ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi &
Recognized by AICTE New Delhi
NBA – Accredited: B.E. (CSE, ECE, EEE, ME and CIV) & MBA
NAAC – Accredited with A+

MCA – II Year

SCHEME & SYLLABUS

(With effect from 2021-22)

III Semester MCA													
SI.No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	PCC	21MCA301	Computer Networks	MCA	MCA	03	-	-	03	50	50	100	03
2	PCC	21MCA302	Internet of Things (IoT)	MCA	MCA	03	-	-	03	50	50	100	03
3	PCC	21MCA303	Advances in Java	MCA	MCA	03	-	-	03	50	50	100	03
4	PEC	21MC304X	Elective-III	MCA	MCA	03	-	-	03	50	50	100	03
5	PEC	21MC305X	Elective-IV	MCA	MCA	03	-	-	03	50	50	100	03
6	PCC	21MCL306	Computer Networks Lab	MCA	MCA	01	-	02	03	50	50	100	02
7	PCC	21MCL307	IoT Lab with Mini Project	MCA	MCA	01	-	02	03	50	50	100	02
8	PCC	21MCL308	Advances in Java Lab	MCA	MCA	01	-	02	03	50	50	100	02
9	SDC	21MCA309	Add on Course on Entrepreneurship	MCA	MCA	-	02	-	02	50	50	100	01
10	INT	21INT310	Summer Internship - I							50	50	100	03
					Total	**18**	**02**	**06**	**27**	**500**	**500**	**1000**	**25**

Elective III		Elective IV	
21MC304A	Blockchain Technology	21MC305A	Deep Learning
21MC304B	Cloud Computing	21MC305B	Big Data Analytics
21MC304C	Digital Marketing	21MC305C	Programming using C#.NET
21MC304D	Software Testing	21MC305D	Software Project Management
21MC304E	NoSQL	21MC305E	Software Defined Networks

IV Semester MCA													
SI.No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	SDC	21AEC401	MOOC	MCA	Any MOOC topic (Choices are given by the department) with minimum 16 weeks to be completed between I Sem to IV Sem							100	04
2	SDC	21MCS402	Research / Technical Seminar	MCA	MCA	-	-	-	02	100	-	100	1
3	SDC	21MCP403	Project Work	MCA	MCA	-	-	-	02	50	50	100	10
4	INT	21INT404	Industry Internship for 12 weeks			-	-	-	03	50	50	100	10
Total						**00**	**00**	**00**	**07**	**200**	**100**	**400**	**25**

Note: PCC: Professional Core Course; PEC = Professional Elective Course; BSC: Basic Science Course SDC = Skill Development Course; INT =Internship	
Definition of Credit:	One-hour Lecture (L) per week per semester = 1 Credit Two-hour Tutorial (T) per week per semester = 1 Credit Two-hour Practical/Laboratory/Drawing (P) per week per semester = 1 Credit Four hours of Self-study = 1 Credit

PG Credit Distribution

Sl. No.	Course Area	I	II	III	IV	Total
1.	BSC	3	-	-	-	03
2.	PCC	21	19	15	-	55
3.	PEC	-	6	6	-	12
4.	SDC	1	-	1	15	17
5.	INT	-	-	3	10	13
Total		**25**	**25**	**25**	**25**	**100**

SEMESTER –III			
Computer Networks			
Course Code	**21MCA301**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1: To provide an introduction to the OSI and TCP/IP layers.
2 : To gain an understanding of the roles of data link control protocols.
3 : To develop the ability to explain the network layers working principles.
4 : To provide a comprehensive introduction to analyze the transport layer functionalities.
5. To familiarize various network security and applications.
6. To Analyze the basic error detection techniques and reliable transmission.

Module-1	**8Hrs**
Applications, Requirements, Network Architecture, Implementing Network Software, Performance.	
Module-2	**8Hrs**
Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless(802.11/Wi-Fi, Bluetooth(802.15.1), cellphone technologies.	
Module-3	**8Hrs**
Internetworking and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices.	
Module-4	**8Hrs**
End-to-End Protocols and Congestion Control Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms.	
Module-5	**8Hrs**
Network Security and Applications Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services.	

Course Outcomes:

At the end of the course the student will be able to:

21MCA301.1	Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, through put of the networks for the given problem.
21MCA301.2	Apply different techniques to ensure the reliable and secured communication in wired and wireless communication
21MCA301.3	Analyze the networking concepts of TCP/IP for wired and wireless components
21MCA301.4	Identify the issues of Transport layer to analyze the congestion control mechanism
21MCA301.5	Design network topology with different protocols and analyze the performance
21MCA301.6	Analyze the basic error detection techniques and reliable transmission.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Computer Networks A Systems Approach (1, 2 ,3.1,3.2,3.3, 3.4,4.1, 5.1,5.2,6.2,6.36.4, 8.1,8.2,8.5, 9.1,9.3)	Larry L Peterson and Bruce S Davie	Morgan Kaufmann Publishers	5th Edition, 2012.
Reference Books				
1	Computer Networking – A Top-Down Approach Featuring the Internet	James F. Kurose, Keith W. Ross	Pearson Education	Fifth Edition, 2009.
2	Computer and Communication Networks	Nader. F. Mir	Pearson Prentice Hall Publishers	Second Edition, 2010.
3	Computer Networks: An Open Source Approach	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker	McGraw Hill Publisher	2012.
4	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw – Hill	Fourth Edition, 2011.

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/learn/computer-networking
2. https://www.coursera.org/specializations/computer communications

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO13**
21MCA301.1	2									-	-	-	-
21MCA301.2							2			-	-	-	-
21MCA301.3	-					2				-	-		-
21MCA301.4	-	2								-	-	-	-
21MCA301.5	2									-	-		-
21MCA301.6		2											

1: Low 2: Medium 3: High

INTERNET OF THINGS (IoT)			
Course Code	**21MCA302**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1: To realize the fundamentals of internet of things

2. To analyze the IoT architecture and design along with functional/compute stack and data management.

3: To apply IOT architecture for a given problem

4: To analyze the application protocol, transport layer methods for the given business case.

5: To analyze the application of data analytics for IOT for a given business case

6: To analyze the architecture and develop programming using modern tools for the given use case

Module-1	**8Hrs**
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack	
Module-2	**8Hrs**
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	
Module-3	**8Hrs**
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	
Module-4	**8Hrs**
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment 10.	
Module-5	**8Hrs**
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.	

Course Outcomes:

At the end of the course the student will be able to:

21MCA302.1	Realize the fundamentals of internet of things
21MCA302.2	Analyze the IoT architecture and design along with functional/compute stack and data management.

21MCA302.3	Apply IOT architecture for a given problem
21MCA302.4	Analyze the application protocol, transport layer methods for the given business case.
21MCA302.5	Analyze the application of data analytics for IOT for a given business case.
21MCA302.6	Analyze the architecture and develop programming using modern tools for the given use case

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	Pearson Education (Cisco Press Indian Reprint)	1st Edition. 2017
2	Internet of Things	Srinivasa K G	CENGAGE Leaning India	1st Edition 2018
Reference Books				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and ArshdeepBahga,	Orient Blackswan Private Limited	1st Edition, 2015
2	Internet of Things: Architecture and Design Principles	Raj Kamal	Tata McGraw Hill	1st Edition, 2017

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/specializations/iot
2. https://www.coursera.org/specializations/uiuc-iot

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO13**
21MCA302.1	2	-											
21MCA302.2	1												
21MCA302.3	-	2											
21MCA302.4	-	1											
21MCA302.5	-	1											
21MCA302.6			2										

1: Low 2: Medium 3: High

ADVANCES IN JAVA			
Course Code	**21MCA303**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To discuss Servlet and its life cycle.
2. To describe JSP tags and its usage in web application.
3. To create Database connection for the web applications
4. To differentiate packages and interfaces in the web application context.
5. To develop simple web application using JSP or Servlet.
6. To design enterprise applications using Java Beans concepts for the given problem.

Module-1 **8Hrs**

Servlet Structure, Servlet packaging, HTML Building utilities, Lifecycle, Single Thread Model Interface, Handling Client request: Form Data, HTTP Request Headers. Generating Server Response: HTTP Status Codes, HTTP Response Headers, Handling Cookies, Session Tracking.

Module-2 **8Hrs**

Introduction to JSP: Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, Creating Template Text, Invoking Java Code form JSP, Limiting Java Code in JSP, Using JSP Expressions, Comparing Servlets And JSP, Writing Scriptlets for Example: Using Scriplets to make parts of JSP Conditional, Using declarations, Declaration Examples.

Module-3 **8Hrs**

Controlling the structure, Structure of generated Servlets and Java Beans, Controlling the structure of generated Servlets: The JSP Page directive, Import Attribute, Session Attribute, is Elignore attribute, Buffer and Auto flush Attribute, Info Attribute, error Page, and is error Page Attributes, is Thread Safe Attribute, extends Attribute, language Attribute, Including Files and Applets in JSP Pages using Java Beans components in JSP documents. JAR File, Manifest file, Working with Java Beans. Bean Properties: Simple properties, Design pattern events, Creating bound properties, Bean Methods, Beaninfo class, Persistence

Module-4 **8Hrs**

Annotations and JDBC Annotations: Built-in Annotations with examples, Custom Annotation. Talking to Database, Immediate Solutions, Essentials JDBC program, using prepared statement object, and Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions.

Module-5 **8Hrs**

EJB and Server Side Components Models Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the enterprise java bean specification, Components Types. Server Side Component Types: session Beans, MessageDriven Beans, Entity Beans, The Java Persistence Model. Container services: Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB, Models: The Stateless Session Bean, The Stateful Session Bean, the Singleton Session Bean, Message Driven Beans. EJB and Persistence. Persistence Entity Manager Mapping persistence objects, Entity Relationships.

Course Outcomes: At the end of the course the student will be able to:	
21MCA303.1	Apply the concept of Servlet and its life cycle to create web application
21MCA303.2	Apply JSP tags and its services to web application.
21MCA303.3	Create packages and interfaces in the web application context.
21MCA303.4	Build Database connection for the web applications.
21MCA303.5	Develop simple web application using JSP or Servlet.
21MCA303.6	Develop enterprise applications using Java Beans concepts for the given problem.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Core Servlets and Java server pages. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14)	Marty Hall,Larry Brown Core	Sun Microsystems Press Publisher	2nd Edition, 2004.
2	Java 6 Programming Black Book, (Chapter 17,18,19,20,21,22,27,28,29,30)	Kogent Learning Solutions Inc	Dreamtech press	2012
3	Development Enterprise Java Components. (Chapters 1,2,3,4,5,6,7,8,9,10,11)	Andrew LeeRubinger , Bill Burke.	Shroff/O'Reilly	6th Edition, 2010
Reference Books				
1	EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans	Michel Sikora	PACKT Publishing	Ist Edition, 2008.
2	The Java Complete Reference, Comprehensive coverage of the Java Language	Herbert Schildt	Tata McGraw Hill	8th Edition, 2011

Web links/Video Lectures/MOOCs/papers

1. https://www.udemy.com/course/jsp-servletfree
2. https://www.coursera.org/projects/introduction-to-java programming-java-fundamental-concepts
3. https://www.coursera.org/learn/cloud-services-java-spring-framework

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 13**
21MCA303.1		2											
21MCA303.2			2										
21MCA303.3		2											
21MCA303.4			2										
21MCA303.5			2										
21MCA303.6				2									

1: Low 2: Medium 3: High

BLOCK CHAIN TECHNOLOGY			
Course Code	**21MC304A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To demonstrate the basics of Block chain concepts using modern tools/technologies.
2. To analyze the role of block chain applications in different domains including cybersecurity.
3. To evaluate the usage of Block chain implementation/features for the given problem.
4. To exemplify the usage of bitcoins and its impact on the economy.
5. To analyze the application of specific block chain architecture for a given problem
6. To demonstrate the working principles of bitcoin

Module-1	**8Hrs**
Introduction to Blockchain, How Blockchain works, Blockchain vsBitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin	
Module-2	**8Hrs**
Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain shared Database, Introduction to crypto currencies, Types, Applications.	
Module-3	**8Hrs**
Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks	
Module-4	**8Hrs**
Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	
Module-5	**8Hrs**
Introduction to Ethereum, Advantages and Disadvantages, Ethereumvs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study	

Course Outcomes:

At the end of the course the student will be able to:

21MC304A.1	Demonstrate the basics of Block chain concepts using modern tools/technologies.
21MC304A.2	Analyze the role of block chain applications in different domains including cyber security.
21MC304A.3	Evaluate the usage of Block chain implementation/features for the given problem
21MC304A.4	Demonstrate the usage of bitcoins and its impact on the economy.
21MC304A.5	Analyze the application of specific block chain architecture for a given problem
21MC304A.6	Demonstrate the working principles of bitcoin

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions.	Arshdeep Bikramaditya Signal, Gautam Dhameja (PriyansuSekharPanda.,	APress	1st Edition 2018
2	Blockchain Applications: A Hands-On Approach	Bahga, Vijay Madisetti	Arshadeep Bahga & Vijay Madisetti	1st Edition 2017
3	Blockchain	Melanie Swan,	OReilly	1st edition, 2015
Reference Books				
1	Bitcoin and Cryptocurrency Technologies	Aravind Narayan. Joseph Bonneau, princton	O'Reilly	4th edition, 2010
2	Bitcoin and Blockchain Basics: A non-technical introduction for beginners	Arthu.T Brooks.	Arthu.T Brooks	1st edition 2019

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/specializations/blockchain
2. https://www.coursera.org/specializations/uci-blockchain

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MC304A.1					2								
21MC304A.2													2
21MC304A.3		2											
21MC304A.4	2												
21MC304A.5													1
21MC304A.6	1												

1: Low 2: Medium 3: High

CLOUD COMPUTING			
Course Code	**21MC304B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1: To explain the system & software models and mechanisms that support cloud computing

2: To classify various cloud services and their providers

3: To compare various cloud deployment models

4: To differentiate various types of computing environments

5: To identify enabling technologies of cloud computing.

6. To choose appropriate cloud model for a given application.

Module-1	**8Hrs**
Introduction to Cloud Computing: Eras of computing, The vision of Cloud Computing, Defining a cloud, A closer look, Cloud computing reference model, Historical developments: Distributed systems, Virtualization, Web 2.0; Service oriented computing; Utility oriented computing.	
Module-2	**8Hrs**
Architectures for parallel and distributed computing: Parallel Vs Distributed computing, Elements of distributed computing, Technologies for distributed computing.	
Module-3	**8Hrs**
Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples: Xen: Para virtualization, VmWare: Full virtualization, Microsoft Hyper – V.	
Module-4	**8Hrs**
Cloud computing architecture: Introduction, Cloud reference model: Architecture, IaaS, PaaS, SaaS, Types of Clouds: Public, Private, Hybrid and Community clouds, Economics of the cloud, Open challenges	
Module-5	**8Hrs**
Cloud Tools and Applications: Aneka PaaS; Open stack: Introduction to open stack; Components of open stack; Amazon web services; Google AppEngine; Microsoft Azure; Scientific applications: Healthcare; Biology; Geo-Science, Business and Consumer applications: ARM & ERP; Productivity; Social networking.	

Course Outcomes:

At the end of the course the student will be able to:

21MC304B.1	Explain the system & software models and mechanisms that support cloud computing
21MC304B.2	Classify various cloud services and their providers
21MC304B.3	Compare various cloud deployment models
21MC304B.4	Differentiate various types of computing environments
21MC304B.5	Identify enabling technologies of cloud computing
21MC304B.6	To choose appropriate cloud model for a given application.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Mastering Cloud Computing	Rjkumar Buyya, Christian Vecchiola, and Thamarai Selci,	Tata McGraw Hill, New Delhi, India	Illustrated edition 2013.
Reference Books				
1	Cloud Computing for Dummies	Judith Hurwitz, R.Bloor, M. Kanfman, F.Halper	Wiley India Edition	2nd Edition 2020
2	Cloud Computing: A Practical Approach	Vette, Toby J. Vette, Robert Elsenpeter	Tata McGraw Hill	Ist Edition 2010

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/specializations/cloud-computing
2. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MC304B.1	2												
21MC304B.2		2											
21MC304B.3					2								
21MC304B.4													2
21MC304B.5					2								
21MC304B.6							1						1

1: Low 2: Medium 3: High

DIGITAL MARKETING			
Course Code	**21MC304C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To interpret key concepts related to e-marketing for any given case
2. To identify the importance of conversion and working with digital relationship marketing.
3. To demonstrate the use of electronic media for designing marketing activities
4. To examine the role of the search engine in improving digital marketing
5. To execute social media marketing for a given scenario
6. To test technical solutions to overcome social media threats

Module-1 **8Hrs**

Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.

Module-2 **8Hrs**

Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

Module-3 **8Hrs**

Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics.

Module-4 **8Hrs**

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising.

Module-5 **8Hrs**

Social Media Channels: Introduction, Key terms and concepts, Traditional media vs Social media. Social media channels: Social networking. Content creation, Bookmarking & aggregating and Location & social media. Tracking social media campaigns. Social media marketing: Rules of engagement. Advantages and challenges. Social Media Strategy: Introduction, Key terms and concepts. Using social media to solve business challenges. Step-by-step guide to creating a social media strategy. Documents and processes. Dealing with opportunities and threats. Step-by-step guide for recovering from an online brand attack. Social media risks and challenges.

Course Outcomes: At the end of the course the student will be able to:	
21MC304C.1	Demonstrate the key concepts related to e-marketing for the given case.
21MC304C.2	Comprehend the importance of conversion and working with digital relationship marketing
21MC304C.3	Demonstrate the use of different electronic media for designing marketing activities.
21MC304C.4	Analyze the role of search engine in improving digital marketing
21MC304C.5	Analyze role of social media marketing for the given problem
21MC304C.6	Analyze technical solutions to overcome social media threats

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Digital Marketing	Seema Gupta	Mc-Graw Hill	1st Edition – 2017
Reference Books				
1	The Art of Digital Marketing	Ian Dodson	Wiley Latest Edition	2nd edition, Updated for Python 3,2016
2	Fundamentals of Digital Marketing	Puneet Singh Bhatia	Pearson	21st Edition – 2017
3	Digital Social Media Marketing	Prof. Nitin C. Kamat, Mr.Chinmay	Himalaya Publishing House Pvt. Ltd.	1st Edition 2017

Web links/Video Lectures/MOOCs

1. https://www.digitalmarketer.com/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf
2. https://mailchimp.com/marketing-glossary/digital-marketing/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MC304C.1							2						2
21MC304C.2		2				1							
21MC304C.3		2											2
21MC304C.4													2
21MC304C.5						1							
21MC304C.6				2									

1: Low 2: Medium 3: High

SOFTWARE TESTING			
Course Code	**21MC304D**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To discuss the basic principles of software testing.
2. To recognize the perceptions on testing with related examples.
3. To interpret the various types of testing.
4. To analyze the difference between functional testing and structural testing.
5. To analyze the performance of fault based testing.
6. To evaluate different testing tools.

Module-1 **8Hrs**

Basics of Software Testing, Basic Principles, Test case selection and Adequacy: Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates. Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

Module-2 **8Hrs**

A perspective on Testing

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper

Module-3 **8Hrs**

Boundary value testing, Equivalence class testing, Decision table based testing

Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem.

Module-4 **8Hrs**

Path Testing, Data flow testing, Levels of Testing, Integration Testing

DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.

Module-5 **8Hrs**

Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test

Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Course Outcomes:

At the end of the course the student will be able to:

21MC304D.1	Discuss the basic principles of software testing with related examples.

21MC304D.2	Recognize the perceptions on testing
21MC304D.3	Interpret the various types of testing.
21MC304D.4	Analyze the difference between functional testing and structural testing.
21MC304D.5	Analyze the performance of fault based testing.
21MC304D.6	Evaluate different testing tools.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Foundations of Software Testing – Fundamental Algorithms and Techniques	Adithya P.Mathur	Pearson Education India	2011
2	Software testing and Analysis- Process, Principles and Techniques,	Mauro Pezze, Michael Young	Wiley India	2012
3	Software Testing A Craftsman's Approach,	Paul C Jorgensen	Auerbach publications	3rd edition, 2011.
Reference Books				
1	Software Testing and Quality Assurance	Kshirasagara Naik, Priyadarshi Tripathy:	Wiley India	2012
2	Software Testing- Principles, Techniques and Tools	M.G.Limaye	McGraw Hill	2009

Web links/Video Lectures/MOOCs

1. https://www.udemy.com/course/certified-tester-foundation-level-
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. https://www.coursera.org/courses?query=software%20testing

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MC304D.1	2												
21MC304D.2		2											
21MC304D.3		2											
21MC304D.4				1									1
21MC304D.5		2											
21MC304D.6					2								

1: Low 2: Medium 3: High

NOSQL			
Course Code	**21MC304E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To demonstrate the basic concepts of unstructured data.
2. To contrast and Manage the Data using CRUD operations.
3. To analyze the NoSQL data architecture patterns
4. To develop the applications using NoSQL
5. To realize the concept of Map Reduce and its applicability in the real world application development.
6. To examine the framework of NOSQL

Module-1	**8Hrs**
Introduction to NoSQL Definition of NoSQL, History of NoSQL and Different NoSQL products. Exploring NoSQL Exploring Mongo DB Java/Ruby/Python, Interfacing and Interacting with NoSQL.	
Module-2	**8Hrs**
NoSQL Basics: NoSQL Storage Architecture, CRUD operations with Mongo DB, Querying, Modifying and Managing. Data Storage in NoSQL: NoSQL Data Stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)	
Module-3	**8Hrs**
Advanced NoSQL, NoSQL in Cloud, Parallel Processing with Map Reduce, Big Data with Hive	
Module-4	**8Hrs**
Working with NoSQL, Surveying Database Internals, Migrating from RDBMS to NoSQL, Web Frameworks and NoSQL, using MySQL as a NoSQL.	
Module-5	**8Hrs**
Developing Web Application with NOSQL and NOSQL Administration Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP.	

Course Outcomes:

At the end of the course the student will be able to:

21MC304E.1	Demonstrate the concepts of unstructured data.
21MC304E.2	Analyze and manage Data using CRUD operations
21MC304E.3	Describe the NoSQL data architecture patterns
21MC304E.4	Develop the applications using NoSQL
21MC304E.5	Realize the concept of Map Reduce and its applicability in the real world application development
21MC304E.6	Analyze the framework of NOSQL

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Professional NOSQL	Shashank Tiwari	John Wiley & Sons, Inc.	Ist Edition 2011
Reference Books				
1	The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing	EelcoPlugge, Peter Membreyand Tim Hawkins	APress	Ist Edition 2010

Web links/Video Lectures/MOOCs

1. https://www.guru99.com/nosql-tutorial.html
2. https://www.javatpoint.com/nosql-databases
3. https://www.geeksforgeeks.org/introduction-to-nosql/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MC304E.1		1											
21MC304E.2		2											
21MC304E.3							2						
21MC304E.4			2	2									
21MC304E.5										2			1
21MC304E.6		2											

1: Low 2: Medium 3: High

DEEP LEARNING			
Course Code	**21MC305A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To discuss the basics of deep learning for a given context.
2. To introduce neural network concepts
3. To implement various deep learning models for the given problem
4. To organize high dimensional data using reduction techniques for the given problem
5. To analyze optimization and generalization techniques of deep learning for the given problem.
6. To appraise the given deep learning application and enhance by applying latest techniques for libraries and packages

Module-1	**8Hrs**
Introduction to machine learning- Linear models (SVMs and Perceptron's, logistic regression)- Introduction to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates	
Module-2	**8Hrs**
DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi- supervised Learning	
Module-3	**8Hrs**
DIMENSIONALITY REDUCTION AND NEURAL NETWORKS: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization	
Module-4	**8Hrs**
OPTIMIZATION AND GENERALIZATION Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.	
Module-5	**8Hrs**
CASE STUDY AND APPLICATIONS Imagenet- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions	

Course Outcomes:

At the end of the course the student will be able to:

21MC305A.1	Demonstrate the basics of deep learning for a given context.
21MC305A.2	Demonstrate neural network concepts
21MC305A.3	Implement various deep learning models for the given problem
21MC305A.4	Realign high dimensional data using reduction techniques for the given problem
21MC305A.5	Analyze optimization and generalization techniques of deep learning for the given problem.
21MC305A.6	Evaluate the given deep learning application and enhance by applying latest techniques.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Advanced Data Analysis from an Elementary Point of View	CosmaRohilla Shalizi	Cambridge University Press	2015
Reference Books				
1	Deep Learning: Methods and Applications	Deng & Yu	Now Publishers	2013
2	Deep Learning	Ian Goodfellow,YoshuaBengio, Aaron Courville	MIT Press,	2016.
3	Neural Networks and Deep Learning	Michael Nielsen	Determination Press.	2015

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/learn/introduction-to-deep-learning-boulder
2. https://www.simplilearn.com/tutorials/deep-learning-tutorial/what-is-deep-learning
3. https://www.youtube.com/watch?v=VyWAvY2CF9c

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MC305A.1	2												
21MC305A.2	2												
21MC305A.3				2									
21MC305A.4				2									
21MC305A.5													2
21MC305A.6													2

1: Low 2: Medium 3: High

BIG DATA ANALYTICS			
Course Code	**21MC305B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To identify the business problem for a given context and frame the objectives to solve it through data analytics tools.
2. To demonstrate various technologies for handling large volumes of data.
3. To describe Hadoop ecosystem.
4. To illustrate the architecture of HDFS and explain the functioning of HDFS clusters.
5. To analyze the usage of Map-Reduce techniques for solving big data problems.
6. To analyze and visualize various datasets.

Module-1 **8Hrs**

Big Data and Analytics
Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , Types of Data Sources, Sampling, Types of Data Elements, Data Exploration, Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data Labels, Categorization

Module-2 **8Hrs**

Big Data Technology
Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, Cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics.

Module-3 **8Hrs**

Meet Hadoop
Data, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing, Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response.

Module-4 **8Hrs**

The Hadoop Distributed File system
The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, HadoopFilesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced, Hadoop Archives.

Module-5 **8Hrs**

A Weather Dataset ,Data Format, Analysing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed Map Reduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a Map Reduce Application, The Configuration API, Combining Resources, Variable Expansion, The Map Reduce Web UI

Course Outcomes: At the end of the course the student will be able to:	
21MC305B.1	Identify the business problem for a given context and frame the objectives to solve it through data analytics tools.
21MC305B.2	Demonstrate various technologies for handling large volumes of data.
21MC305B.3	Describe Hadoop ecosystem.

21MC305B.4	Illustrate the architecture of HDFS and explain functioning of HDFS clusters.
21MC305B.5	Analyze the usage of Map-Reduce techniques for solving big data problems.
21MC305B.6	Analyze and visualize various datasets

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications"	Bart Baesens	Wiley	2nd edition, Updated for Python 3,2016
2	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's	Michael Minelli, Michehe Chambers	Wiley CIO Series	1st Edition, 2013
3	Hadoop: The Definitive Guide	Tom White	O'reilly	3rd Edition, 2012.
Reference Books				
1	Professional Hadoop Solutions	Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich,	Wrox A Wiley Brand	2nd edition 2015
2	Understanding Big data	Chris Eaton, Dirk deroos et al.	McGraw Hill,	Ist edition 2012
3	Big Data Analytics with R and Haoop	Vignesh Prajapati	PACKT Publishing	Ist edition, 2013
4	Oracle Big Data Handbook	Tom Plunkett, Brian Macdonald.	Oracle Press	Ist edition, 2013

Web links/Video Lectures/MOOCs

1. https://youtu.be/bY6ZzQmtOzk
2. https://www.coursera.org/learn/foundations-big-data-analysis-sql
3. https://www.coursera.org/specializations/introduction-data-science

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MC305B.1	2												
21MC305B.2					2								
21MC305B.3					2								
21MC305B.4					2								
21MC305B.5				1									
21MC305B.6													2

1: Low 2: Medium 3: High

PROGRAMMING USING C#.NET			
Course Code	**21MC305C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1: To Analyze C# and client-server concepts using .Net FrameWork Components.
2: To implement object oriented concepts using C#.NET
3. To design user interface for web applications using WinForms
4: To apply delegates, event and exception handling to incorporate with WinForm, and ADO.NET.
5: To analyze the use of .Net Components depending on the problem statement.
6: To demonstrate a web application using ASP.NET with Database connectivity and AJAX concepts.

Module-1 **8Hrs**

Getting started with .NET Framework 4.0 and C#, Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ. Introducing C# Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and Un Boxing. Namespaces, The System namespace, .NET Array Types.

Module-2 **8Hrs**

Classes, Objects and Object Oriented Programming: Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Members, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax of a struct and Access Modifiers for structs, System. Object Class Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Module-3 **8Hrs**

Delegates, Events, Exception Handling and ADO.NET Delegates: Creating and using Delegates, Multicasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/throw/finally statement, Custom Exception. System.Exception, Handling Multiple Exception.\ Data Access with ADO.NET :Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET,ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter.

Module-4 **8Hrs**

Graphical User Interface with Windows Forms and WPF Windows Forms : Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus,

Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows. WPF: New WPF Controls, WPF Architecture: Presentation Framework, Presentation Core, WindowsBase, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0 Applications : Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions.
Module-5 **8Hrs**
Web App Development and Data Access using ADO.NET: Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, Grid View Control, DropDownList, Session Tracking, ASP.NET AJAX : Exploring AJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, Script Manager control, Update Panel, Update Progress Control, Creating Simple Application using AJAX Server Controls

Course Outcomes: At the end of the course the student will be able to:	
21MC305C.1	Analyze C# and client-server concepts using .Net FrameWork Components.
21MC305C.2	Implement object oriented concepts using C#.NET
21MC305C.3	Design user interfacss for web applications using WinForms
21MC305C.4	Apply delegates, event and exception handling to incorporate with WinForm, and ADO.NET.
21MC305C.5	To analyze the use of .Net Components depending on the problem statement.
21MC305C.6	To demonstrate a web application using ASP.NET with Database connectivity and AJAX concepts

Sl No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	.NET 4.0 Programming (6-in-1), Black Book,. (Chapters: 1,10,11,12,13,14 and 19).	Kogent Learning Solutions Inc.	Dream Tech Press	2nd edition, Updated for Python 3,2016
2	C# 2010 for Programmers, (Chapters: 14,15,19 and 27.3)	Paul Deitel and Harvey Deitel	Pearson Education.	4th Edition, 2010
Reference Books				
1	Pro C# 5.0 and the .NET 4.5 Framework,	Andrew Trolsen	Apress	6th Edition, 2012
2	C# 4.0 Unleashed,	Bart De Smet	Pearson Education-SAMS Series.	2011
3	Complete Reference C# 4.0	Herbert Schildt	Tata McGraw Hill	2010

Web links/Video Lectures/MOOCs

1. https://www.udemy.com/course/learn-c-sharp-programming-in-ten-easy-steps/
2. https://www.youtube.com/watch?v=aoFDyt8oG0k

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MC305C.1	2												
21MC305C.2	2												
21MC305C.3				2									
21MC305C.4				2									
21MC305C.5										2			
21MC305C.6					2								

1: Low 2: Medium 3: High

SOFTWARE PROJECT MANAGEMENT			
Course Code	**21MC305D**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To demonstrate the practices and methods for successful software project management
2. To identify techniques for requirements, policies and decision making for effective resource management
3. To acquire the knowledge of managing, economics for conventional, modern and future software projects
4. To illustrate the evaluation techniques for estimating cost, benefits, schedule and risk
5. To devise a framework for software project management plan for activities, risk, monitoring and control
6. To design a framework to manage people

Module-1	**8Hrs**
INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT Introduction, Why is Software Project Management important? What is a Project?, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing software projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, What is Management? Management Control, Traditional versus Modern Project Management Practices**.**	
Module-2	**8Hrs**
PROJECT EVALUATION & FINANCE Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programs, Financial Accounting –An overview – Accounting concepts, Principles &Standards, Ledger posting, Trial balance, Profit and Loss account Balance sheet	
Module-3	**8Hrs**
ACTIVITY PLANNING Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward Pass , Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring	
Module-4	**8Hrs**
MONITORING AND CONTROL Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Software Configuration Management	
Module-5	**8Hrs**
MANAGING PEOPLE AND WORKING IN TEAMS Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham – Hackman Job Characteristics Model, Stress –Health and Safety Working In Teams, Becoming a Team, Decision Making, Leadership.	

Course Outcomes:

At the end of the course the student will be able to:

21MC305D.1	Apply the practices and methods for successful software project management

21MC305D.2	Identify techniques for requirements, policies and decision making for effective resource management
21MC305D.3	Acquire the knowledge of managing, economics for conventional, modern and future software projects
21MC305D.4	Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk
21MC305D.5	Devise a framework for software project management plan for activities, risk, monitoring and control
21MC305D.6	Design a framework to manage people

Sl No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall,	Tata McGraw Hill	Fifth Edition, 2011.
2	Accounting for Management	Guido van Rossum and Fred L. Drake Jr	Network Theory Ltd	2011
Reference Books				
1	Information Technology-Project Management	Jack Marchewka,"	Wiley Student Version	4th Edition, 2013.
2	Project Planning, Scheduling & Control	James P Lewis	McGraw Hill	5th Edition, 2011.
3	Software Project Management in Practice,	Pankaj Jalote	Pearson Education	2002.

Web links/Video Lectures/MOOCs

1. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MC305D.1							2						
21MC305D.2		2											
21MC305D.3		1											1
21MC305D.4								2					
21MC305D.5											2		
21MC305D.6								2					

1: Low 2: Medium 3: High

SOFTWARE DEFINED NETWORKS			
Course Code	**21MC305E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To demonstrate the fundamentals and working of software defined networks.
2. To examine the challenges and opportunities associated with adopting SDN
3. To discuss the basics of Software Defined Networks Operations and Data flow
4. To examine the alternative definitions of Software Defined Networks
5. To solve different Software Defined Network Operations in real world problem
6. To analyze the SDN use case in Data centers.

Module-1 **8Hrs**

Introduction to SDN: Understanding the SDN, Understanding the SDN technology, Control Plane, Data Plane, Moving information between planes, separation of the control and data planes, Distributed control planes, Load Balancing, Creating the MPLS Overlay, Centralized control planes.

Module-2 **8Hrs**

Working of SDN

Evaluation of Switches and Control planes, SDN Implications, Data center Needs, Forerunner of SDN, Software Defines Networks is Born, Sustain SDN interoperability, Open source contribution, Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods.

Module-3 **8Hrs**

The Open Flow Specifications Open Flow Overview, Open Flow Basics, Open Flow 1.0 additions, Open Flow 1.1 additions, Open Flow 1.2 additions, Open Flow 1.3 additions, Open Flow limitations

Module-4 **8Hrs**

SDN via APIS, SDN via Hypervisor-Based Overlays, SDN via Opening up the device, Network function virtualization, Alternative Overlap and Ranking.

Module-5 **8Hrs**

Data centers definition, Data centers demand, tunneling technologies for Data centers Path technologies in data centers, Ethernet fabrics in Data centers, SDN use case in Data centers.

Course Outcomes:

At the end of the course the student will be able to:

21MC305E.1	Recognize the fundamentals and characteristics of Software Defined Networks
21MC305E.2	Examine the challenges and opportunities associated with adopting SDN
21MC305E.3	Discriminate different Software Defined Network Operations and Data Flow.
21MC305E.4	Analyze alternative definitions of Software Defined Networks
21MC305E.5	Apply different Software Defined Network Operations in real world problem
21MC305E.6	Analyze the SDN use case in Data centers.

Sl No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Software Defined Networking	Thomas D Nadeau and Ken Gray.	O'Reilly Media, Inc	Ist Edition, 2013
2	Software Define Networks, A Comprehensive Approach	Paul Goransson, Chuck Black.	MK Publications.	2nd Edition, 2013
Reference Books				
1	Software Defined Networking for Dummies brought you by cisco,	Brian Underdahl and Gary Kinghorn.	John Wiley & Sons, Inc	Cisco Special Edition, 2015

Web links/Video Lectures/MOOCs

1. https://www.geeksforgeeks.org/software-defined-networking/
2. https://www.youtube.com/watch?v=l3E-C1j-SJg

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MC305E.1	2												
21MC305E.2		2											
21MC305E.3							2						
21MC305E.4				1									
21MC305E.5													1
21MC305E.6													1

1: Low 2: Medium 3: High

Computer Networks Lab			
Course Code	**21MCL306**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(1-0-2)	SEE Marks	50
Credits	**02**	Exam Hours	03

Course Learning Objectives:

1. To apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem.
2. To apply different techniques to ensure the reliable and secured communication in wired and wireless communication.
3. To analyze the networking concepts of TCP/IP for wired and wireless components.
4. To identify the issues of Transport layer to analyze the congestion control mechanism.
5. To design network topology with different protocols and analyze the performance using a simulator.
6. To identify the practical utilization of Networking standards and protocols.

PART-A

Implement the following Computer Networks concepts using C/C++

1. Write a program for distance vector algorithm to find suitable path for transmission.
2. Using TCP/IP sockets, write a client-server program to make the client send the file name and to make the server send back the contents of the requested file if present.
3. Write a program for Hamming code generation for error detection and correction.
4. Write a program for congestion control using leaky bucket algorithm.

PART-B

(Simulate the following Computer Networks concepts using any network simulators)

1. Simulate a three nodes point to point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds.
3. Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination.
4. Write a TCL Script to simulate working of multicasting routing protocol and analyze the throughput of the network
5. Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network.

Note 1: In the practical exam student has to execute one program from part-A and one from part-B.

Course Outcomes: At the end of the course the student will be able to:	
21MCL306.1	Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem.
21MCL306.2	Apply different techniques to ensure the reliable and secured communication in wired and wireless communication.

21MCL306.3	Analyze the networking concepts of TCP/IP for wired and wireless components.
21MCL306.4	Identify the issues of Transport layer to analyze the congestion control mechanism.
21MCL306.5	Design network topology with different protocols and analyze the performance using a simulator.
21MCL306.6	Identify the practical utilization of Networking standards and protocols.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Computer Networks A Systems Approach (1, 2 ,3.1,3.2,3.3, 3.4,4.1, 5.1,5.2,6.2,6.36.4, 8.1,8.2,8.5, 9.1,9.3)	Larry L Peterson and Bruce S Davie	Morgan Kaufmann Publishers	5th Edition, 2012.
Reference Books				
1	Computer Networking – A Top-Down Approach Featuring the Internet	James F. Kurose, Keith W. Ross	Pearson Education	5th Edition, 2009.
2	Computer and Communication Networks	Nader. F. Mir	Pearson Prentice Hall Publishers	2010.
3	Computer Networks: An Open Source Approach	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker	McGraw Hill Publisher	2011.
4	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw – Hill	4th Edition, 2011.

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/learn/computer-networking
2. https://www.coursera.org/specializations/computer communications

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MCL306.1		2										-	-
21MCL306.2			2									-	-
21MCL306.3			2										-
21MCL306.4		2										-	-
21MCL306.5					2								-
21MCL306.6					2								

1: Low 2: Medium 3: High

IOT LAB WITH MINI PROJECT			
Course Code	**21MCL307**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(1-0-2)	SEE Marks	50
Credits	**02**	Exam Hours	03

Course Learning Objectives:

1: To familiarize the fundamentals of internet of things
2: To demonstrate the IoT architecture design for a given problem
3: To apply IOT techniques for a given problem
4: To analyze the application protocol, transport layer methods for the given business case.
5: To design and develop an application for the given problem for the societal/industrial problems
6: To develop python program by applying suitable feature for the given problem and verify the output

PART-A

1. Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division.Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name 'n' times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line.
   Read a file line by line and print the word count of each line.
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Access an image through a Pi web cam
6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9. Get an alarm from a remote area (through LAN) if smoke is detected.

The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi

PART-B

A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually.
2. The team must submit a brief project report (20-25 pages) that must include the following
a. Introduction b. Requirement Analysis c Software Requirement Specification
d. Analysis and Design, e. Implementation f. Testing
3. Brief synopsis not more than two pages to be submitted by the team as per the format given. It is recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.
4. Rubrics may be used to evaluate the Mini-Project

Each students has to execute one program picked from Part-A during the semester end examination. In SEE Part-A and Part-B shall be given 50% weightage each.

Course Outcomes: At the end of the course the student will be able to:	
21MCL307.1	Familiarize the fundamentals of internet of things
21MCL307.2	Demonstrate the IoT architecture and design for a given problem Demonstrate object oriented principles
21MCL307.3	Apply IOT architecture for a given problem
21MCL307.4	Analyze the application protocol, transport layer methods for the given business case.
21MCL307.5	Design and develop an application for the given problem for the societal/industrial problems
21MCL307.6	Develop python program for the given problem and verify the output

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	Pearson Education (Cisco Press Indian Reprint)	1st Edition, 2017
2	Internet of Things	Srinivasa K G	CENGAGE Leaning India	1st Edition 2018
Reference Books				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and ArshdeepBahga,	Orient Blackswan Private Limited	1st Edition, 2015
2	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill Education	1st Edition, 2017

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/specializations/iot
2. https://www.coursera.org/specializations/uiuc-iot

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MCL307.1					2								
21MCL307.2									2				
21MCL307.3					2								
21MCL307.4											2		
21MCL307.5										2			
21MCL307.6												2	

1: Low 2: Medium 3: High

ADVANCES IN JAVA LAB			
Course Code	**21MCL308**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(1:0:2)	SEE Marks	50
Credits	**02**	Exam Hours	03

Course Learning Objectives:

1. To use Servlet and its life cycle to create web application.
2. To implement JSP tags and its services to web application.
3. To demonstrate Database connection for the web applications
4. To create packages and interfaces in the web application context.
5. To develop a simple Java bean class and define the properties
6. To design enterprise applications using different Java Beans concepts.

1. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).
2. Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).
3. Write a JAVA Servlet Program to implement and demonstrate GET and POST methods (Using HTTP Servlet Class).
4. Write a JAVA Servlet Program using cookies to remember user preferences.
5. Write a JAVA Servlet program to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.
6. Write a JSP Program which uses jsp:include and jsp:forward action to display a Webpage.
7. Write a JSP Program to get student information through a HTML and create a JAVA Bean class, populate Bean and display the same information through another JSP
8. Write a JSP program to implement all the attributes of page directive tag.
9. Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries (For example update, delete, search etc…).
10. An EJB application that demonstrates Session Bean (with appropriate business logic).
11. An EJB application that demonstrates MDB (with appropriate business logic)

Course Outcomes:

At the end of the course the student will be able to:

21MCL308.1	Apply the concept of Servlet and its life cycle to create web application.
21MCL308.2	Apply JSP tags and its services to web application.
21MCL308.3	Create packages and interfaces in the web application context.
21MCL308.4	Build Database connection for the web applications
21MCL308.5	Develop a simple Java bean class and define the properties
21MCL308.6	Develop application programs using Java beans concept.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Servlets and Java server pages. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14)	Marty Hall,Larry Brown Core	Vol 1: Core Technologies.	2nd Edition. 2003
2	Java 6 Programming Black Book, (Chapter 17,18,19,20,21,22,27,28,29,30)	Kogent Solution Inc.	Dreamtech press	2007th Edition
3	Development Enterprise Java Components. (Chapters 1,2,3,4,5,6,7,8,9,10,11)	Andrew LeeRubinger, Bill Burke.	Enterprise JavaBeans 3.1. O'reilly	6th Edition, 2010
Reference Books				
1	EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans	Michel Siklora,	Michel Siklora,	2008
2	The Java Complete Reference, Comprehensive coverage of the Java Language	Herbert Schildt	Tata McGraw Hill Edition	8th Edition, 2011

Web links/Video Lectures/MOOCs

1. https://www.youtube.com/watch?v=vJ-Zn4fo0MQ

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13
21MCL308.1			2		2								
21MCL308.2		2											
21MCL308.3			2										
21MCL308.4			2										
21MCL308.5		2											-
21MCL308.6					2								

1: Low 2: Medium 3: High

Add on Course on Entrepreneurship			
Course Code	**21MCA309**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	50
Credits	**01**	Exam Hours	02

Background:

The guidelines of AICTE's recently published "National INNOVATION and STARTUP Policy 2019 for Students and Faculty," is expected to assist the colleges and educational institutions to actively engage students, faculties and staff in innovation and entrepreneurship-related activities. This will assist Higher Education Institutions (HEI's) to bring uniformity across HEIs in terms of Intellectual Property ownership management, technology licensing and institutional Startup policy, thus enabling the creation of a robust innovation and Startup ecosystem across all HEIs. However, there is a vast difference in how HEI's approach this across the country, which depends on how experienced they are in setting up the support systems including incubators, mentoring, what kind of courses and training are available for students to take etc. According to the Ministry of Human Resource Development (MHRD) statement, "India aspires to become a 5 trillion-dollar economy shortly. To reach this mark, it needs to evolve system and mechanisms to convert the present demographic dividend into high quality technical human resource, capable of doing cutting edge research and innovation, and deep-tech entrepreneurship.

Course Learning Objectives:

1. To discover if they have entrepreneurial ideas and to mature to the point of launching their ideas using the "Lean Launchpad," business model canvas and customer discovery process
2. To mature their entrepreneurial mindset.
3. To pitch their ideas to angel and VC investors
4. To take their ideas to the prototype stage.
5. To recognize the ideation process, entrepreneurship and employment.
6. To appraise any entrepreneurship opportunities

Module-1 **3 Hrs**

Pitch an idea – Identify the problem to be solved

Entrepreneurial journey, entrepreneurial discovery, market research and decision making, selection of best possible path out of all options, evaluation of risk and risk analysis, out of the box strategies

Module-2 **3 Hrs**

Circular Design thinking, understanding how to get effective customer feedback (using Lean Launchpad method)

Ideation and prototyping, testing, validation and commercialization, disruption as a success driver, technological innovation and entrepreneurship-1

Module-3 **3 Hrs**

Iterate using lean start-up

Technological innovation and entrepreneurship-2, raising financial resources, conduction of need analysis and taking appropriate decisions, studying lean startup model by a market survey

Module-4 **3 Hrs**

Create the minimum value product (MVP) and prototype, Create the Business Model Canvas

Education and entrepreneurship, beyond founders and founder-families, India as a start-up nation, national entrepreneurial culture, succeeding with the family business

Module-5	**3 Hours**
Start selling the idea and negotiation exercises Entrepreneurial thermodynamics, understanding the nuances of ideation process, entrepreneurship and employment, converting the idea into a sellable product, start-up case studies	
Books and References: 1. Zero to One: Notes on Startups, or How the Build the Future by Peter Thiel 2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries 3. India as Global Start-up Hub: Mission with Passion by C B Rao 4. Elon Musk: Tesla, SpaceX, and the Quest for a Fantastic Future by Ashlee Vance 5.Steve Jobs by Walter Isaacson 6.Innovation and Entrepreneurship: Practice and Principles by Peter F Drucker 7.The Innovator's Solution: Creating and Sustaining Successful Growth by Clayton M Christensen	

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/learn/open-innovation-entrepreneurship
2. https://www.coursera.org/learn/innovative-entrepreneur
3. https://www.udemy.com/course/innovation-entrepreneurship/
4. https://www.edx.org/professional-certificate/usmx-innovation-and-entrepreneurship
5. https://onlinecourses.nptel.ac.in/noc20_mg35/preview

Course Outcomes: At the end of the course the student will be able to:	
21MCA309.1	Discover if they have entrepreneurial ideas and to mature to the point of launching their ideas using the "Lean Launchpad," business model canvas and customer discovery process
21MCA309.2	Mature their entrepreneurial mindset
21MCA309.3	Pitch their ideas to angel and VC investors
21MCA309.4	Take their ideas to the prototype stage
21MCA309.5	To recognize the ideation process, entrepreneurship and employment.
21MCA309.6	To appraise any entrepreneurship opportunities

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MCA309.1				-	-				3	2		**3**	
21MCA309.2		-		-	-				3	2		3	
21MCA309.3	-	-		-					3	2		3	
21MCA309.4									3	2		3	
21MCA309.5												2	
21MCA309.6												2	

1: Low 2: Medium 3: High

Industry Internship- I			
Course Code	**21INT310**	CIE Marks	50
Teaching Hours/Week (L:T:P)	-	SEE Marks	50
Credits	**3**	Exam Hours	-

Course Learning Objectives:

1. To sketch out different project development needs.
2. To build interpersonal skills to improve the industry- academia culture.
3. To improve self-learning
4. To develop innovative IT applications to meet industrial and societal needs
5. To adapt themselves to changing IT requirements through life-long learning
6. To exhibit leadership skills and advance in their chosen career

Guidelines for Industry Internship:

- A mandatory summer internship of minimum 4 weeks during 2nd and 3rd semester vacation.
- Summer internship shall include inter/ intra Institutional activities
- Internship examination shall be conducted during 3rd semester and the prescribed credit shall be included in the 3rd semester.
- The student shall present the progress of the internship to the panel of members constituted by the Head of the Department (HoD), Internship Coordinator and the Guide.

Course Outcomes:

At the end of the course the student will be able to:

21INT310.1	Sketch out different project development needs.
21INT310.2	Build interpersonal skills to improve the industry- academia culture.
21INT310.3	Exhibit leadership skills and advance in their chosen career
21INT310.4	Analyze the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.
21INT310.5	Develop applications using modern tools and technologies.
21INT310.6	Demonstrate self-learning capabilities with an effective report and detailed presentation.

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21INT310.1		2											
21INT310.2											2		
21INT310.3								2			2		
21INT310.4						2							2
21INT310.5					2								
21INT310.6							2						

1: Low 2: Medium 3: High

SEMESTER –IV			
MOOC			
Course Code	**21AEC401**	Total Marks	100
Teaching Hours/Week (L:T:P)	(0:0:0)		
Credits	**04**	Exam Hours	-

Course Learning Objectives:

1. To provide open access to high quality education content and information
2. To promote self-learning approach
3. To provide an opportunity for choosing courses and content in their area of interest.
4. To develop interdisciplinary learning approaches
5. To recognize the new technologies in their area of interest
6. To formulate the MOOC studies for lifelong learning.

Any MOOC topic (Choices are given by the department) with minimum 16 weeks to be completed between I Semester to IV Semester.

Course Outcomes:

At the end of the course the student will be able to:

21AEC401.1	Get exposure to high quality education content and information
21AEC401.2	Inculcate self-learning approach
21AEC401.3	Choose courses and content in their area of interest
21AEC401.4	Develop interdisciplinary learning approaches
21AEC401.5	Recognize the new technologies in their area of interest
21AEC401.6	Formulate the MOOC studies for life long learning

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21AEC401.1	-	-	-	-	-	2	-	-					-
21AEC401.2	-	-	-	-	-	-	2	-					-
21AEC401.3	-	-	-	-	-	-	2	-					-
21AEC401.4	-	-	-	-	-	-	-	1					-
21AEC401.5	-	-	-	-	-	-		-					1
21AEC401.6							2						

1: Low 2: Medium 3: High

Research / Technical Seminar			
Course Code	**21MCS402**	CIE Marks	100
Teaching Hours/Week (L:T:P)	(0:0:0)	SEE Marks	-
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. To acquire knowledge on advanced technologies
2. To read and understand technical papers
3. To improve effective oral communication
4. Compare the current Technology trends
5. To enhance innovative approaches
6. To improve research aspects

The CIE marks awarded for Research/Technical Seminar shall be based on the evaluation of Seminar Report, Presentation skills and performance in Question and Answer session in the ratio 50:25:25. Seminar presentation and report have to be evaluated using rubrics.

Course Outcomes: At the end of the course the student will be able to:	
21MCS402.1	Analyze relevant topic in computing sciences and make valid conclusions on industry/society/environment using fundamental/ research based knowledge.
21MCS402.2	Demonstrate the basic concepts and ideas presented in technical papers
21MCS402.3	Demonstrate self-learning by making effective presentation and report writing.
21MCS402.4	Differentiate technology trends in the selected area.
21MCS402.5	Apply innovative approaches in articulation of presentation or technical / research document
21MCS402.6	Develop a technical or research article

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
21MCS402.1	-	2	-	-	-	-	-	-					-
21MCS402.2	-	2	-	-	-	-	-	-					-
21MCS402.3	-	-	-	-	-	-	2	-	2				-
21MCS402.4	-	2	-	-	-	-	-	-					-
21MCS402.5	-	-	-	-	-	-		-	2				-
21MCS402.6													2

1: Low 2: Medium 3: High

Project Work			
Course Code	**21MCP403**	CIE Marks	50
Teaching Hours/Week (L:T:P)	-	SEE Marks	50
Credits	**10**	Exam Hours	2

Course Learning Objectives:

1. To Identify different user requirements and perform feasibility analysis.
2. To develop innovative IT applications to meet industrial and societal needs
3. To adapt themselves to changing IT requirements through life-long learning
4. To exhibit leadership skills and advance in their chosen career.
5. To conduct testing of application using appropriate techniques and tools.
6. To formulate the project findings.

Project:

- The candidate should carry out the project in any industry or R&D organization or educational institution under a guide / co-guide.
- This is an individual project to be carried out during 3rd and 4th Semester
- The candidate has to present the work carried out before the examiners during the Semester End examination.
- The work carried out should be free from plagiarism.
- The literature study may be clearly written which may be the summary of existing work and highlight of what are the functionalities that are proposed to the project.
- Student shall indicate the different research papers, documents referred as a part of the literature study.

General Rules

1) Project work may be application/ testing or research oriented and accordingly the project report contents may vary.
2) Students are encouraged and appreciated to show their project code demo along with their power point slide show during their viva-voce exams as an added advantage.

Course Outcomes:

At the end of the course the student will be able to:

21MCP403.1	Identify different user requirements and perform feasibility analysis.
21MCP403.2	Develop innovative IT applications to meet industrial and societal needs
21MCP403.3	Adapt themselves to changing IT requirements through life-long learning
21MCP403.4	Exhibit leadership skills and advance in their chosen career.
21MCP403.5	Conduct testing of application using appropriate techniques and tools.
21MCP403.6	Formulate the project findings.

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21MCP403.1		2											
21MCP403.2			2							2		2	
21MCP403.3							2						
21MCP403.4								2			2		
21MCP403.5										2			
21MCP403.6						2			2				

1: Low 2: Medium 3: High

Industry Internship			
Course Code	**21INT404**	CIE Marks	50
Teaching Hours/Week (L:T:P)	-	SEE Marks	50
Credits	**10**	Exam Hours	3

Course Learning Objectives:

1. To sketch out different project development needs.
2. To build interpersonal skills to improve the industry- academia culture.
3. To improve self-learning
4. To develop innovative IT applications to meet industrial and societal needs
5. To adapt themselves to changing IT requirements through life-long learning
6. To exhibit leadership skills and advance in their chosen career

Guidelines for Industry Internship:

- The students shall undergo internship in the industry for a period of 12 weeks
- The internship shall be carried out in industry / R&D labs or institutions.
- Internship should be presented along with the report by the end of 6 weeks and shall be evaluated by the internal panel for 100 marks.
- The student shall prepare a report and submit the same to the guide allotted by the institute.

The student shall present the progress of the internship to the panel of members constituted by the Head of the Department (HoD), Internship Coordinator and the Guide.

Course Outcomes:

At the end of the course the student will be able to:

21INT404.1	Sketch out different project development needs.
21INT404.2	Build interpersonal skills to improve the industry- academia culture.
21INT404.3	Exhibit leadership skills and advance in their chosen career
21INT404.4	Analyze the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.
21INT404.5	Develop applications using modern tools and technologies.
21INT404.6	Demonstrate self-learning capabilities with an effective report and detailed presentation.

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
21INT404.1		2											
21INT404.2											2		
21INT404.3								2			2		
21INT404.4						2							2
21INT404.5					2								
21INT404.6							2						

1: Low 2: Medium 3: High