958345
3. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012,ISBN:978-1-119-99435-0
4. Barrie Sosinsky, “Cloud Computing Bible”, Wiley-India, 2010.ISBN :978-0-470-90356-8
5. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014, ISBN: 978-1-118-43063-7

Savitribai Phule Pune University, Pune
Second Year of MCA (2019 Course)
410917: Mobile Computing Laboratory

Teaching Scheme: **PR: 04 Hours/Week**	**Credit 02**	**Examination Scheme:** **TW: 50 Marks** **PR: 50 Marks**

Prerequisites:

1. Nebeans7.0 ml Windows
2. Java setup 6.0
3. Jdk 6- nb7.0

Course Objectives:

1. To study the emerging technologies in the context of wireless networks
2. To understand the mobile computing environment.
3. To learn about recent and future technologies use to develop mobile applications.

Course Outcomes:

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

1. To design successful mobile computing applications and services.
2. To use contemporary development environment and languages (e.g., C#, Java,J2SE, WML) to develop mobile applications.
3. To program the typical functionalities of modern smartphones (e.g., light sensor, gyro, accelerometer, cameras, microphones, GPS, barometer).
4. To work effectively as a member of a team to complete a large programming project.

Guidelines for Instructor's Manual

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

Guidelines for Student 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 in brief, algorithm, flowchart, 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 Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at

the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation.

So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our

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. In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned.

Suggested list of Experiments
(Instructor may design based on these)

1	Study of GSM architecture and signaling techniques.
2	Study of WML and J2ME simulators.
3	Design & develop a program for text formatting , character formatting & display data in tabular format using WML programming.
4	Introduction to WML script. Design & develop a program to convert currency in WML script.
5	Design of simple Calculator having +,-,* and / using WML/J2ME.
6	Design of Calendar for any given month and year using WML/J2ME.
7	Design a personal phone book containing the name, phone no., address, e-mail,etc. using WML/J2ME.
8	Write an Android application program that demonstrates the different layouts.
9	Developing an android application using layout to display Date and time.
10	Write an Android application program that demonstrates intent in mobile application development.
11	Study of GlomoSim Simulator.
12	Study of Distributed mobile computing.

Savitribai Phule Pune University
Second Year of MCA (2019 Course)
410918: Object Oriented Modeling and Design Laboratory

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	Term work: 50 Marks

Prerequisites: Problem Solving and Object-Oriented Paradigm, Software Engineering.

Course Objectives:

- Prepare an analysis model of a system using UML 2diagrams.
- Implement an appropriate design pattern to solve a design problem.
- Understand a test-driven development approach for coding.
- Understand Object Oriented Software Development life cycle activities.

Course Outcomes:

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

CO1: Identify classes and collaboration from requirements.
CO2: Analyze and design model to implement.
CO3: Use the test-driven development approach in implementation.
CO4: Experience Object Oriented Software Development life cycle activities.

Guidelines for Instructors Manual

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

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and hand written 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 soft copy.

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 Practical Examination

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

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.
In addition to these, instructor may assign one real life application in the form of a mini project based on the concepts learned. Instructor may also set one assignment or mini project that is suitable to respective branch beyond the scope of syllabus.

Suggested List of Laboratory Assignments

1. Purpose: Understanding the implementation details of relationships among classes
Lab pre work: Prepare a class diagram from the given problem description using UML2.0 notations.
Laboratory work: Implement the class diagram with a suitable object oriented language.

2. Purpose: Implementation of a design model
Lab pre work: Prepare a design model from analysis model in the form of UML 2 class diagram.
Laboratory work: Implement the design model with a suitable object oriented language

3. Purpose: Implementation of a state model from the given description.
Lab pre work: Prepare a state model from the given problem description and draw a state diagram using UML2 notations
Laboratory work: Implement the state model with a suitable object oriented language

4. Purpose: Preparing an interaction model from the given details
Prepare a use case model, sequence model and activity model from the given description using UML 2 notations.

5. Purpose: Implement a Strategy design pattern
Map the participants for the strategy design pattern from a given problem description and implement with a suitable object oriented language

6. Purpose: Implement a State design pattern Map the participants for the state design pattern from a given problem description and implement with a suitable object oriented language
7. Purpose: Understand the concept of Test driven Development Implement a design level class diagram (given as an input) with Test Driven Development approach.
8. Objective: Understand and implement the Concept of a reusable component Implement a reusable component in form of jar file (or in equivalent form for other OO languages). Use this component in separate client implementation by importing the component as jar file(or equivalent form for other OO language).
Reference Books: 1. Software Architecture: Foundations, Theory and Practice by Richard N. Taylor, Nenad Medvidovic, Eric M. Dashofy, Wiley India Pvt. Limited,2010, 2. Software design: from programming to architecture, by Eric J. Braude, J. Wiley,2004. 3. Pattern oriented software architecture: a pattern language for Distributed Computing, by By Fran Buschmann, Kelvin Henney, Douglas C Schmid, Wiley India Pvt. Limitedvolume-4.

Savitribai Phule Pune University, Pune
Second Year of MCA (2019 Course)
410919: Data Science with R Laboratory

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	02	Term Work: 50 Marks Practical: 50 Marks

Prerequisites:

Course Objectives:

- To learn basics of R Language for Data Science

Course Outcomes:

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

CO1: Install R Studio
CO2: Write programs using the basic fundamentals of R programming language
CO3: Implement Modeling techniques using R programming.
CO4: Implement Mining techniques using R programming.
CO5: Implement data analysis using graphs in R

Guidelines for Instructors Manual

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

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **hand written 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 soft copy.**

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 Practical Examination

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

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.

In addition to these, instructor may assign one real life application in the form of a mini project based on the concepts learned. Instructor may also set one assignment or mini project that is suitable to respective branch beyond the scope of syllabus.

Suggested List of Laboratory Assignments

1	Installation and study of R Studio Framework
2	Design and develop at least 10 problem statements which demonstrate the use of data structure, functions, Importing / Exporting Data in R
3	Design and develop at least 5 problem statements which demonstrate the use of Control Structure of R
4	Implement any 2 Predictive Modeling techniques using R programming.
5	Implement any 2 Descriptive Modeling techniques using R programming.
6	Implement any 2 Association Rule Mining techniques using R programming.
7	Implement data analysis using graphs in R (Scatter plot, Line chart, Bar chart, Histogram, Box plot)

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410920: Project Based Learning II

Teaching Scheme:	**Credit**	**Examination Scheme:**
PR: 02 Hours/Week	**01**	**Term Work: 50 Marks**

Preamble: Project-based learning (PBL) is a student-centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem. It is a style of active learning and inquiry-based learning (Reference: Wikipedia).

Course Objectives:

- To emphasize learning activities those are long-term, interdisciplinary and student-centric.
- To inculcate independent learning by problem solving with social context.
- To engages students in rich and authentic learning experiences.
- To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

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

- Project based learning will increase their capacity and learning through shared cognition, team work and group dynamics.
- Learning through PBL approach will promote long-term retention of material and replicable skill
- Students will be able to draw lessons with practical approach and real life applications

Course Execution details

Group Structure:

A group of 4 students can be formed, which would be monitored, guided and mentored by a staff.

Problem Definition:

- The supervisor can frame a problem definition based on the real life application of concerned subjects, detailed study of a system, studying a prototype, etc.
- 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.
- Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.

- A report should be submitted by the group explaining the complete work done.
- Students should submit a detailed report of the fieldwork.

Evaluation:

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

- Idea Inception (5%)
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (50%)(Individual assessment and team assessment)
- Documentation (Gathering requirements, design &modeling, implementation/execution, use of technology and final report, other documents) (25%)
- Demonstration (Presentation, User Interface, Usability etc)(10%)
- Contest Participation/ publication(10%)

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

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410921A AC4 – I: Professional Ethics and Etiquettes

About Course:

Professional ethics is the underlying concept behind the successful accomplishment of any act of a professional towards achieving the individual and societal goals. These goals should ultimately result in morally, legally, ethically and even culturally acceptable good things for all. Engineers being special group of professionals need to be more conscious of their acts since their duties,
rights and responsibilities permeate into the society and the surroundings. To practice professional ethics, understanding of values and concepts are essential.

Course Objectives:

- To create awareness on professional ethics and Human Values.
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards.
- To inculcate knowledge and exposure on Safety and Risk.
- To students to right attitudinal and behavioral aspects

Course Outcome:

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

CO1: Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories

CO2: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO3: Follow Ethics as an engineering professional and adopt good standards & norms of engineering practice.

CO4: Apply ethical principles to resolve situations that arise in their professional lives

Course Contents:

1. **Qualities to enhance Professional ethics**: Honesty, Integrity, Transparency, Accountability, Confidentiality, Objectivity, Respect Obedience to the law and Loyalty. Time Management Goal Setting and Memory Skills

2. **Safety, Responsibilities And Rights:** Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk collegiality, Collective Bargaining, Confidentiality , Conflicts of Interest, Professional Rights, Employee Rights

3. **Professional Etiquette:** Etiquette at Meetings, Public Relations Office(PRO)'s Etiquettes, Technology Etiquette Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette, Dressing Etiquettes : for Interview, offices and social functions, Ethical Values: Importance of Work Ethics

4. **Research Ethics and Codes of Ethics:** Intellectual Property Rights (IPR), Industrial standardization, ethical code and its importance, ethical accountability, law in engineering, engineering as social experimentation.

Books:

Text Books:

1. Professional Ethics and Etiquette, Fergusson Publishing, Third edition, ISBN: 143812641

Reference Books:

1. Career Skills Library Professional Ethics and Etiquette Second Edition Career Skills Library Communication Skills, Dandi Daley Mackall

Savitribai Phule Pune University, Pune
Second year of MCA (2019 Course)
410921B AC4 – II: MOOC-learn New Skill

About Course:

MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills, pursue lifelong interests and deliver quality educational experiences at scale. Whether you are interested in learning for yourself, advancing your career or leveraging online courses to educate your workforce, SWYAM, NPTEL, EDX or similar ones can help.

World's largest SWAYAM MOOCs, a new paradigm of education for anyone, anywhere, anytime, as per your convenience, aimed to provide digital education free of cost and to facilitate hosting of all the interactive courses prepared by the best more than 1000 specially chosen faculty and teachers in the country. SWAYAM MOOCs enhances active learning for improving lifelong learning skills by providing easy access to global resources.

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.

This is done through an indigenous developed IT platform that facilitates hosting of all the courses, taught in classrooms from 9th class till post-graduation to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to the residents in India. More than 1,000 specially chosen faculty and teachers from across the Country have participated in preparing these courses.
The courses hosted on SWAYAM is generally in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology. In order to ensure best quality content are produced and delivered, seven National Coordinators have been appointed: They are NPTEL for engineering and UGC for post-graduation education.

Course Objectives:

- To promote interactive user forums to support community interactions among students, professors, and experts
- To promote learn additional skills anytime and anywhere
- To enhance teaching and learning on campus and online

Course Outcome:

CO1: On completion of the course, learner will acquire additional knowledge and skill.

Guidelines:

- Instructors are requested to promote students to opt for courses with proper mentoring. The departments will take care of providing necessary infrastructural and facilities for the learners.

References:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/
3. https://www.edx.org

Savitribai Phule Pune University
Second year of MCA (2019 Course)
410921C AC4 – III: Foreign Language (Japanese Module 3)

Prerequisite Courses: **Audit Courses AC2-I (310919) and AC3-III (410911)**

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: Possess ability of basic communication.
CO2: Possess the knowledge of Japanese script.
CO3: Get introduced to reading, writing and listening skills for language Japanese.
CO4: Develop interest to pursue professional Japanese Language course

Course Contents

1. Introduction to Kanji Script, Describing one‘s daily routine. To ask what someone does. Expressions of Giving & Receiving.
2. Adjectives (Types of adjectives), Asking impression or an opinion about a thing / person / place that the listener, has experienced, visited, or met, Describing things / person / places with the help of the adjectives.
3. Expressions of Like & Dislikes. Expressing one‘s ability, hobby, Comparison between objects, persons & cities, which resulted from a certain action in the past.

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)