Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune

DEPARTMENT OF MASTER OF COMPUTER APPLICATION

Curriculum Structure and Syllabus

of

Second Year Master of Computer Application

(Course 2020)

Effective from Academic Year 2022-23

(Updated with minor changes from 2022-2023)

Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering

Course Approval Summary

Board of Study-**Department of Master of Computer Application**

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS
1.	Software Testing & Quality Assurance	MCA3412	11	
2.	Computer Network	MCA3414	14	
3.	Research Methodology	MCA3415	16	
4.	Professional Elective Course-3 Cloud Computing	MCA3501	18	
5.	Professional Elective Course-3 Advanced Internet Technology	MCA3502	20	
6.	Professional Elective Course-3 Big Data Analytics	MCA3503	22	
7.	Professional Elective Course-3 Business Opportunity Identification	MCA3504	24	
8.	Professional Elective Course-3 Lab Cloud Computing Lab	MCA3505	26	
9.	Professional Elective Course-3 Lab AIT Lab	MCA3506	27	
10	Professional Elective Course-3 Lab Big Data Analytics Lab	MCA3507	29	
11	Professional Elective Course-3 Lab Business Opportunity Identification Lab	MCA3508	30	
12.	Professional Elective Course-4 Data Science with Python-2	MCA3511	31	
13.	Professional Elective Course-4 Business Intelligence Tools & its	MCA3512	33	
14	Professional Elective Course-4 Mobile Application Development	MCA3513	35	
15	Professional Elective Course-4 Start up and New Venture Management	MCA3514	37	
16	Professional Elective Course-4 Lab Data Science using Python Lab	MCA3515	40	

Chairman
BoS, Master of Computer Application
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS
17	Professional Elective Course-4 Lab Business Intelligence Tool Lab	MCA3516	42	
18	Professional Elective Course-4 Lab Mobile Application Development Lab	MCA3517	44	
19	Professional Elective Course-4 Lab Start up and New Venture Management	MCA3518	45	
20	Software Testing & Quality Assurance Lab	MCA3413	46	
21	Seminar	MCA3701	47	
22	Mini Project	MCA3702	49	
23	Professional Elective Course-5 Artificial Intelligence	MCA4501	52	
24	Professional Elective Course-5 Internet Of Things	MCA4502	54	
25	Professional Elective Course-5 Project Management	MCA4503	56	
26	Professional Elective Course-5 Deep Learning	MCA4504	58	
27	Professional Elective Course-5 Block Chain	MCA4505	60	
28	MOOC Course	MCA4995	62	
29	Project	MCA4703	63	

Chairman
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Approved by Academic Council:

Chairman, Academic Council
Pimpri Chinchwad College of Engineering

Approved by Board of Governors:

Chairman, Board of Governors
Pimpri Chinchwad College of Engineering

Institute Vision

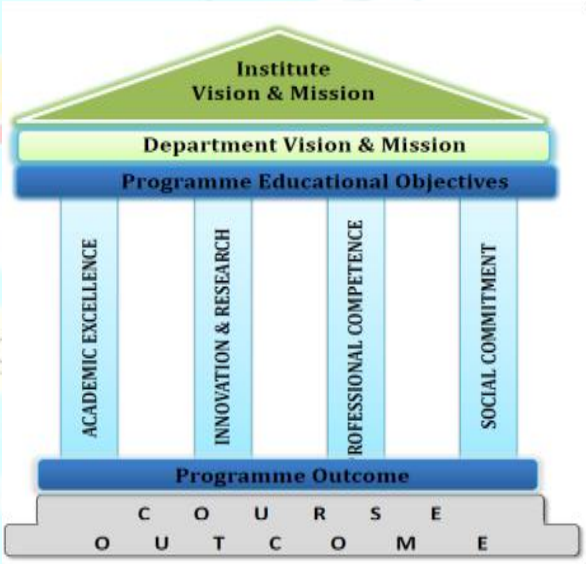
To Serve the Society, Industry and all the Stakeholders through the **Value-Added Quality Education.**

Institute Mission

To serve the needs of society at large by establishing State-of-the-Art Engineering, Management and Research Institute and impart attitude, knowledge and skills with quality education to develop individuals and teams with ability to think and analyze right values and self-reliance.

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



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List of Course Abbreviations:

Abbreviations	Course Full Name
PCC	Professional Core Course
PEC	Professional Elective Course
BSC	Basic Science Course
MGT	Management Course
SEM	Seminar
PROJ	Project
PDT *	Professional Development Course
LS #	Life Skill Course
AC #	Audit Course
MO	MOOC Course

Note:

* - Indicates courses are conducted in 1-2 weeks, after Semester Examination (During Vacation).

- Indicates courses conducted at Institute Level.

CURRICULUM FRAMEWORK

- **The MCA Program is the based on the following type of course:**

SR. NO.	TYPE OF COURSE	ABBREVATION
1.	Professional Core Course	PCC
2.	Basic Science Course	BSC
3.	Management	MGT
4.	Professional Elective Course	PEC
5.	Open Elective Course	OEC
6.	Project / Seminar	PROJ/SEM
7.	MOOC's Course	MOOC
8.	Professional Development Training	PDT
9.	Life Skill	LS
10.	Audit Course	Audit

- **The Course and Credit Distribution is as under**

Sr. No.	Type of Course	Number of Courses	Total Credit	Credit Per (%)
1	Professional Core Course (PCC)	15	36	38.71
2	Basic Science Course (BSC)	2	8	8.6
3	Management Course (MGT)	2	8	8.6
4	Professional Elective Course (PEC)	9	19	20.43
5	Seminar (SEM)	1	3	3.23
6	Project /Mini Project (PROJ)	3	18	19.35
7	MOOC's Course (MOOC)	1	1	1.08
8	Professional Development Training (PDT)	1	-	-
9	Life Skill (LS)	1	-	-
10	Audit Course (Audit)	2	-	-
	Total	**37**	**93**	**100**

Course Distribution: Semester wise

Sr. No.	Type of Course	Number of Courses Per Semester				Total
		I	II	III	IV	
1	Professional Core Course (PCC)	7	4	4	0	**15**
2	Basic Science Course (BSC)	1	1	0	0	**02**
3	Management Course (MGT)	1	1	0	0	**02**
4	Professional Elective Course (PEC)	0	4	4	1	**09**
5	Seminar (SEM)	0	0	1	0	**01**
6	Project /Mini Project (PROJ)	0	1	1	1	**03**
7	MOOC's Course (MO)	0	0	0	1	**01**
8	Professional Development Training (PDT)	0	0	1	0	**01**
9	Life Skill (LS)	1	0	0	0	**01**
10	Audit Course (AC)	1	1	0	0	**02**
	Total	**11**	**12**	**11**	**03**	**37**

Credit Distribution: Semester wise

Sr. No.	Type of Course	Number of Credit Per Semester				Total
		I	II	III	IV	
1	Professional Core Course (PCC)	16	8	12	0	**36**
2	Basic Science Course (BSC)	4	4	0	0	**8**
3	Management Course (MGT)	4	4	0	0	**8**
4	Professional Elective Course (PEC)	0	8	8	3	**19**
5	Seminar (SEM)	0	0	3	0	**3**
6	Project /Mini Project (PROJ)	0	1	1	16	**18**
7	MOOC's Course (MO)	0	0	0	1	**1**
8	Professional Development Training (PDT)	-	-	-	-	**-**
9	Life Skill (LS)	-	-	-	-	**-**
10	Audit Course (AC)	-	-	-	-	**-**
	Total	**24**	**25**	**24**	**20**	**93**

Semester wise Credit, Hours/Week and Marks:

Semester	Credits	Hours/Week	Marks
I	24	30	675
II	25	31	725
III	24	28	700
IV	20	35	550
Total	**93**	**124**	**2650**

STRUCTURE FOR 2ND YEAR MCA (MASTER OF COMPUTER APPLICATION)

SEMESTER-III

MCA Structure		Semester-III	Teaching Scheme					Examination Scheme					
Course Code	**Course Type**	**Course Name**	**L**	**P**	**T/A**	**H**	**CR**	**IE-1**	**IE-2**	**ETE**	**TW**	**OR**	**Total**
MCA3412	PCC	Software Testing & Quality Assurance	3	-	-	3	3	20	30	50	-	-	100
MCA3414	PCC	Computer Network	3	-	1	4	4	20	30	50	-	-	100
MCA3415	PCC	Research Methodology	3	-	1	4	4	20	30	50	-	-	100
MCA3501 TO MCA3504	PEC	Professional Elective Course-3	3	-	-	3	3	20	30	50	-	-	100
MCA3505 TO MCA3508	PEC	Professional Elective Course-4	3	-	-	3	3	20	30	50	-	-	100
MCA3701	SEM	Seminar			3	3	3				100	-	100
MCA3413	PCC	Software Testing & Quality Assurance Lab	-	2	-	2	1	-	-	-	25	-	25
MCA3511 TO MCA3514	PEC	Professional Elective Course-3 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA3515 TO MCA3518	PEC	Professional Elective Course-4 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA3702	PROJ	Mini Project-2	-	2	-	2	1	-	-	-	25	-	**25**
MCA3901	PDT	Professional Development Training	-	2*	-	2*	-	-	-	-	-	-	-
		Total	**15**	**8**	**5**	**28**	**24**	**100**	**150**	**250**	**200**	**0**	**700**

2*: PDT course conducted in 1-2 weeks, after Semester Examination (During Vacation).
Mini Project- Societal / Internship /Sponsored / Start up/ Interdisciplinary / Achievement in recognized Project Competition

Abbreviations: Course Abbreviation;

L- Lecture; **P**- Practical; **T/A**-Tutorial/Activity;
H- Hours; **CR**- Credits; **IE-1** –Internal Evaluation-1;
IE-2 –Internal Evaluation-2; **ETE** – End Term Examination;
TW – Term Work; **OR** – Oral Exam

SEMESTER-IV

MCA Structure		Semester-IV	Teaching Scheme					Examination Scheme					
Course Code	**Course Type**	**Course Name**	**L**	**P**	**T/A**	**H**	**CR**	**IE-1**	**IE-2**	**ETE**	**TW**	**OR**	**Total**
MCA4501 To MCA4505	PEC	Professional Elective Course-5	3	-	-	3	3	20	30	50	-	-	100
MCA4995	MO	MOOCS Course	-	-	-	1	1	-	-	-	50	-	50
MCA4703	PROJ	Project	-	32	-	32	16	-	-	-	200	200	400
Total			**3**	**32**	**0**	**35**	**20**	**20**	**30**	**50**	**250**	**200**	**550**

PROFESSIONAL ELECTIVE COURSES (Semester-III)

Course Code	Professional Elective Course-3	Course Code	Professional Elective Course-4
MCA3501	Cloud Computing	MCA3511	Data Science with Python-2
MCA3502	Advance Internet Technology	MCA3512	Business Intelligence Tools & its Application
MCA3503	Big Data Analytics	MCA3513	Mobile Application Development
MCA3504	Business Opportunity Identification	MCA3514	Start up and New Venture Management
MCA3505	Cloud Computing Lab	MCA3515	Data Science with Python Lab
MCA3506	AIT Lab	MCA3516	Business Intelligence Tools Lab
MCA3507	Big Data Analytics Lab	MCA3517	Mobile Application Development Lab
MCA3508	Business Opportunity Identification Lab	MCA3518	Start up and New Venture Management Lab

PROFESSIONAL ELECTIVE COURSES (Semester-IV)

Course Code	Professional Elective Course-5
MCA4501	Artificial Intelligence
MCA4502	Internet Of Things
MCA4503	Project Management
MCA4504	Deep Learning
MCA4505	Block Chain

SYMCA Syllabus
Content with
Teaching and Evaluation Scheme

SEMESTER III

Program:	MCA (Second Year)			**Semester : III**			
Course :	Software Testing & Quality Assurance			**Code :** MCA3412			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

1. Basic concepts of programming language and database concepts.
2. Basic knowledge of software engineering and project life cycle.

Objectives:

1. To understand the principles of software quality assurance.
2. To learn fundamental concepts in software testing & testing levels.
3. To understand test design techniques based on software functionality & its structure.
4. To understand test planning, monitoring and controlling process.

Outcomes:

After learning the course, the students should be able to

1. Describe different quality factors in software.
2. Explain concept of software testing.
3. Explain different software testing levels.
4. Illustrate the test cases based on the testing levels.
5. Use the testing design techniques for preparing test cases.
6. Illustrate test plan based on the requirements.

Detailed Syllabus

Unit	Description	Duration
1.	**Software Quality Assurance Fundamentals:** 1.1 Definition of Quality, Quality Assurance, Quality Control, 1.2 Difference between QA and QC, 1.3 Software Quality Assurance, SQA Planning & Standards 1.4 Building Blocks of SQA 1.5 Software Quality Metrics: Process Metrics & Product Metrics	**5**
2.	**Overview of Software Testing** 2.1Review of software development models (Waterfall Models, Spiral Model, W Model, V Model)	**4**

	2.2 Basic Definition of Software Testing 2.3 Importance of Software Testing 2.4 Errors, Defects, and Failures 2.5 Testing and Debugging	
3.	**Fundamentals of software testing** 3.1 Software Testing Principles 3.2 Software Testing Life Cycle (STLC) 3.3 Defect life cycle 3.4 Quality Assurance and Testing 3.5 Manual Testing Vs Automation Testing	**5**
4.	**Test Levels & Testing Types** Test Levels 4.1 Component Testing 4.2 Integration Testing 4.3 System Testing 4.4 Acceptance Testing. Testing Types 4.5 Regression Testing 4.6 Performance Testing 4.7 Stress Testing 4.8 User Acceptance Testing 4.9 Load Testing	**6**
5.	**Test Design Technique** Black-box Test Techniques 5.1 Equivalence Partitioning 5.2 Boundary Value Analysis 5.3 Decision Table Testing 5.4 State Transition Testing 5.5 Use Case Testing White-box Test Techniques 5.6 Statement Testing and Coverage 5.7 Decision Testing and Coverage Experience-based Test Techniques 5.8 Error Guessing 5.9 Exploratory Testing & Checklist-based Testing	**8**
6.	Test Management 6.1Test Organization 6.2 Tasks of a Test Manager and Tester 6.3 Test Planning and Estimation 6.4 Purpose and Content of a Test Plan with Test Strategy and Test Approach 6.5Entry Criteria and Exit Criteria 6.6 Test Execution Schedule 6.7 Test plan writing & Test Reports.	**8**
	Total	**36**

Reference Books:

1. Roger S. Pressman, “Software Engineering-A Practitioner’s Approach”, McGraw Hill pub.2010Software Testing in Real World Edward Kit- Pearson Pub
2. Software Testing Techniques by Boris Beizer-DreamTech Pub,2nd Edition
3. Software Testing by Ron Patton, TechMedia Pub.
4. Introducing Software by Testing Louise Tamres
5. Fundamentals of Software Engineering –Rajib Mall, 3rd Edition
6. Allen Gilles “Software quality: Theory and management”, International Thomson, Computer press 1997.
7. Software Testing Principles Techniques and Tools by Milind.G. Limaye- Tata Mcgraw Hill Pub.
8. Stephen H. Kan, “Metrics and models in software quality Engineering”, Addison –Wesley 2003

Program:	MCA (Second Year)			Semester : III			
Course :	Computer Networks			Code : MCA3414			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE1	IE2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Pre-requisite:

1. Fundamentals of Computer

Objectives:

1. To learn and understand fundamentals of computer network, network architectures, protocols and applications.
2. To provide a foundation of architectural concepts of Internet and computer networking
3. To understand the features and operations of computer network protocols.
4. To learn and demonstrate the IP addressing scheme.

Outcomes:

After learning the course, the students should be able to:

1. Describe the different components and inter-relationship of different layers in network layered models and architectures.
2. Understand the application layer services, functions, and protocols.
3. Understand the transport layer services, connection-oriented and connection layers protocols and its functions.
4. Demonstrate the use of IP Addressing Scheme.
5. Understand the link layer services, link layers protocols and error detection/correction techniques.
6. Compare symmetric and asymmetric encryption algorithms.

Detailed Syllabus:

Unit	Description	Duration
1.	**Computer Networks and the Internet** What Is the Internet?, A Services Description, Protocol., The Network Core, A Network of Networks, Protocol Layers and Their Service Models, OSI Layered Architecture, TCP/IP Protocol Suite.	5
2.	**Application Layer** Principles of Network Applications, Network Application Architectures, Application-Layer Protocols, The Web and HTTP, Non-Persistent and Persistent Connections, HTTP Message Format, Electronic Mail in the	7

	Internet, SMTP, Comparison with HTTP, Mail Access Protocols, DNS: Services Provided by DNS, How DNS Works?	
3.	**Transport Layer** Introduction and Transport-Layer Services, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP, UDP Segment Structure, Connection-Oriented Transport: TCP, TCP Segment Structure	**6**
4.	**The Network Layer** Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, The Internet Protocol (IP): Datagram Format, IPv4 Addressing, Numerical Exercises, IPv6: Next Generation IP. Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP.	**8**
5	**The Link Layer: Links, Access Networks, and LANs** Introduction to the Link Layer: The Services Provided by the Link Layer, Error-Detection and-Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), Backward Error Correction: ARQ, Forward Error Correction: Hamming Code, Link Layer Protocol: HDLC and PPP	**6**
6	**Security in Computer Networks** What Is Network Security?, Principles of Cryptography, Symmetric Key Cryptography, Public Key Encryption	**4**
	Total	**36**

Text Books:

1. Computer Networking, A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Pearson Edu., 6th Ed.

Reference Books:

1. Data Communications and Networking, Behrouz A. Forouzan, TMH, 5th Ed.
2. Computer Networks, Andrew S. Tanenbaum, Pearson Edu., 5th Ed.
3. Network Security Essentials – William Stallings, 3rd Edition, Pearson Education, Asia
4. Cryptography and Network Security Atul Kahate, TMH, 2nd Ed.

List of Tutorials / Activities:

1. Study of basic network commands
2. Study of basic network topologies
3. Setup of two or more computers via LAN for sharing resources
4. Demonstration of IP addressing scheme through network configuration
5. Demonstration of Cisco Packet Tracer Simulation Tool with Examples
6. Demonstration of VMware Virtualization Tool

Program:	MCA (Second Year)			Semester :			III
Course :	Research Methodology			Code :			MCA3415
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-		3	20	30	50	100
				Evaluation Scheme			
				TW	PR	OR	Total

Prior Knowledge of:

Analytical skill, Mathematical Skill

Objectives:

1. To understand some basic concepts of research and its methodologies.
2. To carry out literature survey, Select and define appropriate research problem and parameters ·
3. To perform the data collection from various sources, segregate the primary and secondary data.
4. To organize and conduct research in a more appropriate manner.
5. To write a research paper, report and thesis.

Detailed Syllabus

Unit	Description	Duration
1.	**Introduction to Research Methodology:** Research: Definition, why study Research? What is good research? Motivation and objectives, Research methods vs Methodology. Types of research, Significance of Research, Research Process, Criteria of Good Research.	8
2.	**Data collection methods:** **Methods of data collection** of primary data, Observation method, Interview method, Collection of data through questionnaire and schedules, Collection of secondary data, Selection of appropriate method for data collection. Literature – Meaning and importance, Literature searching and information gathering, Identifying gap areas from literature review.	6
3.	**Identification of Research Problem:** Defining the Research problem; problem identification process; Components of the research problem; Concepts of Hypothesis.	6
4.	**Research Writing :** Concept, Types of a research writing, Components of a good research Writing, Types of research papers.	6
5.	**Statistic in Research methodology:** Introduction of statistics, Functions, Measures of central tendency, Arithmetic mean, Median, Mode, Standard	6

	deviation, Co-efficient of variation, Correlation, Regression, Multiple Regression. Sampling distribution.	
6.	**Ethics in Research:** Meaning of Research Ethics, Copyright, Intellectual property rights and patent, Citation and acknowledgement, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.	**4**
	Total	**36**

Text Books/ Reference Books:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age
2. International 4th Edition, 2018.
3. RESEARCH METHODOLOGY: a step-by-step guide for beginners (3rd Ed.) (by RanjitKumar)
4. 3.Business Research Methods by Donald Cooper & Pamela Schindler, TMGH, 9th Edition.
5. Research Methodology Concepts and Cases Deepak Chawla, Neena Sondhi, Vikas Pub. 4
6. Business Research Methods by Sachdeva Himalaya Publication
7. Statistical Methods – S.P.Gupta, Sultan Chand, New Delhi
8. Statistical and Quantative Methods – Mr. Ranjit Chitale

Professional Elective Course - 3

Program:	MCA (Second Year)			**Semester :**			**III**
Course :	**Cloud Computing**			**Code :**			MCA3501
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

Basic of Computer Networks

Objectives:

1. To understand fundamental concepts of Cloud Computing
2. To identify key cloud companies and service providers
3. To know different cloud platforms available.
4. To gain knowledge of cloud services and cloud security

Outcomes:

After learning the course, the students should be able to:

1. Describe the main concepts, key technologies, strengths, and limitations of Cloud Computing and the possible Applications for Cloud Computing.
2. Identify the Architecture and/or Infrastructure of Cloud Computing, including SaaS, PaaS, IaaS, Public Cloud, Private Cloud, Hybrid Cloud, and Community Cloud.
3. Explain the concept of Abstraction and Virtualization in Cloud Computing.
4. Analyze the trade-offs between deploying applications in the Cloud and over the Local Infrastructure.
5. Compare the advantages and disadvantages of various Cloud Computing Platforms.
6. Explain the core issues of Cloud Computing such as Security, Privacy, Identity Management and Access Control.

Detailed Syllabus

Unit	Description	Duration
1.	**Defining Cloud Computing** Defining Cloud Computing, Essential Characteristics of Cloud Computing Cloud Types, The NIST Model, Deployment models, Service Models, Benefits and Limitations of Cloud Computing Comparison of IaaS, Paas, SaaS Cloud Computing vs Cluster Computing vs Grid Computing	**6**
2.	**Understanding Abstraction and Virtualization** Basics of Virtualization Technologies Load Balancing and Virtualization Understanding Hypervisors	**4**

	Virtual Machine Types VMware	
3.	**Infrastructure as a Service** Introduction to Infrastructure as a Service Understanding Amazon Web Services (AWS) Amazon Web Service Components and Services AWS Elastic Compute Cloud (EC2) Amazon Machine Images Pricing Models AWS Storage Systems Amazon Simple Storage System (S3) Amazon Elastic Block Store (EBS) CloudFront AWS Database Services Amazon SimpleDB Amazon Relational Database Service (RDS)	**8**
4.	**Platform as a Service** Introduction to Platform as a Service Google Cloud Platform (GCP) Exploring Google Applications Google App Engine Microsoft Cloud Services (MS Azure) Exploring Microsoft Cloud Services Defining the Microsoft Azure Platform	**8**
5	**Software as a Service** Introduction to Software as a Service (Salesforce) Salesforce.com versus Force.com: SaaS versus PaaS Web Services	**5**
6	**Understanding Cloud Security** Cloud Security Fundamentals Cloud Computing Security Challenges Identity Management and Access Control	**5**
	Total	**36**

Text Books:

Cloud Computing Bible by Barrie Sosinsky, Wiley India

Reference Books:

1. Borko Furht, "Handbook of Cloud Computing", Springer
2. Cloud Computing, A Practical Approach, by Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGrawHill Education.
3. Cloud Security & Privacy by Tim Malhar, S. Kumaraswammy, S. Latif (SPD, O'REILLY)
4. Venkata Josyula, "Cloud computing – Automated virtualized data center", CISCO Press

Program:	MCA (Second Year)			Semester :III			
Course :	Advanced Internet Technology			Code :MCA3502			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	CE	MTE	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

HTML
CSS
JavaScript

Objectives:

1. Understand the use and advantages of Node.js
2. Understand the Node.js architecture
3. Understand how to use Node.js for web development
4. Understand and use MongoDB

Outcomes:

After learning the course, the students should be able to:

1. Understand the usefulness of server-side JavaScript and various concepts related to Node.js
2. Apply Node.js modules
3. Use Node.js package manager
4. Apply Express to build RESTful APIs
5. Perform CRUD operations on MongoDB

Detailed Syllabus

Unit	Description	Duration
2.	**Getting Started with Node JS** Introduction Architecture How Node JS Works? Installing Node JS First Program	**06**
2.	**Node JS Module System** Introduction Global Objects Creating and Loading Modules Module Wrapper Function Built-in Modules Event Emmitter	**06**

3.	**Node JS Package Manager** Introduction Package.json Installing and Using Package Dependencies Versioning Global Package	**06**
4.	**Building RESTful API's Using Express** Introduction to Express RESTful Services Build First Server Nodemon Environment Variables, Route Parameters Handling GET and POST Request Input Validation	**06**
5.	**Asynchronous JavaScript** Synchronous Vs. Asynchronous Callback, Callback Hell Named Function Promises Async and Wait	**06**
6.	**CRUD Operations Using Mongoose** Introduction and Installation of MongoDB Connection to MongoDB Schemas Models Saving and Querying Document Operators	**06**
	Total	**36**

Reference Books:

Beginning Node.js, Apress Publication
Web Development with Node and Express, O'Reilly Publication
Beginning Node.js, Express & MongoDB Development, Greg Lim

Program:	MCA (Second Year)			Semester :			III
Course :	Big Data Analytics			Code :			MCA3503
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

1. Basics of Database Management Systems
2. Data Warehousing and Data Mining Concepts

Objectives:

1. To Understand the Big Data challenges & opportunities, its applications
2. Gain conceptual understanding of NOSQL Database.
3. Understanding of concepts of map and reduce and functional programming
4. Gain conceptual understanding of Hadoop Distributed File System

Outcomes:

After learning the course, the students should be able to:

1. Describe big data fundamentals including concepts, challenges, opportunities and its various applications in used.
2. Explain the impact of big data for business decisions and strategies used
3. Explain conceptually how big data is stored and processed in scale-up and scale-out database architectures
4. Understand Hadoop ecosystem components and their roles.
5. Analyze big data analytics business use cases.
6. Describe NoSQL databases

Detailed Syllabus

Unit	Description	Duration
1.	**"Big Data" in the Enterprise** Big Data Concepts, Opportunities and Challenges from Big Data Enterprise Information Management :New Approach to Enterprise Information Management For Big Data, Capabilities needed for Big data, Big Data Implications for Industries	
2.	**Emerging Database Landscape** Scale-Out Architecture, RDBMS Vs Non-Relational Database Database Workload & its Characteristics Implication Of Big data Scale on Data Processing	**6**
3.	**Application Architectures For Big Data And Analytics** Big Data Warehouse & Analytics Big data Warehouse System requirements & Hybrid Architectures	**5**

	Enterprise Data Platform Ecosystem Big Data and Master Data Management	
4.	**Data Modeling Approaches for Big data and Analytics Solution** Understanding data integration Pattern Big Data Workload Design Approaches Map-Reduce patterns, Algorithms and Use Cases	**4**
5.	**NoSQL** Introduction of NoSQL Database concepts: ACID Vs. BASE, Advantages, Schema, Two Phase Commit, Sharding and Share Nothing Architecture, Brewers CAP Theorem, Features and comparisons of NOSQL Databses: Cassandra, MongoDB, Cloudera, CouchDB, Hbase	**7**
6.	**Hadoop Framework** Hadoop Architecture History of Hadoop – Facebook, Dynamo, Yahoo, Google Components of Hadoop Framework :HDFS, MapReduce Introduction to Pig, Hive, Mahout Other Hadoop Ecosystem Components	**7**
	Total	**36**

Text Books:

1. "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Madhu Jagadeesh, SoumendraMohanty, HarshaSrivatsa, 1st Edition, Apress (2013)

Reference Books:

1. "Big Data Analytics: Turning Big Data into Big Money", Frank J. Ohlhorst, Wiley Publishers (2012)
2. "DB2 11: The Database for BigData & Analytics", CristianMolaro, Surekha Parekh, Terry Purcell, MC Press, 2013

Program:	MCA (Second Year)			Semester : III			
Course :	Business Opportunity Identification			Code : MCA3504			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

Managerial Skill, Entrepreneurship skill

Objectives:

1. To make students understand the nature of entrepreneurship, and transform energy to students to take to acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities
2. To develop the ability of analyzing various aspects of entrepreneurship
3. To develop the ability of understanding business situations and knowledge necessary to plan entrepreneurial activities

Outcomes:

After learning the course, the students should be able to:

1. Describe the fundamentals of Entrepreneurship
2. Identify a basket of potential business opportunities.
3. Analyze a business model for business opportunity
4. Develop the market potential using Market Survey techniques
5. Analyze the decision making of entrepreneur in establishing a business.
6. Describe the product development process with Customer Discovery

Detailed Syllabus

Unit	Description	Duration
1.	**Chapter 1-Entrepreneurship** Concept of Entrepreneur, Types of entrepreneur Entrepreneurship as a career, Entrepreneurship as a style of management Developing entrepreneurial Competencies Concept of Business Incubation Business Incubators, Success and Failure of Start ups	5
2.	**Chapter 2-Introduction Business Opportunity Identification** Concept of Business Opportunity, What is a business idea, How to generate Business Ideas? Business Opportunities Identification Process, Business Value Chain, different sections of the business value chain for potential opportunities	7
3.	**Chapter 3- Business opportunity Identification** Business Opportunities Identification Techniques, Business Opportunities in	6

	India, Different Business Models, Identifying the right Business Model Canvas, Opportunities in different industries / Sectors Opportunities arising out of digitization	
4.	**Chapter 4- Market Survey and Research:** What is a market survey? Process of conducting a market survey, Primary and secondary sources of information, Market survey tools, Preparation of schedule, Techniques of data collection Questionnaire	**6**
5.	**Major Decisions in opportunity selection:** Major motives that influence Business, Project Identification criteria, Making Project plan, Decision process- Understanding the broad industry group, Selection of Specific Project, Final Selection of Project Critical risk contingencies of the proposal	**7**
6.	**Customer Discovery:** Market Intelligence, Market analysis, Customer validation, developing business model, Crafting value proposition, Product Development , Product launch goals, Go-to-Market Strategy, The role of selling in a startup, Social media Promotion tools.	**5**
		36

Reference Books:

1. Entrepreneurship: New Venture Creation – David H. Holt, Pearson Publication

2. Entrepreneurship –Creating and leading an Entrepreneurial organization- Arya Kumar, Pearson Publication

3. Entrepreneurship Development and small business management – Poornima M. Charantimath, Pearson Publication

4. Entrepreneurial Development-Dr. S. S. Khanka- S.Chand Publication

Program:	MCA (Second Year)			Semester : III			
Course :	Cloud Computing Lab			Code : MCA3505			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

Computer Networks

Objectives:

1. To understand fundamental concepts of Cloud Computing
2. To identify key cloud companies and service providers
3. To know different cloud platforms available.
4. To gain knowledge of cloud services and cloud security

Outcomes:

After learning the course, the students should be able to:

1. Describe various computing service models including SaaS, PaaS and IaaS
2. Explain Cloud Virtualization Technology.
3. Identify and explain Cloud Platforms and Applications: AWS, GCP, Azure and Sales Force
4. Explain Cloud Security Fundamentals

Sr. No.	List of Experiments / Tutorials / Activities:	Duration
1.	Demonstration of VMware Virtualization Tool	3
2.	Demonstration of Oracle Virtualization Tool	3
3.	Case Study on Amazon Web Services (AWS) Cloud Platform	6
4.	Case Study on Google Cloud Platform (GCP) G Suite Applications	4
5.	Case Study on Microsoft Azure Applications	4
6.	Case Study on Salesforce Applications Cloud	4
	Total	24

Text Books:

Cloud Computing Bible by Barrie Sosinsky, Wiley India

Reference Books:

1. Borko Furht, "Handbook of Cloud Computing", Springer
2. Cloud Computing, A Practical Approach, by Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGrawHill Education.
3. Cloud Security & Privacy by Tim Malhar, S. Kumaraswammy, S. Latif (SPD, O'REILLY)
4. Venkata Josyula, "Cloud computing – Automated virtualized data center", CISCO Press

Program:	MCA (First Year)			**Semester :III**			
Course :	AIT Lab			**Code :** MCA3506			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

HTML
CSS
Javascript

Objectives:

1. Understand the use and advantages of Node.js
2. Understand the Node.js architecture
3. Understand how to use Node.js for web development
4. Understand and use MongoDB

Outcomes:

After learning the course, the students should be able to:

1. Use advanced JavaScript
2. Apply Node.js modules
3. Use Node.js package manager
4. Apply Express to build RESTful APIs
5. Perform CRUD operations on MongoDB

Detailed Syllabus:

Unit	Description	Duration
3.	**Getting Started with Node JS** Assignments based on Node.js basics	**2**
2.	**Node JS Module System** Assignments based on Node.js modules	**4**
3.	**Node JS Package Manager** Assignments based on Forms	**4**
4.	**Building RESTful API's Using Express** Assignments based on Express and RESTful API	**2**
5.	**Asynchronous JavaScript** Assignments based on Advanced JavaScript	**6**
6.	**CRUD Operations Using Mongoose** Assignments based on CRUD Operations on MongoDB	**6**
	Total	**24**

Reference Books: Beginning Node.js, Apress Publication Web Development with Node and Express, O'Reilly Publication Beginning Node.js, Express & MongoDB Development, Greg Lim
List of Experiments: Demonstrate basics of Node.js Demonstrate the use of Node.js modules Demonstrate the use of Node.js packages, versioning Demonstrate the use of Express Demonstrate the use of RESTful API Demonstrate the use of Mongoose and MongoDB

Program:	MCA (Second Year)			Semester : III			
Course :	Big Data Analytics Lab			Code : MCA3507			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

1. Database Management Systems
2. Data Warehousing and Data Mining

Objectives:

1. To Understand the Big Data challenges & opportunities, its applications
2. Gain conceptual understanding of NOSQL Database.
3. Understanding of concepts of map and reduce and functional programming
4. Gain conceptual understanding of Hadoop Distributed File System

Outcomes:

After learning the course, the students should be able to:

1. Describe Implications of Big Data Analytics for different industry domains and its various applications in used.
2. Compare and contrast Relational (SQL) and Non-Relational Databases (NoSQL)
3. Explain hadoop ecosystem components and their roles.
4. Analyze big data analytics business use cases.

Sr. No.	List of Experiments / Tutorials / Activities:	Duration
1.	Case Study on Implications of Big Data Analytics for Telecom	4
2.	Case Study on Implications of Big Data Analytics for Banking	4
3.	Case Study on Implications of Big Data Analytics for Insurance	4
4.	Case Study on Implications of Big Data Analytics for Retail	4
5	Case Study on Implications of Big Data Analytics for Health Care	4
6	Case Study on Implications of Big Data Analytics for IT/Operations	4
	Total	24

Text Books:

"Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Madhu Jagadeesh, SoumendraMohanty, HarshaSrivatsa, 1st Edition, Apress (2013)

Reference Books:

1. "Big Data Analytics: Turning Big Data into Big Money", Frank J. Ohlhorst, Wiley Publishers (2012)
2. "DB2 11: The Database for BigData & Analytics", CristianMolaro, Surekha Parekh, Terry Purcell, MC Press, 2013

Program:	MCA (Second Year)					Semester : III	
Course :	Business Opportunity Identification Lab					Code : MCA3508	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

Managerial Skill, Entrepreneurship skill

Objectives:

1. To make students understand the nature of entrepreneurship, and transform energy to students to take unexplored career path
2. To acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities
3. To develop the ability of analyzing various aspects of entrepreneurship
4. To develop the ability of understanding business situations and knowledge necessary to plan entrepreneurial activities

Outcomes:

After learning the course, the students should be able to:

1. Identify a basket of potential business opportunities.
2. Analyze a business model for business opportunity
3. Develop the market potential using Market Survey techniques
4. Describe the product development process with Customer Discovery

	Description	Duration
	List of Activities: 1. Activity Based on Business opportunity Identification 2. Activity based on Project plan 3. Activity Based on business model framework 4. Activity Based on Market Survey and Research techniques 5. Activity based on concept of product development process	**24**

Reference Books:

1. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya.
2. Entrepreneurship Development & Small Business Enterprises – Second Edition, Poornima M.Charantimath , Pearson
3. Entrepreneurial Development, S. Chand and Company Limited, S.S. Khanka, .
4. Fundamentals of Entrepreneurship, H. Nandan, PHI.
5. Entrepreneurship – New venture Creation, Holt, PHI.

Professional Elective Course – 4

Program:	MCA (Second Year)			**Semester :** III			
Course :	Data Science with Python-2			**Code :** MCA3511			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of: Python Programming, Basics of Machine Learning.

Objectives:

1. Student should able to learn basic of statics, python data structures, data visualization Techniques to implement machine learning algorithms Regressions.
2. Student should able learn basic of statics, python data structures, data visualization techniques to implement machine learning algorithms Classification.
3. Student should able learn basic of statics, python data structures, and data visualization techniques to implement machine learning algorithms Clustering.
4. Student should able to learn Ensemble Learning Techniques.

Outcomes:

After learning the course, the students should be able to:

1. Describe regression algorithms.
2. Implement Regression Algorithm with data visualization.
3. Describe Classification algorithm
4. Implement different Classification algorithm for data visualization.
5. Implement clustering algorithm for data visualization.
6. Explain Ensemble Learning Techniques.

Detailed Syllabus

Unit	Description	Duration
1.	**Unit-1: Regression** Polynomial Regression, Random Forest Regression Implementation with scikit-learn	**6**
2.	**Unit2:- Support vector Machines (SVM)** Linear Support vector machines Implementation with scikit-learn (Linear Classification) Kernel-based classification	**4**
3.	**Unit3:- Classification** Logistic Regression Decision Tree Classification Random Forest Classification KNN Classification	**10**

4.	**Unit-4: Naive Bayes** Baye's theorem Naive Bayes classifier Naive Bayes in scikit-learn	**5**
5.	**Unit 5: Clustering** K-means Clustering Finding the optimal number of clusters Implementation with scikit-learn Hierarchical clustering Understanding concept of dendrograms	**6**
6.	**Unit-6: Ensemble Learning** Bagging Technique, Boosting Technique, Implementing Regression Model Implementing Decision Tree	**5**
	Total	**36**

Reference Books:

1. Machine learning Algorithms by Giuseppe Bonaccorso
2. Introduction to Machine Learning with Python by Andreas C. Muller & Sarah Guido
3. Hands on Machine learning with scikit-learn, Keras, & Tenserflow by Aurelien Geron
4. Machine Learning- By Tom Mitchell

Program:	MCA (Second Year)				Semester: III		
Course:	Business Intelligence Tools & its Application				Code: MCA3512		
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of: Basic concept of DBMS,SQL Queries , Statistics and Data warehouse

Objectives:

1. Understand the need of BI and BI Life Cycle
2. Learn the few BI Tools for performance measuring and visualization.

Outcomes: After completion of this course, the students would be able to

1. Understand the basic rudiments of business intelligence system.
2. Extract data from multiple files and create data warehouse for analysis
3. Apply basic and advanced calculation on dataset.
4. Plot various advanced charts using BI tools.
5. Apply Geographic Visualizations using Tableau on demographic data set.
6. Build Dashboards and Stories within Tableau.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Business Intelligence** Definitions and tools in Business Intelligence, Need, Features and BI Application in various domains. **BI Components**: Data Warehouse, Business Analysis, Business Performance Management and User Interface.	6
2	**Data Preparation using Tableau:** Introduction to Tableau: Overview of Tableau products- Tableau Desktop, Tableau Prep, Tableau Online, Tableau Server. Introduction to the Data Set and Tableau Interface. **Data Connection with Tableau Desktop** Connecting to Excel, CSV, Text, PDF Files,	6
3	**Calculations in Tableau** Row Level Data Calculations, Aggregate-level Calculations, User Calculations, Creating and editing Table Calculations, Logical Calculations, String Calculations, Number Calculations, Type Conversion, Level of Detail (LOD) expressions, LOD types, **Use Cases and examples**.	6

4	**Data Visualization using Tableau:** Basic Charts: Histograms, Box plot, Pie, Bar, Stacked Bar Chart, Line, Bubble, Bullet, Scatter, Tree, Heat maps, Text table, Highlighted table. **Dual axes graphs:** Pareto, Funnel and Market Basket Analysis.	**6**
5	**Geographic Visualizations in Tableau** Introduction to Geographic Visualizations, manually assigning Geographical Locations. Types of Maps, Spatial Files, Custom Geocoding, Polygon Maps,Web Map Services, Background Images.	**4**
6	**Advanced Visual Analytics: Dashboards and Stories** Introduction to Dashboards, Building a Dashboard, Dashboard Layouts and Formatting, Interactive Dashboards with actions, Story Points. **Use case and application on Super store and HR data set**.	**8**
	Total	**36**

Recommended Books:

1) Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.
2) Pro Tableau: A Step-by-Step Guidebooks by Seema Acharya, Subhashini Chellappan
3) Tableau 10 Bootcamp: Intensive training for data visualization and dashboarding by Joshua N. Milligan, Donabel Santos
4) Learning Tableau 2019 Tools for Business Intelligence, Data Prep, and Visual Analytics, 3rd Edition by Joshua N. Milligan
5) Practical Tableau 100 Tips, Tutorials, and Strategies from a Tableau Zen Master by Ryan Sleeper
6) Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software by Daniel G. Murray

Program:	MCA (Second Year)			Semester :III			
Course :	Mobile Application Development			Code :MCA3513			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	–	--	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

1. Basic Programming Concepts
2. Object Oriented Programming
3. Database Operations

Objectives:

1. To Demonstrate Basic Android Development tools such as Eclipse, DDMS, Drawables, Listeners, and so on.
2. To demonstrate how to create applications using SQLite database.
3. To implement concepts of Android Development.
4. To make the students understand the Android platform's organization, patterns and programming mechanisms and be able to use them effectively to develop their own Android applications.

Outcomes:

After learning the course, the students should be able to:

1. Describe the architecture of the android operating system.
2. Construct user interfaces using android XML layouts for better UI experience.
3. Apply Activities and Intents for navigation in android applications.
4. Apply adapters in android applications as a bridge between an AdapterView and the underlying data for that view.
5. Apply database operations using sqlite for android applications

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Android Application Development** Introduction to Android Android Architecture Features of Android Installation of Android Platform Activity Life Cycle Views and View Groups	**5**
2.	**UI Design, Styles and Themes** Form widgets Text Fields Different Layouts, [dip,dp,sip,sp] versus px styles.xml	**8**

	drawable resources for shapes, gradients(selectors) Style attribute in layout file Applying themes via code and manifest file AlertDialogs & Toast Time and Date Images and media Menus Toast	
3.	**Introduction to Intents and Adapters** What is Intent? Types of Intent. Adapters : ArrayAdapters, BaseAdapters ListView and ListActivity Custom listview GridView using adapters Gallery using adapters Android Session and Session management	**5**
4.	**Data Storage, retrieval and Sharing** File system in android Internal and external storage Saving and loading files File Management tools	**6**
5.	**Introduction to SQLite** Creating SQLite database, Editing Tasks with SQLite Cursors and content values Working with Android database	**6**
6	**Introduction to Fragments and Parsing Data** Introduction to fragments FragmentsLife Cycle Fragments in Activity XML Parsing JSON Parsing	**6**
	Total	**36**

Reference Books:

1. Professional AndroidTM Application Development Wrox Publications, Reto Meier.
2. Hello Android, Introducing Google's Mobile Development Platform, Ed Burnette, Pragmatic Programmers,ISBN: 978-1-93435-617-3.
3. Sams teach yourself Android application development, Lauren Dercy and Shande Conder, Sams publishing.

Program:	MCA (Second Year)			Semester : III			
Course :	Start up and New Venture Management			Code : MCA3514			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

Managerial Skill, Entrepreneurship skill

Objectives:

1. To develop awareness about entrepreneurship and successful entrepreneurs.
2. To develop an entrepreneurial mind-set
3. To develop the ability of analyzing various aspects of entrepreneurship

Outcomes:

After learning the course, the students should be able to:

1. Identify the startup opportunities
2. Discuss Legal and other requirements for new venture
3. Analyze a business plan
4. Apply Business Management techniques
5. Develop Financials of a Project Report
6. Describe the role of Government and various the institutional support system for entrepreneurship

Detailed Syllabus

Unit	Description	Duration
1	**Startup opportunities** Meaning of Startup The Rise of The startup Economy Startup Policy Startup opportunities The Startup Ecosystem -Entrepreneurship in India. Government Initiatives: Start up India, Atmanirbhar Bharat Make in India Assistance to an entrepreneur Industrial Park , Special Economic Zone MSME Act Financial assistance to MSME, Case studies of Start ups	6

2	**Business Organizations and Business Laws:** Sole Proprietorship, Joint Hindu Family Business, Partnership, Limited Liability Partnership (LLP), Corporate Governance, Franchising, Business Laws Intellectual Property Rights (patent, trademark, copyright, new design Act)	4
3.	**Business Plan** Introduction to Business Plan Contents of Business Plan: Cover Page and table of Contents, Executive Summary, Business Concept, Business Strategy, Management Summary, Marketing Plan, Operations Plan, Financial Plan Presenting Business Plan Procedure for setting up an Enterprise Whom to Approach for What? Why Do some business plans fail?	8
4.	**Business Management** Project Manager, Project Life Cycle, Capital Budgeting Generating an Investment Project proposal Project Analysis Market Analysis Technical Analysis Financial Analysis Economic Analysis Project Evaluation and Selection Project Financing	8
5.	**The Financials of a Project Report** A scan of factors prior to preparation of a plan New venture Expansion Strategies and Issues Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits. Sample business Plans and project Reports	6
6.	**Institutions Supporting Business Enterprises** Role of Directorate of Industries, Industrial Development Corporation (IDC), State Financial corporation (SFCs), Khadi and village Industries Commission (KVIC), Industry Associations, Non-Governmental Organizations (NGOs), Business Incubators	4
		36

Reference Books:

1. Entrepreneurship: New Venture Creation – David H. Holt, Pearson Publication

2. Entrepreneurship –Creating and leading an Entrepreneurial organization- Arya Kumar, Pearson Publication

3. Entrepreneurship Development and small business management – Poornima M. Charantimath, Pearson Publication

4. Entrepreneurial Development-Dr. S. S. Khanka- S.Chand Publication

Program:	MCA (Second Year)			**Semester :** III			
Course :	Data Science using Python Lab			**Code :** MCA3515			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

1. Basic of Statistics & Python Programming.
2. Basics of Machine Learning.

Objectives:

1. To understand basics of Regression Algorithm
2. To learn various classification algorithms.
3. To have understanding of clustering algorithm
4. To learn the different Ensemble Learning techniques.

Outcomes:

After learning the course, the students should be able to:

1. Demonstrate the various Regression Algorithm.
2. Demonstrate the different Classification Algorithm.
3. Demonstrate the different Clustering Algorithm.
4. Demonstrate the various Ensemble Learning.

Detailed Syllabus:

Unit	Description	Duration
1.	**Unit-1: Regression** Demonstration of Polynomial Regression, Random Forest Regression Assignment based on above algorithms.	**4**
2.	**Unit-2: Support vector Machines (SVM)** Demonstration of **Support vector Machines.** Assignment based on above algorithms.	**2**
3.	**Unit-3: Classification** Demonstration of Logistic Regression, Decision Tree Classification, Random Forest Classification, KNN Classification Algorithm. Assignment based on above algorithms.	**8**
4.	**Unit-4: Naive Bayes** Demonstration of Naive Bayes algorithm Assignment based on Naive Bayes.	**2**
5.	**Unit-5: Clustering** Demonstration of K-means Clustering, Hierarchical clustering	**4**

	Assignment based on clustering algorithm.	
6.	**Unit-6: Ensemble Learning** Demonstration of Bagging Technique, Boosting Technique, Assignment based on Ensemble Learning	**4**
	Total	**24**

Reference Books:

1. Machine learning Algorithms by Giuseppe Bonaccorso
2. Introduction to Machine Learning with Python by Andreas C. Muller & Sarah Guido
3. Hands on Machine learning with scikit-learn, Keras, & Tenserflow by Aurelien Geron
4. Machine Learning- By Tom Mitchell

List of Experiments:

1. Program based on Regression Algorithm.
2. Program based on Support vector Machine.
3. Program based on Classification Algorithm.
4. Program based on Naive Bayes algorithm.
5. Program based on Clustering Algorithm.
6. Program based on Ensemble Learning.

Program:	MCA (Second Year)				**Semester:** III		
Course:	Business Intelligence Tool Lab				**Code: 3516**		
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	-	-	-	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
-	**2**	**-**	**1**	**25**	**-**	**-**	**25**

Prior Knowledge of: DBMS, Basic Statistics, Data warehouse and Data Mining

Objectives: Identify the prerequisites, objectives, methodology and material for the basic Data Visualization, establish connection with the dataset, perform various operations on the data set

Outcomes:
After learning the course, the students should be able to:
Visual analytics, covering various techniques to perform sorting, filtering and grouping on the dataset.

Detailed Syllabus:

Unit	Description	Duration
1.	**Data Preparation using Tableau** Introduction to Tableau Interface, Installation of tableau and Registration for license, Build a simple data flow, connecting to data from File and Database servers.	3
2.	**Data Analysis:** Number Functions, String Functions, Date Functions, Logical Functions, Aggregate Functions. filtering techniques such as Parameterized filtering, Quick Filter, Context Filter and Grouping.	4
3.	**Reporting:** Joins and Unions, Data Blending Generating Reports by aggregating data, advanced analytical scenarios using Level of Detail expressions. Use Case I - Count Customer by Order Use Case II - Profit per Business Day Use Case III - Comparative Sales	4
4.	**Visualization:** Histograms, Box plot, Pie, Bar, Stacked Bar, Line, Bubble, Scatter, Tree, Heat maps, Whisker's Plots, Gantt Charts, Pareto Charts, Control Charts.	4
5.	**Geographic Visualizations in Tableau:** Create a Map and assign Geographic locations to the fields, demonstrate how to create a Map from a Spatial file, Create a Filled Map, Symbol Map, and a Density Map	3

6.	**Dashboards and Stories:** Demonstrate how to add objects to a Dashboard, Build a simple Dashboard (using Layouts and Formatting features), Create Interactive Dashboards using actions, Build Stories with Dashboards **In-class Project - Domain: Retail Industry / Super Store**	6
	Total	24

Reference Books:

1) Pro Tableau: A Step-by-Step Guidebooks by Seema Acharya, Subhashini Chellappan
2) Tableau 10 Bootcamp: Intensive training for data visualization and dashboarding by Joshua N. Milligan, Donabel Santos
3) Learning Tableau 2019 Tools for Business Intelligence, Data Prep, and Visual Analytics, 3rd Edition by Joshua N. Milligan
4) Practical Tableau 100 Tips, Tutorials, and Strategies from a Tableau Zen Master by Ryan Sleeper
5) Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software by Daniel G. Murray

List of Experiments (Assignment):

1) Assignment based on Data connections to file and database server
2) Assignment based on data computation Join, Union, filters, group and set
3) Assignment based on using Level of Detail expressions.
4) Assignment based on basic and advanced Charts
5) Assignment based on Geographic Visualizations
6) Assignment based on interactive dashboard using actions (filter, highlighting, URL

Program:	MCA			Semester :III			
Course :	Mobile Application Development Lab			Code : MCA3517			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

Basic Programming Concepts, Object Oriented Programming , Database Operations

Objectives:

1. To Demonstrate Basic Android Development tools such as Eclipse, DDMS, Drawables, Listeners, and so on.
2. To demonstrate how to create applications using SQLite database.
3. To implement concepts of Android Development.
4. To make the students understand the Android platform's organization, patterns and programming mechanisms and be able to use them effectively to develop their own Android applications.

Outcomes:

After learning the course, the students should be able to:

1. Describe the architecture of the android operating system.
2. Construct user interfaces using android XML layouts for better UI experience.
3. Apply Activities and Intents for navigation in android applications.
4. Apply adapters in android applications as a bridge between an AdapterView and the underlying data for that view.
5. Apply database operations using sqlite for android applications

Detailed Syllabus:

Unit	Description	Duration
1.	Assignment based on Form Widgets 1	4
2.	Assignment based on Form Widgets 2	4
3.	Assignment based on Intents and Adapters	4
4.	Assignment based on File Handling	4
5.	Assignment based on SQLite	4
6.	Assignment based on Fragments	4
	Total	24

Reference Books:

1. Professional Android TM Application Development Wrox Publications, Reto Meier.
2. Hello Android, Introducing Google's Mobile Development Platform, Ed Burnette, Pragmatic Programmers,ISBN: 978-1-93435-617-3.
3. Sams teach yourself Android application development, Lauren Dercy and Shande Conder, Sams publishing.

Program:	MCA (Second Year)			**Semester : III**			
Course :	**Start up and New Venture Management Lab**			**Code : MCA3518**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prior Knowledge of:

Managerial Skill, Entrepreneurship skill

Objectives:

1. To develop awareness about entrepreneurship and successful entrepreneurs.
2. To develop an entrepreneurial mind-set
3. To develop the ability of analyzing various aspects of entrepreneurship

Outcomes:

After learning the course, the students should be able to:

1. Identify the startup opportunities
2. Analyze a business plan
3. Apply Business Management techniques
4. Develop Financials of a Project Report

	Description	**Duration**
	List of Activities: 1. Activity Based on New Business Ventures 2. Activity based on Business Plan Preparation 3. Activity Based on Business Plan Presentation / pitching business ideas 4. Activity Based on Financials of a Project Report 5. Activity based on analysis of Project Reports	**24**

Reference Books:

1. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya.
2. Entrepreneurship Development & Small Business Enterprises – Second Edition, Poornima M.Charantimath , Pearson
3. Entrepreneurial Development, S. Chand and Company Limited, S.S. Khanka, .
4. Fundamentals of Entrepreneurship, H. Nandan, PHI.
5. Entrepreneurship, 6/e, Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.
6. Entrepreneurship – New venture Creation, Holt, PHI.
7. Entrepreneurship- Successfully Launching New Ventures, Barringer, Ireland, Pearson. Entrepreneurship, Roy, Oxford.

Program:	MCA (Second Year)			**Semester : III**			
Course :	Software Testing & Quality Assurance Lab			**Code :** MCA3413			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

3. Basic concepts of programming language and database concepts.
4. Basic knowledge of software engineering and project life cycle.

Objectives:

5. To learn fundamental concepts in software testing & testing levels.
6. To understand test design techniques based on software functionality & its structure.
7. To understand test planning, monitoring and controlling process

Outcomes:

After learning the course, the students should be able to:

1. Illustrate the test cases designing based on the use cases .
2. Use the testing design techniques for a given system under test based on requirements. (Application)
3. Illustrate the software test plan based on the requirements.

List of Experiments / Tutorials / Activities: (Font Type: Times New Roman, Size: 10)

1. Design test cases using Use case Diagrams
2. Design test cases using WBT technique
3. Design test cases using Cyclomatic complexity
4. Design test cases using Equivalence Partitioning
5. Design test cases using Boundary value analysis
6. Design test plan using IEEE format.

Reference Books:

1. Roger S. Pressman, “Software Engineering-A Practitioner’s Approach”, McGraw Hill pub.2010Software Testing in Real World Edward Kit- Pearson Pub
2. Software Testing Techniques by Boris Beizer-DreamTech Pub,2nd Edition
3. Software Testing by Ron Patton, TechMedia Pub.

Program:	MCA (Second Year)			Semester :III			
Course :	Seminar			Code :MCA3701			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Activity	Credit	IE-1	IE-2	ETE	Total
	-	3	3				
				TW	OR	PR	Total
				100			100

Introduction:

Seminar provides an opportunity for a student to discuss and analyses a range of new technology and management, ideas and concepts together. Seminar refers to a course of intense study relating to the improvement of technical and management knowledge of student.

Course Objectives:

To expose the student to new technologies and new trends and to perform the focused study of specific topic.

To explore and enhance the use of various presentation tools and techniques.

Course Outcomes:

On completion of the seminar,

Student will be able to improve skills to read, understand and present topic on technology.

Student will be able to improve communication and writing skills.

Student will be able to write a technical report summarizing state-of-the-art on an identified topic.

Guidelines for Seminar:

- Each student will select a topic in the area of Information Technology and management preferably keeping track with recent trends.
- The topic must be selected in consultation with the Institute guide.
- The student must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc) in relevant area on seminar topic as decided by the guide.
- Each student will make a seminar presentation using audio/visual aids and submit the seminar report.

Recommended format/Contents of review report (20-25 pages) :

- Title page with Title of the Topic, Name of the Student with Exam Seat Number/Roll Number, Name of the Guide, Name of the Department, Institution and University.
- Seminar Approval Sheet/Certificate
- Abstract and Keywords
- Acknowledgement
- Introduction of Seminar Topic
- Motivation, purpose and scope of Topic
- Related work of the Seminar Title
- Detail Study of Seminar Topic
- Discussion (your own reflections and analysis)
- Conclusions
- Bibliography/References in IEEE Format

Program:	MCA (Second Year)			Semester :III			
Course :	Mini Project			Code :MCA3702			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Activity	Credit	IE-1	IE-2	ETE	Total
	-	3	3				
				TW	OR	PR	Total
				25			25

Guidelines for Mini Project1 and Mini Project2

- **About Course :** The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research. The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. This course will also develop investigative, research and report writing skills and will provide an opportunity to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to computing problems.
- **Objectives**
  - To develop practical ability and knowledge about tools/techniques in order to solve the real world problems
  - To expose the students to use software engineering approach to analyze and formulate the real world problem
  - To gain deeper understanding in specific functional areas
  - To inculcate the skills of team work
  - To enhance communication skill
  - To gain the insight of technical writing
- **Course Outcome (Software Development) :**After learning the course, the students will be able to:
  - Formulate the requirements from a given problem
  - Synthesize and employ knowledge from Software Engineering, Project Management, and Technology.
  - Create, design, develop and deploy a solution, according to theSoftware

Development Life Cycle

- Demonstrate the ability to communicate effectively in speech and writing

- **Course Outcome (Research Work) :**After learning the course, the students will be able to:
  - Carry out a substantial research-based project/activity
  - Analyze data and synthesize research findings
  - Comprehend, and explain research articles in their academic discipline
  - Report research findings in written and verbal forms
- **Guidelines**
  - Students are not restricted to software development only. They have the flexibility to Carry-out/perform/opt/achieve either of the following work during the semester:
    - Interdisciplinary Project
    - Application / Software Development
    - Publication (Paper, Chapter, Article etc)
    - Research Proposal/Project/Activity
  - A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the Project Coordinator.
  - Students are expected to develop the software using the technologies of their choice. The student must obtain permission from his/her project guide regarding the project topic and technology.
  - Evaluation of mini-project shall be done for 25 marks. This evaluation shall be based on 3 (three) reviews.
  - Mini Project work may be carried out individually or in groups in case of bigger projects. However, if the project is done in groups, each student must be given responsibility for a distinct module and care should be taken to see the progress of

individual modules is independent of others.

- At the end of the semester, the student shall submit softcopy and hardcopy of the following things to the guide, as applicable
  - Project work report and entire source code (if any) with database (if any)
  - Publication details and necessary documents
  - Research activity details with necessary documents

Semester IV

Program:	MCA (Second Year)			**Semester : IV**			
Course :	Artificial Intelligence			**Code :** MCA4501			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of: concepts of Mathematics, programming and data structure.

Objectives:

1. To learn fundamental concepts in Artificial Intelligence.
2. To learn searching strategies and search techniques used in Artificial Intelligence.
3. To understand the concepts of knowledge representation and reasoning.
4. To become familiar with traditional and expert systems.

Outcomes:

1. Explain AI Building Blocks Presented In Intelligent Agents
2. Use An Appropriate Problem Solving Method.
3. Learn The Concepts For Knowledge Representation.
4. Distinguish Traditional And Expert Systems.

Detailed Syllabus

Unit	Description	Duration
1.	**Unit – 1**: **Introduction** Introduction to Artificial Intelligence Role of AI in daily life applications What is Intelligence and Artificial Intelligence? What is Intelligent Agents and task environment? Architecture and Classification of Agents Limitations of AI	**4**
2.	**Unit – 2: Search Strategies** Solving problems by searching Search- Issues in the Design of Search Programs Un-Informed Search- BFS, DFS	**8**
3.	**Unit – 3: Local Search Techniques (Heuristic Search Techniques)** Hill Climbing Best-First Search A*Algorithm	**8**
4.	**Unit – 4: Adversarial Search Techniques** Alpha beta search algorithm, AO*Algorithm, The Minimax algorithm	**8**

5.	**Unit – 5: Knowledge representation & reasoning** Need Of Knowledge Representation Knowledge Representation And Mapping Schemes Types And Properties Of Good Knowledge Based System Knowledge Representation Issues Agents That Reason Logically First-Order Logic Inference In First-Order Logic Logical Reasoning System	**5**
6.	**Unit – 6: Expert system and applications** Introduction Phases In Building Expert Systems, Expert System Versus Traditional Systems, Rule-Based Expert Systems Application Of Expert Systems, List Of Shells And Tools	**3**
	Total	**36**

Reference Books:

1. Artificial Intelligence – A Modern Approach (3rd Edition) By Stuart Russell & Peter Norvig.
2. Artificial Intelligence for Humans, By Jeff Heaton
3. Artificial Intelligence: The Basics, By Kevin Warwick
4. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, By James V Stone

Program:	MCA (Second Year)			Semester : IV			
Course :	Internet Of Things			Code : MCA4502			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

1. Computer Networks
2. Cloud Computing
3. Python Programming

Objectives:

1. To introduce the concepts of Internet of Things
2. To impart the knowledge on IoT application areas
3. To enable the students learn the effective usage of device connectivity and web connectivity models
4. To illustrate the data Collection, Storage and analyzing methods in Cloud

Outcomes:

After learning the course, the students should be able to:

1. Describe the need and applications of IoT in the computing world.
2. Explain the Architecture, Physical and Logical design of IoT
3. Compare and Constrast IoT Enabling Technologies
4. Analyze the applications of IoT for home, businesses and industries
5. Analyze the basic building blocks of an IoT device
6. Demonstrate IoT applications using Raspberry Pi with Python programming

Detailed Syllabus

Unit	Description	Duration
1.	**Internet of Things:** Introduction Internet of Things Definition Evolution IoT Architectures SOA-based Architecture API-oriented Architecture Reource Management Communication Protocals IoT Applications	7
2.	**Design of IoT:** Physical Design of IoT Things in IoT IoT Protocols Logical Design of IoT IoT Functional Blocks IoT Communication Models	6

	IoT Communiation APIs	
3.	**IoT Enabling Technologies** Wireless Sensor Networks Cloud Computing Big Data Analytics Communication Protocols Embedded Systems	**5**
4.	**Domain Specific IoT** Home Automation: Smart Lighting, Appliances, Intrusion Detection Cities: Smart Parking, Roads, Strcutural Health Monitoring, Emergency Response Environment: Weather Monitoring, Air Pollution, River Flood Detection Agriculture: Smart Irrigation, Green House Control Energy, Retail, Logistics, and other Industry specific applications of IoT	**6**
5.	**IoT Systems – Logical Design using Python** Introduction, Installing Python, Data Types, Data Structures, Control Flow, Functions, Modules, Packages, File Handling, etc Python Packages of Interest for IoT: JSON, XML, HTTPLib, URLib, SMTPLib IoT Physical Devices & Endpoints Basic building blocks of an IoT Device Raspberry Pi Raspberry Pi Interfaces: Serial, SPI, I2C	**5**
6.	**Programming Raspberry Pi with Python** Controlling LED with Raspberry Pi Interfacing an LED and Switch with Raspberry Pi Interfacing a Light Sensor (LDR) with Raspberry Pi IoT Physical Servers & Cloud Offerings Cloud Storage Models & Communication APIs for IoT	**7**
	Total	**36**

Text Books:

1. Internet of Things: A Hands on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2017

Reference Books:

1. Designing the Internet of Things, Adrian McEwen, Hakim Casimally, Wiley and Sons publications, 2014.
2. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill publications, 2016.
3. Internet of Things Principles and Paradigms, Rajkumar Buyya, Amir Vahid Dastjerdi, Elsevier, 2016.

Program:	MCA (Second Year)			**Semester : IV**			
Course :	Project Management			**Code :** MCA4503			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of: concepts of Software Engineering and Software Testing.

Objectives:

1. To understand concepts of software project management.
2. To learn different types of software cost estimation technique.
3. To learn configuration management process.
4. To understand software team management.

Outcomes:

1. Explain concept of software project management.
2. Explain different risk associated with project.
3. Use software estimation technique for a given project based on the requirements.
4. Design review checklist for a given system under test based on requirements.
5. Explain concept of configuration management.
6. Explain concept of software team management.

Detailed Syllabus

Unit	Description	Duration
1.	**Unit – 1**: Project Management Framework Overview of project Management Project Organization Project management life cycle Planning a software project Role of - Project Manager , Team members Client & Users in project management Testing and Debugging	**5**
2.	**Unit – 2: Software Project Estimation** Different methods of estimation COCOMO model Delphi cost estimation Function point analysis. Project Management through Microsoft Project(Ms-Project)・ Introduction Gantt Chart PERT Chart Usage of Microsoft Project for Estimation and Management Software Project Metrics	**10**

	(Size Oriented, Software Measurement, Function Oriented, Project Scheduling, tracking & Progress reporting	
3.	**Unit – 3:** Risk Management Identification of Risks Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Risk Closure	**5**
4.	**Unit – 4:** Software Quality Management & Control Quality Assurance & Standards ✓ SEI Capability Maturity Model ✓ CMM Concept of Software Quality Software Quality Attributes Software Quality Metrics and Indicators Quality assurance & Validation plan (SQA Activities , reviews, walkthroughs, inspection Defect Management	**8**
5.	**Unit – 5:** Configuration Management Configuration management & Maintenance plan Change Management Version and Release Management Configuration Management Tools	**4**
6.	**Unit – 6:** Software Team Management Team Structure & Staff development plan Characteristics of Performance management High performance Directive and collaborative styles Team Communication Group Behavior Managing customer expectations.	**4**
	Total	**36**

Reference Books:

1.Software engineering principles and practice, McGraw-Hill, Waman S. Javadekar
2. Effective software project management,Willy india edition, Robert K. Wysocki
3. Software quality, producing practical, consistent software, Mordechai Ben-Menachem
4. Software project management in practice, Pearson,Pankaj Jalote
5. Software testing and quality assurance , Theory and practice,Willy-India edition, Kshirsagar Naik
6. Software project management, A Concise Study, S. A. Kelakar.
7. Software Engineering, Pressman.

Program:	MCA (Second Year)			Semester: IV			
Course:	Deep Learning			Code: MCA4504			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of: Basic Statistics, linear algebra and data visualization

Objectives:

Exploit the unknown structure in the input distribution to discover good representations, with higher-level learned features defined in terms of lower-level features.

Outcomes: After completion of this course, the students would be able to

1. Understand the concepts of Deep Learning and learn how it differs from machine learning
2. Apply the Support Vector Machine to classify the linear and nonlinear data.
3. Compute the Activation function for Neural Network
4. Apply ANN Back propagation and Gradient Descent Algorithm
5. Demonstrate working of CNN algorithm to classify the numeric dataset/image dataset
6. Custom ensemble approach to solve machine learning problems

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Deep Learning** Overview of Deep Learning, Curse of Dimensionality, Machine Learning vs. Deep Learning, Use cases /applications of Deep Learning, Human Brain vs. Neural Network	6
2	**Support Vector Machine** Hyperplane, Maximum Margin, Optimal Hyperplane, Linear and Non-Linear Classification. Problems based on SVM	6
3	**Artificial Neural Network-I** Introduction to Neural Network- Biological Neuron, working of a Biological Neuron Model of Artificial Neural Network, Input Layers, Hidden (computation) Layers, Output Layer, pros and cons of neural networks. Activation Function - Sigmoid Functions, Hyperbolic Tangent function (Tanh),ReLU Function	6
4	**Artificial Neural Network-II** Building blocks of ANN. Back Propagation in Neural Network, Numerical problems on Back Propagation method. Perceptron Network, Single Layer Perceptron Algorithm, Single Layer Perceptron Use-case	6
5	**Convolution Neural Network** Introduction of CNN, Use of Kernel, Stride, Padding, Pooling, Flatten, and ReLu activation function in CNN, Working and training of Convolution Neural Network, Example of CNN. Features and limitations of CNN.	6

6	**Ensemble Techniques** Bagging and boosting, Numerical problems on Ensemble Techniques	**6**
	Total	36

Recommended Books:

1) Deep Learning by Ian Goodfellow, YoshuaBengio, Aaron Courville
2) Neural Networks and Deep Learning: A Textbook by Charu C. Aggarwal
3) Introduction to Deep Learning by Eugene Charniak
4) Deep Learning: A Practitioner's Approach by Josh Patterson, Adam Gibson

Program:	MCA (Second Year)			**Semester :** IV			
Course :	**Block Chain**			**Code : MCA4505**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prior Knowledge of:

1. Object Oriented Programming
2. Computer Network

Objectives:

1. To give the basic overview of the Blockchain technology

2. To develop the skill and knowledge of Hyperledger

Outcomes:

After learning the course, the students should be able to:

1. Explain the concepts related to Blockchain.
2. Understand various protocols involved in Blockchain enabled applications
3. Understand the use of cryptocurrency
4. Use Hyperledger to demonstrate the use of Blockchain

Detailed Syllabus

Unit	Description	Duration
1.	**Introduction to Blockchain** Basics, History, Architecture, Conceptualization Basic Crypto Primitives Bitcoin Basics	**05**
2.	**Consensus** Distributed Consensus Consensus in Bitcoin – I (The Basics, PoW and Beyond, The Miners) Permissioned Blockchain (Basics, Consensus) 2.4 RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance	**05**
3.	**HyperLedger** Hyperledger Fabric – Transaction Flow Hyperledger Fabric Details Fabric – Membership and Identity Management Hyperledger Fabric Network Setup Fabric Demo on IBM Blockchain Cloud	**07**
4.	**Deployment** Fabric Demo, deploy from scratch Hyperledger Composer – Application Development Hyperledger Composer – Network Administration	**07**
5.	**BlockChain Use Cases** Blockchain in Financial Service(Payments and Secure Trading, Compliance and Mortgage, Financial Trade)	**06**

	Blockchain in Supply Chain Blockchain in Government (Advantages, Use Cases, Digital Identity) Blockchain Security (Overview, Membership and Access control in Fabric,Privacy in Fabric)	
6.	**Ecosystems** Ethereum Ethereum development tools and Quorum Corda	**06**
		36

Reference Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Program:	MCA (Second Year)			**Semester :** IV			
Course :	**MOOCs Course**			**Code : MCA4995**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	-	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				50	-	-	50

A student needs to register for one MOOC Course minimum of 8 weeks. The duration of the MOOC course will be between the duration of semester-IV. Student may select MOOC course depends on his/her own interest, specialization or current trends.

The reviews and the evaluation of MOOC course will be done as per guidelines.
Two internal reviews for MOOC course shall be conducted. Student shall be evaluated as per the rubric defined for these reviews. The marks of these reviews will be collated as a term work with 100% weightage.

Program:	MCA (Second Year)			Semester :III			
Course :	Project			Code : MCA4703			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
	-	-					
				TW	OR	PR	Total
				200	200		400

The Project work constitutes a major component in most professional programmes. It needs to be carried out with due care and should be executed with seriousness by the students. The project work is not only a partial fulfilment of the MCA requirements but also provides a mechanism to demonstrate your skills, abilities, and specialization. Students shall submit the internship/major-project proposals after entering into the 4th semester of MCA, as per the calendar of the project.

Objective

The objectives of the project are to help the student develop the ability to apply theoretical and practical tools/techniques to solve real-life problems related to the industry, academic institutions, research laboratories, and society.

Course Outcomes

After the completion of this project work, the student should be able to:

1. Describe the Systems Development Life Cycle (SDLC) / Testing Life Cycle.
2. Determine how to collect information to determine and evaluate requirements.
3. Decide the S/W requirement specifications and H/W requirement specifications.
4. Construct and evaluate ERD, UML Diagram, Database/Table Structures, wherever necessary.
5. Design and evaluate system input and outputs interfaces.
6. Perform coding/testing of the project.
7. Documentation requirements and prepare and evaluate systems documentation.
8. Decide the future scope and further enhancement of the system.
9. Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.
10. Develop the ability to communicate effectively.

Guidelines

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational institutions /Software companies. However, it is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. Approval of the project proposal is mandatory. If approved, the student can commence working on it.

The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.

It may be done individually or in groups in case of bigger projects. However, if the project is done in groups, each student must be given responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.

The Project Synopsis should contain an Introduction to Project, Objectives, and Problem statement, which should clearly explain the project scope in detail. Any other point may be included if required as per the project type/category/nature/scope.

Students should take guidance from an internal guide and prepare a Project Report on "Project Work" which is to be submitted to the Head of the Department. Wherever possible, a separate file containing source-code listings should also be submitted. Every student should also submit a soft copy of their project synopsis. Their respective Institutes should forward a copy of this synopsis to the external panel members, in advance of the project viva dates if asked for.

Selected projects must have a relevant scope of 400 marks (200 Marks Internal, 200 Marks External).

In the fourth semester, the student must visit at least once in two weeks to the institute and the progress of the project must be communicated to the college project guide.

The project report should be prepared in a format prescribed by the department.

The major project work carries 200 marks for internal assessment and 200 marks for external viva. The external viva shall be conducted by a minimum of one external examiner.

Internal assessment of 200 marks will be done on the basis of 3 project reviews by the department. Each review carries a weightage of 50 marks. However, if required, the department may change the number of reviews to be conducted, depending on the circumstances.
Project work may be carried out in the department or outside with prior permission of the department.

Resubmission of MCA project in case of failed students

If the student is unsuccessful in the project, s/he should 're-do' the whole cycle, right from the submission of the project proposal. Students are advised to select a new topic for the project and should prepare and submit the project proposal to the department as per the project guidelines. There are no separate slots for the submission of the project synopsis/project reports for the failed students. Respective submissions of the project synopsis and the project reports should be done strictly as per the schedule/guidelines given by the department.

Report Submission Format

Report submission formats mentioned below are specific to project work related to software development and software testing. However, the points mentioned in the index may be removed or new relevant points may be added to the project report to justify the project work. If the project work is not related to software development or software testing then the project guide and students may suggest and prepare the project report with the points relevant to the nature and scope of the project, with prior approval/permission by the Head of the Department.

Title Page

PROJECT REPORT

ON

"NAME OF THE SYSTEM"

FOR

NAME OF THE COMPANY

BY

NAME OF STUDENT

(PRN: _____)

SAVITRIBAI PHULE PUNE UNIVERSITY

MASTER OF COMPUTER APPLICATION

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

20_ - 20_

Project Title Page
One Blank Page
Offer Letter by Company/Client/Education Institute/Research Institute
Completion Letter by Company/Client/Education Institute/Research Institute
Institute Certificate
Acknowledgment
Index (with page number)

Chapter No	Details
1	**Introduction**
1.1	Company Profile / Institute Profile / Client Profile
1.2	Abstract
1.3	Existing System and Need for System
1.4	Scope of System
1.5	Operating Environment - Hardware and Software
1.6	Brief Description of Technology Used
2	**Proposed System**
2.1	Proposed System / Solution
2.2	Objectives of Proposed System
2.3	Users of System
2.4	Workflow Diagram
3	**Analysis and Design**
3.1	System Requirements (Functional and Non-Functional requirements)
3.2	Use Case Diagrams
3.3	Class Diagram
3.4	Activity Diagram
3.5	Deployment Diagram
3.6	Entity Relationship Diagram
3.7	Table Specifications
4	**Coding and Input-Output**
4.1	Algorithms / Code Snippets / Pseudo Code
4.2	Input and Output Screens (Screens must have valid data. All reports must have at-least 5 valid records.)
5	**Testing**
5.1	Test Plan
5.2	Test Cases
6	**Limitations of Proposed System**
7	**Proposed Enhancements**
8	**Conclusion**
9	**Bibliography**

Report format for Software Testing Projects

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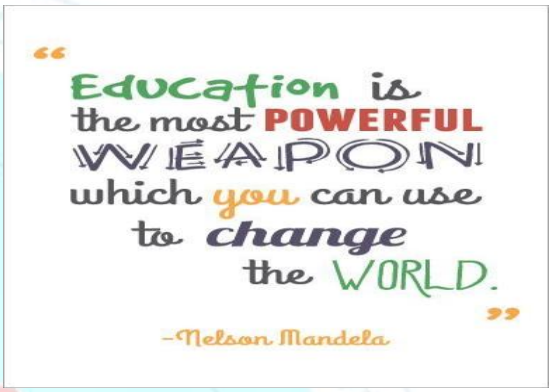
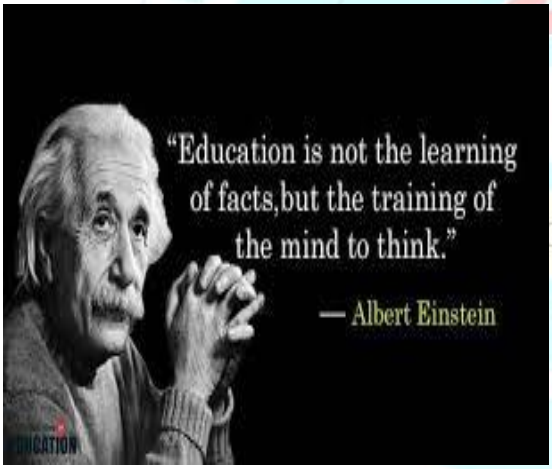
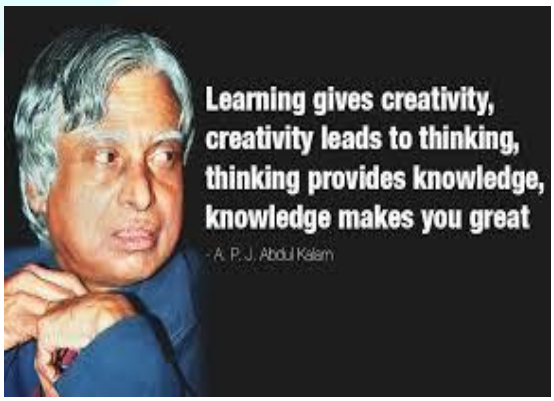
One Blank Page
Offer Letter by Company/Client/Education Institute/Research Institute
Completion Letter by Company/Client/Education Institute/Research Institute
Institute Certificate
Acknowledgment
Index (with page number)

Chapter No	Details
1	**Introduction**
1.1	Company Profile / Institute Profile / Client Profile
1.2	Application Overview
1.3	Operating Environment - Hardware and Software
1.4	Brief Description of Technologies Used to Develop Software
1.5	Users of System
2	**Software Testing**
2.1	Objectives of Testing
2.2	Scope of Testing 2.2.1 Functions to be Tested 2.2.2 Functions not to be Tested
2.3	Test Life Cycle
2.4	Software Testing Tools
3	**Test Strategy**
3.1	System Test
3.2	Performance Test
3.3	Security Test
3.4	Automated Test
3.5	Stress and Volume Test
3.6	Recovery Test
3.7	Documentation Test
3.8	Beta Test
3.9	User Acceptance Test
4	**Test Schedule**
5	**Test Case / Test Script**
6	**Test Metrics**
6.1	No. of test cases planned vs executed, No. of test cases passed/failed
6.2	No. of defects identified and their Status & Severity
6.3	Defects distribution – module wise
7	**Defect Report / Test Log**
8	**Conclusion**
9	**Bibliography**


An investment in knowledge pays the best interest.
Benjamin Franklin
EVERYDAYPOWER


Education is the most POWERFUL WEAPON which you can use to change the WORLD.
-Nelson Mandela


"Education is not the learning of facts,but the training of the mind to think."
— Albert Einstein


Learning gives creativity, creativity leads to thinking, thinking provides knowledge, knowledge makes you great
- A. P. J. Abdul Kalam