

SONA COLLEGE OF TECHNOLOGY

(AUTONOMOUS)

SALEM – 636 005

AFFILIATED TO ANNA UNIVERSITY, CHENNAI

REGULATION 2020 – MCA

Choice Based Credit System

CURRICULUM & Syllabus



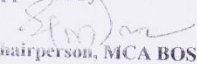
SECOND SEMESTER

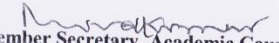
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS


MCA
II-2

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA II Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P20MCA201 ✓	Operating Systems ✓	2 ✓	0 ✓	0 ✓	2 ✓	30 ✓
2	P20MCA202 ✓	Computer Networks ✓	2 ✓	0 ✓	0 ✓	2 ✓	30 ✓
3	P20MCA203 ✓	Internet Programming ✓	3 ✓	0 ✓	0 ✓	3 ✓	45 ✓
4	P20MCA204 ✓	Cloud Computing Technologies ✓	3 ✓	0 ✓	0 ✓	3 ✓	45 ✓
5	P20MCA205 ✓	Data Science* ✓	3 ✓	0 ✓	2 ✓	4 ✓	75 ✓
6	P20MCA206 ✓	Mobile Application Development ✓	3 ✓	0 ✓	0 ✓	3 ✓	45 ✓
7	P20MCA501 ✓	Agile Technologies ✓	3 ✓	0 ✓	0 ✓	3 ✓	45 ✓
	P20MCA513 ✓	MicroServices and DevOps					
Practical							
8	P20MCA 207 ✓	Internet Programming Laboratory ✓	0 ✓	0 ✓	4 ✓	2 ✓	60 ✓
9	P20MCA208 ✓	Cloud Computing Technologies Laboratory ✓	0 ✓	0 ✓	4 ✓	2 ✓	60 ✓
10	P20MCA209 ✓	Soft Skills and Aptitude Career Enhancement Laboratory - II ✓	0 ✓	0 ✓	2 ✓	1 ✓	30 ✓
*Laboratory Integrated Theory						Total Credits	25 ✓

Approved by

 Chairperson, MCA BOS
 Dr.T.Padma


 Member Secretary, Academic Council
 Dr.R.Shivakumar


 Chairperson, Academic Council & Principal
 Dr.S.R.R.Senthil Kumar

Copy to:-
 HOD MCA, Second Semester MCA Students and Staff, COE
 10.12.2021

Regulations-2020

P20MCA201 - OPERATING SYSTEMS

L	T	P	C	M
2	0	0	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Describe the basic organization of computer systems.
- Understand inter process communication using shared memory and message passing.
- Gain knowledge about CPU scheduling and the basis for multi programmed operating systems.
- Provide a detailed description of various ways of organizing memory hardware.
- Know the performance and characteristics of mass-storage devices.

UNIT I - INTRODUCTION & SYSTEM STRUCTURES 5

What Operating Systems Do - Computer System Organization- Computer System Architecture: Operating System Services- System Calls - Types of System Calls - System Programs – Operating System Structure - System Boot.

UNIT II – PROCESS MANAGEMENT 5

Process Concept- Process Scheduling- Operations on Processes- Inter process Communication- Multicore Programming- Multithreading Models- Implicit Threading- Threading Issues- The Critical Section Problem- Semaphores- Classic Problems of Synchronization.

UNIT III – CPU SCHEDULING & DEADLOCKS 5

CPU Scheduling: Basic Concepts - Scheduling Criteria- Scheduling Algorithms - Thread Scheduling- Multiple Processor Scheduling - Real-Time CPU Scheduling. Deadlocks: System Model- Deadlock Characterization- Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance- Deadlock Detection - Recovery from Deadlock.

UNIT IV – MEMORY MANAGEMENT 5

Main Memory: Background- Swapping- Contiguous Memory Allocation Segmentation- Paging. Virtual memory : Background- Demand Paging- Copy-on Write- Page Replacement- Allocation of Frames- Thrashing.

UNIT V – STORAGE MANAGEMENT 5

Mass-Storage Structure: Overview of Mass Storage Structure- Disk Structure- Disk Attachment- Disk Scheduling- Disk Management- Swap-Space Management- RAID Structure. File System Interface: File Concept- Access Methods- Directory and Disk Structure- File System Mounting- File Sharing- Protection. File System Implementation: File System Structure- File System Implementation- Directory Implementation- Allocation Methods – Free Space Management- Efficiency and Performance- Recovery.

TOTAL = 30 Hours

COURSE OUTCOMES:

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

- Explain the fundamental concepts of operating system services and system calls
- Analyze the issues and use of locks, semaphores and monitors for synchronizing multithreaded systems and implement them in multithreaded programs.
- Describe the concepts of deadlock in operating systems and how they can be managed / avoided.
- Implement memory management techniques.
- Apply the algorithms in secondary storage and file management techniques

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012.
2. G. Coulouris, J. Dollimore, and T. Kindberg, “Distributed Systems: Concepts & Design”, Fifth edition, Addison-Wesley, 2012.
3. William Stallings, “Operating Systems: Internals and Design Principles”, Prentice Hall, 7thEdition, 2011.
4. Andrew S. Tanenbaum& Maarten van Steen, “Distributed Systems: Principles and Paradigms”, Prentice-Hall, Second Edition, 2006.
5. Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, McGraw-Hill, 1st Edition, 2001.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P O A	P O B	P O C	P O D	P O E	P O F	P O G	P O H	P O I	P O J	P O K
P20MCA201.1	Describe the basic organization of computer systems.	3	3	3	3	3	3	2	2	2	2	3
P20MCA201.2	Understand inter process communication using shared memory and message passing.	3	3	3	3	3	2	2	2	2	2	3
P20MCA201.3	Gain knowledge about CPU scheduling and the basis for multi programmed operating systems.	3	3	3	3	3	3	2	2	2	3	3
P20MCA201.4	Provide a detailed description of various ways of organizing memory hardware.	3	3	3	2	3	3	2	3	2	3	3
P20MCA201.5	Know the performance and characteristics of mass-storage devices.	3	3	3	3	3	3	2	3	2	3	3


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P20MCA202 – COMPUTER NETWORKS

L	T	P	C	M
2	0	0	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the protocol layering and physical level communication.
- Analyze the performance of a network.
- Understand the various components required to build different networks.
- Learn the functions of network layer and the various routing protocols.
- Familiarize the functions and protocols of the Transport layer.

UNIT I - INTRODUCTION AND PHYSICAL LAYER 5

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II – DATA-LINK LAYER & MEDIA ACCESS 5

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III - NETWORK LAYER 5

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV – TRANSPORT LAYER 5

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V – APPLICATION LAYER 5

WWW and HTTP – FTP – Email – Telnet – SSH – DNS – SNMP

TOTAL = 30 Hours

COURSE OUTCOMES:

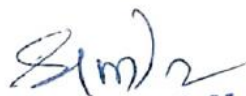
At the end of the course the student should be able to:

- Understand the basic layers and its functions in computer networks.
- Evaluate the performance of a network.
- Understand the basics of how data flows from one node to another.
- Analyze and design routing algorithms.
- Design protocols for various functions in the network.
- Understand the working of various application layer protocols

REFERENCES

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
3. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
4. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
5. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
6. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P	P	P	P	P	P	P	P	P	P	P	P	P	PS	PS
		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		a	b	c	d	e	f	g	h	i	j	k	l	m	a	b
P20MCA202.1	Understand the protocol layering and physical level communication.	3	2	2	2	1	1	1	1	2	1	1	2	1	3	3
P20MCA202.2	Analyze the performance of a network.	3	3	3	2	1	1	1	1	2	1	1	1	1	3	3
P20MCA202.3	Understand the various components required to build different networks.	3	3	3	1	2	1	1	2	2	2	1	1	1	3	3
P20MCA202.4	Learn the functions of network layer and the various routing protocols.	3	3	3	1	2	2	2	2	2	2	3	2	1	3	3
P20MCA202.5	Familiarize the functions and protocols of the Transport layer.	3	3	3	2	3	2	2	2	2	2	3	2	1	3	3


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P20MCA203 - INTERNET PROGRAMMING

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the various technologies used over internet.
- Learn java-specific web services architecture.
- Discuss on Client and Server side scripting
- learn the Spring framework and build applications using Spring..
- learn and implement the concept of Java Persistence API

UNIT I - WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II – CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL. AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods

UNIT III - SERVER SIDE PROGRAMMING 9

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV – SPRING 9

Spring Configuration and Spring Boot, Spring MVC: Dispatcher Servlet and Configuration - Interceptors - Controllers - Views - Input Validation - File Upload, Building RESTful Web Services, Spring Security Architecture, Spring Cache.

UNIT V – JAVA PERSISTENCE API AND HIBERNATE 9

Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

TOTAL = 45 Hours

COURSE OUTCOMES:

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

- Construct a basic website using HTML and Cascading Style Sheets.
- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
- Develop server side programs using Servlets and JSP.
- Implement Web Application using Spring
- Implement a Java application using Java Persistence API.

REFERENCES:

1. Deitel and Deitel and Nieto,"Internet and World Wide Web - How to Program", Prentice Hall, 5th Edition, 2011.
2. Stephen Wynkoop and John Burke,"Running a Perfect Website",QUE,2nd Edition,1999.
3. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
4. Jeffrey C and Jackson,"Web Technologies A Computer Science Perspective", Pearson Education, 2011.
5. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
6. UttamK.Roy, -Web Technologies", Oxford University Press, 2011.

CO No	Course Outcomes - On completion of the course the student should be able to :	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	PS O a	PS O b
P20MCA203.1	Construct a basic website using HTML and cascading style sheets.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA203.2	Build dynamic web page with validation using java script objects and by applying	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3

	different event handling mechanism.																
P20MCA203.3	Develop server side programs using servlet and JSP.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3
P20MCA203.4	Implement web applications using spring	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3
P20MCA203.5	Implement a java application using Java persistence API	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3


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P20MCA204 - CLOUD COMPUTING TECHNOLOGIES

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand Cloud computing its services.
- Understand the virtualization techniques in cloud.
- Explain the concept of cloud database and analyze the various security concerns of cloud.
- Discuss on the storage and testing in cloud
- Discuss on the Real time applications and Best practices of cloud.

UNIT I - OVERVIEW OF CLOUD COMPUTING 9

Introduction to Cloud Computing –Cloud service models – Cloud computing sub service models – Cloud deployment models – Alternative deployment models – Cloud architecture –Characteristics of cloud computing.

UNIT II – VIRTUALIZATION AND LOAD BALANCING IN CLOUD 9

Virtualization Techniques – Virtualization Technology – Overview of x86 virtualization - Types of Virtualization – CPU – Memory – Device and I/O – OS level – Network Server–Client- Application – Open source Containers in Cloud Kubernetes- Load balancing.

UNIT III – DATABASE AND SECURITY 9

Cloud databases and File systems –Cloud database , Cloud File system , Cloud Programming model – Cloud Disaster Recovery - Security concerns of cloud computing – Cloud information security objectives - Cloud security and existing security solutions –Cloud Security Architecture, VM Security challenges , Vulnerability Assessment tools for cloud , Open source security solution products in cloud .

UNIT IV – CLOUD STORAGE AND CLOUD TESTING 9

Cloud Middleware – Concept and Need of Cloud Middleware. Cloud optimized storage: scalability – Replications options – Data archiving methods – Physical storage facilities: Data center operations – Data monitoring strategies - Cloud testing – Secure cloud software testing.

UNIT V – REAL TIME APPLICATIONS AND BEST PRACTICES OF CLOUD COMPUTING 9

Role of Cloud in Big data and IoT – Cloud Providers and their products – Amazon , Microsoft, VMware - Working with Google app engine and Hosting the application- Consideration before adopting cloud – Development and environments for service development – Best practices– Economics of choosing a cloud platform for an organization – Cloud computing Consumer case studies.

TOTAL = 45 Hours

COURSE OUTCOMES:

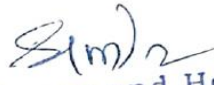
At the end of the course the student should be able to:

- Apply the service models and deployment models of cloud computing in real time.
- Analyze the details of virtualization and load balancing.
- Appraise the databases and security mechanism of cloud.
- Appraise the storage and testing mechanisms of Cloud Computing.
- Analyze the best practices of implementing cloud and the integration of latest technologies with cloud computing.

REFERENCES

1. Rishabh Sharma ,”Cloud Computing – Fundamentals , Industry approach and trends” ,Wiley Pub, 1st Edition 2015.(Unit 1,2,3,4,5).
2. Shailendra Singh,”Cloud Computing”, Oxford university press, 2018(Unit 1,2,3)
3. Dr.S.AnandaMurugan,T.Priya,M.C.Arvind Babu,”Cloud Computing”, University Science Press,2017.(Unit 4)
4. Barrie Sosinsky , “ Cloud Computing Bible “ , Wiley pub , 2011.
5. Buyya, Selvi ,Vecchiola” Mastering Cloud Computing – Foundations and application programming “,TMH Pub, 1st Edition, 2013
6. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications, Cambridge University Press (14 October 2010) [ISBN: 978-0521137355]
7. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, McGraw-Hill Education; 1 edition (1 November 2009) [ISBN: 0071626948]
8. Liz Kao, Jon Paz, “Salesforce.com for dummies “ , Wiley , 6th Edition , 2016.
9. Dan Appleman,”Advanced Apex Programming”, 2nd Edition ,2013 , Desaware Publishing.
10. Jim Smith and Ravi Nai ,:Virtual Machines: Versatile Platforms for Systems and Processes (The Morgan Kaufmann Series in Computer Architecture and Design)”,2005, Morgan Kaufman publisher.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	P S O a	P S O b
P20MCA204 .1	Apply the service models and deployment models of cloud computing in real time.	2	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204 .2	Analyze the details of virtualization and load balancing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204 .3	Appraise the databases and security mechanism of cloud.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA202 .4	Appraise the storage and testing mechanisms of Cloud Computing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204 .5	Analyze the best practices of implementing cloud and the integration of latest technologies with cloud computing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3


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P20MCA205 – DATA SCIENCE

L	T	P	C	M
3	0	2	4	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the basic concepts of Data Science and Big Data
- Understand the statistical concepts using R Language.
- Discuss various data models used data analysis.
- Discuss the concepts of data analysis using Hadoop
- Describe the Linear Transformations and Matrices

UNIT I –INTRODUCTION TO DATA SCIENCE AND BIG DATA 9

Introduction to Data Science – Data Science Process – Exploratory Data analysis –Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data- Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics – Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions - Re- Sampling – statistical inference – Introduction to Data Visualization.

UNIT II DATA ANALYSIS USING R 9

Univariate Analysis: Frequency. Mean. Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis –Bivariate Analysis: Correlation – Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-way cross Tabulation.

UNIT III – DATA MODELING 9

Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations

UNIT IV DATA ANALYTICAL FRAMEWORKS 9

Introduction to Hadoop: Hadoop Overview – RDBMS Versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication –Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction

UNIT V Linear Transformation & matrices: 9

Introduction to linear transformations - General linear transformations - Kernel & Range - Matrices of general linear transformations - Eigen Values & Eigen Vectors: Introduction to Eigen values - Diagonalizing of a matrix - Orthogonal diagonalization - Application of differential equation.

TOTAL = 75 Hours

List of Programs

1. Download, install and explore the features of R/Python for data analytics.
2. Use the Diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate Analysis: Linear and logistic regression modeling.
 - c. Multiple Regression Analysis
 - d. Also Compare the results of the above analysis for the two data sets.
3. Apply Bayesian and SVM techniques on Iris and Diabetes data set.
4. Apply and explore various plotting functions on UCI data sets.

Implement the following using Hadoop, Map Reduce, HDFS, Hive:

5. Perform setting up and installing Hadoop in its two operating modes: pseudo-distributed and fully distributed.
6. Implement the following file management tasks in Hadoop: adding files and directories, Retrieving files and Deleting files
 - (i) Performing a MapReduce Job for word search count (look for specific keywords in a file)
 - (ii) Implement step word elimination problem: Input a large textual file containing one sentence per file and a small file containing a set of stop words (one stop word per line) and save the results in an output textual file containing the same sentences of the large input the without the words appearing in the small file.
7. Implement a MapReduce program that processes a weather data set to:
 - a. Find average, max and min temperature for each year in National Climate Data Centre data set.
 - b. Filter the readings of a set based on Value of the measurement. The program must save the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.
8. Mini projects on the following:
 - a. Simulate a simple recommender system with Amazon product dataset, Social tweet data set etc. on Hadoop.

- b. Perform a very large text classification run on Hadoop.

COURSE OUTCOMES:

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

- Apply the modern analytical tools on Big data.
- Experiment with statistical concepts using R language
- Experiment various data models using R Language
- Perform a Data Analysis Using Hadoop Framework
- Illustrate all the strategies on Linear Transformations and Matrices.

REFERENCES

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & Sons, First Edition, 2013.
2. Umesh R Hodeghatta, Umesh Nayak, “Business Analytics Using in R – A Practical Approach”, Apress, First Edition, 2017.
3. Howard Anton & Chris Rorres, “Elementary Linear Algebra”, Wiley, Eleventh Edition 2013.
4. J. Leskowac, Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition, 2014.
5. Nishant Gerg, “Hbase Essentials”, Packt, First Edition, 2014.
6. Rachel Schutt, Cathy O’Neill, “Doing Data Science”, O’Reilly, First Edition, 2013.
7. Foster Provost, Tom Fawcet, “Data Science for Business”, O’Reilly, First Edition, 2013.
8. Bert Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley, First Edition, 2014.

CO No	Course Outcome (CO)	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	P S O a	P S O b
P20MCA205. 1	Apply the modern analytical tools on Big data	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205. 2	Experiment with statistical concepts using R language	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205. 3	Experiment various data models using R Language	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3

P20MCA205.4	Perform a Data Analysis Using Hadoop Framework	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205.5	Illustrate all the strategies on Linear Transformations and Matrices	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3


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P20MCA206 - MOBILE APPLICATION DEVELOPMENT

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Relate the need of mobile applications and point out the importance of it.
- Discuss on the basic concepts of android.
- Identify the components beyond user interface and use them in an application.
- Describe the advanced application development in android.
- Discuss the basic concepts of iOS application development.

UNIT I - INTRODUCTION TO MOBILE APPLICATIONS 7

Introduction to mobile applications - Mobility landscape - Mobile platforms - Mobile apps development – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications – Market and business drivers for mobile application.

UNIT II –ANDROID INTRODUCTION 9

Android Introduction - Android features - Android Architecture – Mobile UI resources (Layout, Fragment, UI elements, Drawable, Menu) - Activity – states and life cycle - Interaction amongst activities – Notifications.

UNIT III –ANDROID APP DEVELOPMENT 10

Threads – Async tasks - Services – states and life cycle – Shared preferences - Broadcast receivers - Telephony and SMS APIs - Animation

UNIT IV –ANDROID ADVANCED CONCEPTS 10

Multimedia-Audio/Video Playback and Record – Location Awareness – Native Hardware access using Accelerometer and Gyroscope– Mobile Databases using SQLite - Content Providers - Introduction to material designing

UNIT V – iOS INTRODUCTION AND APP DEVELOPMENT 9

Basics of Swift for iOS App development - iOS Introduction - features –Architecture - iOS Actions and Outlets – Story Board – Views - Simple iOS Application - iCloud introduction - iPhone market place.

TOTAL = 45 Hours

COURSE OUTCOMES:

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

- Analyze the significance of mobile application development and its market value.
- Develop real time mobile applications and discuss the architecture, platform and tools required for mobile application.
- Design and develop an application with the given component.
- Develop an application beyond user interface with intricate tools like mobile databases, sensors, animation, multimedia etc.
- Analyze the Architecture, iCloud and the concepts of iOS.

REFERENCES

1. “Composing Mobile Apps: Learn, Explore, Apply using Android “, Anubhav Pradhan, Anil V. Deshpande, Wiley Publications, 2014.
2. “IOS 12 Programming for Beginners”, Craig Clayton ,Packt publishing 3rd Edition.
3. Android Application Development All in one for Dummies, Barry Burd, Wiley Publications (Edition 1)
4. Teach Yourself Android Application Development in 24 Hours, Lauren Darcey & Shane Conder, SAMS Publication, 2010.
5. “Microsoft Mobile development Handbook”, Andy Wigley, Microsoft Publications, 2001.
6. “iOS Apps for Masterminds “,J.D.Gauchat,Registration number 1126232, 4th edition, 2018.
7. “Learning Swift: Building Apps for macOS, iOS, and Beyond “,Jonathon Manning ,Paris Buttfield-Addison ,Tim Nugent ,O’reilly , 3rd Edition.

CO No	Course Outcomes - Mobile Application and Development	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	PS O a	PS O b
P20MCA2 06.1	Analyze the significance of mobile application development and its market value	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3

P20MCA2 06.2	Develop real time mobile applications and discuss the architecture , platform tools required for mobile applications	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA2 06.3	Design and develop and application with the given component.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA2 06.4	Develop an application beyond user interface with intricate toolslike mobile databases,sensors, animation , multimedia etc	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA2 06.5	Analyze the architecture , iCloud and the concepts of iOS.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3


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P20MCA207 – INTERNET PROGRAMMING LABORATORY

L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- To be familiar with Web page design using HTML/XML and style sheets
- To learn to create dynamic web pages using server side scripting.
- To learn to write Client Server applications.
- To develop a web application using Spring.
To implement a Persistence layer using Hibernate and Spring Data JPA

LIST OF EXPERIMENTS

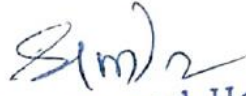
1. Create a web page with the following using HTML
2. To embed a map in a web page
3. To fix the hot spots in that map
4. Show all the related information when the hot spots are clicked.
5. Create a web page with the following.
6. Cascading style sheets.
7. Embedded style sheets.
8. Inline style sheets. Use our college information for the web pages.
9. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
10. Write programs in Java using Servlets:
11. To invoke servlets from HTML forms
12. Session tracking using hidden form fields and Session tracking for a hit count
13. Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
14. Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
15. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
16. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
17. Create a Spring MVC application. The application should handle form validation, file upload, session tracking.
18. Design a complex system using JPA and Hibernate. The system should have multiple entities and relationships between the entities. The database schema should be generated through Hibernate. Provide RESTful endpoints for CRUD operations for the defined entities. Also, support pagination and searching using JPA's JPQL and Criteria API.

TOTAL = 60 Hours

COURSE OUTCOMES:**At the end of the course the student should be able to:**

- Upon Completion of the course, the students will be able to:
- Construct web pages using HTML/XML and Style sheets
- Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- Develop dynamic web pages using server side scripting
- Develop applications in Spring
- Develop applications in JPA and hibernate

CO No	Course Outcomes - Internet Programming Lab	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA207.1	Construct web pages using HTML/XML and style sheets	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.2	Build dynamic web pages with validation using javascript objects and by applying different event handling mechanisms.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.3	Develop dynamic web pages using server side scripting	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.4	Develop applications in Spring	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.5	Develop applications in JPA and hibernate	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3


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P20MCA208 - CLOUD COMPUTING TECHNOLOGIES LABORATORY

L T P C M
0 0 4 2 100

Course Objectives:

- Relate the application of cloud computing with real time.
- Develop SaaS application in cloud CRM.
- Develop sample programs in any of the on demand cloud CRM in the market
- Create applications in cloud CRM in a very short time without any developmental cost.
- Understand cloud containers.

List of Programs:

Develop applications in Cloud:

Cloud CRM:

1. Formula and Validation – Basic and Advanced level.
2. Workflow Process
3. Automation Process
4. Apex triggers
5. Data management
6. Visual Force pages
7. SaaS Application
8. Einstein dashboard – Reports
9. AI for business

Open source Cloud Containers:

10. Containers - Kubernetes

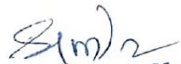
Course Outcomes:

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

- Create real time applications that uses formulas, validation, and workflow and automation process in Cloud CRM.
- Create applications that describes Visual Force pages, Apex triggers, Data Management tools in Cloud CRM.
- Appraise open source cloud containers and learn its implementation

TOTAL = 60 Hours

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	P S O a	P S O b
P20MCA208.1	Create real time applications that uses formulas, validation, and workflow and automation process in Cloud CRM.	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA208.2	Create applications that describes Visual Force pages, Apex triggers, Data Management tools in Cloud CRM.	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA208.3	Appraise open source cloud containers and learn its implementation	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3


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COURSE OUTCOMES:

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

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2. Solve problems of advanced levels than those in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate greater than level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests.
4. Make effectively oral presentation and take part in group discussions and write formal letters, memos, paragraphs and notices

Demonstrating soft-skill capabilities with reference to the following topics:

1. Soft Skills

- a) Presentation Skills
- b) Team work
- c) Leadership Skills
- d) Listening Skills
- e) Critical Thinking (Observation, Analysis, Interpretation, Reflection, Evaluation, Inference, Explanation, Problem Solving and Decision Making)

Solving problems with reference to the following topics:

**2. Quantitative
Aptitude
and
Logical Reasoning**

- a) Percentage
- b) Profit, loss & Discount
- c) Time & Work , Pipes & Cisterns
- d) Partnership
- e) Time Speed and Distance
- f) Interest Calculations
- g) Logarithm
- h) Data Sufficiency
- i) Ranking & Ordering
- j) Data Interpretation
- k) Company specific aptitude questions-1

Demonstrating verbal ability skills in English with reference to the following topics:

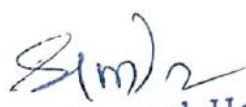
Focus on language

- a. Subject verb agreement
- b. Modal verbs
- c. Reading comprehension
- d. Spotting errors
- e. Choosing the correct / incorrect sentences
- f. Describing the picture
- g. Critical Reasoning
- h. Theme Detection
- i. Cloze test

Speaking	Mini presentation and group discussion
Writing	Paragraph writing, e-mail, letter to editors and memos
Reading	Reading advertisements and graphs, reading passages for specific information transfer

TOTAL = 30 Hours

CO / PO, PSO Mapping													
MCA													
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO – 1	1	1	2	1	1	3	3	3	1	1	2	1	3
CO – 2	1	1	1	1	1	3	3	2	1	2	2	3	2
CO – 3	1	1	1	1	1	3	3	3	1	3	2	1	2
CO – 4	1	1	1	1	1	3	3	3	1	2	2	1	2


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ELECTIVE - I

P20MCA501 – AGILE TECHNOLOGIES

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- To understand the basic concepts of Agile Software Process.
- To gain knowledge in the area of various Agile Processes.
- To develop Agile Software Process
- To know the benefits and pitfalls of working in an Agile Team.
- Assess product quality risks within an Agile project

UNIT I – INTRODUCTION 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT II - AGILE PROCESSES 9

Lean Production – SCRUM, Crystal, Feature Driven Development – Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III – AGILITY and KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making – Earl’s Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge sharing - Role of Story – Cards – Story-Card Maturity Model (SMM).

UNIT IV – AGILITY and Requirements Engineering 9

Impact of Agile Processes in Re-Current Agile Practices – Variance – Overview of Re using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V – AGILITY and Quality Assurance 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development – Agile Scrum – Scrum Master – Scaling Projects using Scrum.

TOTAL = 45 Hours

COURSE OUTCOMES:

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

- Demonstrate a systematic understanding of current agile techniques and practices used in industry.
- Apply industry standard agile techniques in develop software in a team.
- Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
- Develop techniques and tools for improving team collaboration and software quality.
- Managing the Agile Approaches up to the enterprise level.

REFERENCES

1. David J Anderson and Eli Schragenheim, “Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results”, Illustrated Edition, Prentice Hall PTR, 2004.
2. Orit Hazza and Yaepi Dubinsky,” Agile Software Engineering: Undergraduate Topics in Computer Science, Springer Verlag, First Edition, 2009.
3. Craig Larman,”Agile and Iterative Development: A Manager’s Guide”, Pearson Education, Second Edition, 2007.
4. Kavin C.Desouza,”Agile Information Systems: Conceptualization, Construction and Management”, Elsevier, Butterworth-Heinemann, First Edition, 2007.
5. Ken Schwaber, “Agile Project Management with Scrum”, Illustrated, Revised Edition, Microsoft Press, 2004.
6. Konnor Cluster, ”Agile Project Management: Learn How to Manage a Project with Agile Methods, Scrum, Kanban and Extreme Programming”, Independently Published, First Edition, 2019.

CO No	Course Outcome (CO)	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	P S O a	P S O b
P20MCA501.1	Demonstrate a systematic understanding of current agile techniques and practices used in industry	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA501.2	Apply industry standard agile techniques in develop software in a	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3

	team																
P20MCA501.3	Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3	
P20MCA501.4	Develop techniques and tools for improving team collaboration and software quality	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3	
P20MCA501.5	Managing the Agile Approaches up to the enterprise level	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3	


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P20MCA513– MICROSERVICES AND DEVOPS

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Explain an overview of Microservices and Containers.
- Understand the key concepts and principles of DevOps
- List the most common DevOps tools
- Identify the business benefits of DevOps and continuous delivery.
- Recall the specific DevOps methodologies and frameworks.

UNIT I – INTRODUCTION TO MICROSERVICES 9

Definition of Microservices – Characteristics - Microservices and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud.

UNIT II - MICROSERVICES ARCHITECTURE 9

Monolithic architecture- Microservice architectural style- Benefits - Drawbacks of Microservice architectural style - decomposing monolithic applications into Microservices.

UNIT III - BASICS OF DEVOPS 9

History of DevOps- DevOps and software development life cycle- water fall model – agile model – DevOps life cycle – DevOps tools: distributed version control tool –Git- automation testing tools – Selenium - reports generation – TestNG - User Acceptance Testing – Jenkins.

UNIT IV - MICROSERVICES IN DEVOPS ENVIRONMENT 9

Evolution of Microservices and DevOps – Benefits of combining DevOps and Microservices working of DevOps and Microservices in Cloud environment - DevOps Pipeline representation for a NodeJS based Microservices.

UNIT V - VELOCITY AND CONTINUOUS DELIVERY 9

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and Devops- Infrastructure and the job of Ops.

TOTAL = 45 Hours

COURSE OUTCOMES:

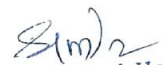
At the end of the course the student should be able to:

- Understand the Microservices and containers.
- Explain the architecture of Microservices.
- Describe DevOps and the common tools used in DevOps.
- Apply Microservices in DevOps.
- Develop, integrate and deploy projects using DevOps.

REFERENCES

1. **Namit Tanasseri, RahulRai, “Microservices with Azure”, 1st Edition, Packt Publishing, UK, 2017.**
2. **Eberhard Wolff, “Microservices: Flexible Software Architecture”, 1st Edition, Pearson Education, 2017**
3. James A Scott, “A Practical Guide to Microservices and Containers”, Map R Data Technologies e–book. <https://mapr.com/ebook/microservices-andcontainers/assets/microservices-and-containers.pdf>.
4. Joyner Joseph, Devops for Beginners, First Edition, Mihails Konoplovs publisher, 2015.
5. Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, 5th Edition, IT Revolution Press, 2018.
6. Michael Hüttermann, DevOps for Developers, 1st Edition, APress, e-book, 2012.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P O a	P O b	P O c	P O d	P O e	P O f	P O g	P O h	P O i	P O j	P O k	P O l	P O m	P S O a	P S O b
P20MCA513.1	Understand the Microservices and containers.	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1
P20MCA513.2	Explain the architecture of Microservices.	1	3	3	1	1	2	2	1	1	3	3	3	1	3	1
P20MCA513.3	Describe DevOps and the common tools used in DevOps.	3	3	3	1	3	3	3	3	1	1	1	1	1	3	3
P20MCA513.4	Apply Microservices in DevOps.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
P20MCA513.5	Develop, integrate and deploy projects using DevOps.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3


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