

(An Autonomous Institution)
 Courses of Study for MCA III Semester under Regulations 2020
 Branch: Master of Computer Applications

date : 21/09/21

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P20MCA301 ✓	Embedded Systems and Internet of Things ✓	3 ✓	0 ✓	0 ✓	3 ✓	45
2	P20MCA302 ✓	Cyber Security ESSENTIALS ✓	2 ✓	0 ✓	0 ✓	2 ✓	30
3	P20MCA303 ✓	Artificial Intelligence and Machine Learning ✓	3 ✓	0 ✓	0 ✓	3 ✓	45
4	P20MCA510 ✓	Elective – Full Stack Web Development* ✓	2 ✓	0 ✓	2 ✓	3 ✓	60
5	P20MCA511 ✓	Elective – Advanced Java Programming* ✓	2 ✓	0 ✓	2 ✓	3 ✓	60
	P20MCA512 ✓	Elective – Advanced Web Programming* ✓					
6	P20MCA513 ✓	Elective – Microservices and DevOps ✓	3 ✓	0 ✓	0 ✓	3 ✓	45
Practical							
7	P20MCA304 ✓	Embedded Systems and Internet of Things Laboratory ✓	0 ✓	0 ✓	4 ✓	2 ✓	60
8	P20MCA305 ✓	Artificial Intelligence and Machine Learning Laboratory ✓	0 ✓	0 ✓	4 ✓	2 ✓	60
9	P20MCA306 ✓	Mini Project Laboratory ✓	0 ✓	0 ✓	4 ✓	2 ✓	60
10	P20MCA307 ✓	Soft Skills and Aptitude Career Enhancement Laboratory – III ✓	0 ✓	0 ✓	2 ✓	1 ✓	30
* Laboratory Integrated Theory						Total Credits	24

Approved by

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

P20MCA301 - EMBEDDED SYSTEMS AND INTERNET OF THINGS

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Provide an overview of principles of Embedded System
- Understand the basics of IoT, communication models and emerging technologies.
- Exhibit domain and system management for IoT applications.
- Use cloud services for IoT applications.
- Learn real world application scenarios of IoT along with its societal and economic impact using case studies.

UNIT I - INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems, General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of Embedded Systems, Characteristics and Quality attributes of Embedded Systems. The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components-Embedded System development environment - IDE- Embedded product development life cycle.

UNIT II -DESIGN OF IoT 9

Introduction-Definition and characteristics of IoT-Physical design of IoT-Things in IoT and IoT Protocols-Logical design of IoT-IoT functional blocks-IoT communication model and IoT communication APIs-IoT enabling technologies-Wireless Sensor Networks-Role of Cloud Computing and Big Data Analytics, IIOT, Industry 4.0-Communication protocols-IoT levels.

UNIT III - DOMAIN, M2M AND SYSTEM MANAGEMENT 9

Introduction - Home Automation-Cities-Industry-Health & Lifestyle-M2M-SDN and NFV for IoT-Software Defined Networking-Network Function Virtualization-IoT system management-Need for IoT system management - Simple Network Management protocol. Protocols: IEEE 802.15.4 - The IEEE 802 Committee Family protocols-The physical layer-The Media Access Control Layer-Uses of 802.15-BACNet Protocol-Modbus-KNX-Zigbee Architecture-Network Layer-APS layer-Security.

UNIT IV - DEVELOPING INTERNET OF THINGS 9

IoT Platforms Design Methodology-IoT System for Weather Monitoring-IoT System for Agriculture. Introduction to Cloud Storage Models & Communication APIs-WAMP-AutoBahn for IoT -Xively Cloud for IoT-Python Web Application Framework-Django Architecture - Development with Django Toolkit-Arduino -Raspberry Pi.

UNIT V - CLOUD SERVICES FOR IOT

9

Designing a RESTFUL Web API-Amazon Web Services for IoT - EC2-Autoscaling-S3-RDS-Dynamo DB-Kinesis-SkyNet IoT Messaging Platform. Case Studies - Environment-IoT systems for weather reporting Bot-Air Pollution Monitoring system-Forest Fire Detection-IoT system for Energy-Smart grid - Renewable Energy Systems.

TOTAL = 45 Hours

COURSE OUTCOMES:

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

- Acquire knowledge and understand fundamental embedded system design paradigms and architecture.
- Illustrate the design, communication model and enabling technologies for IoT.
- Analyze the system management and domain for various applications of IoT.
- Classify the various protocols that are used for developing IoT applications.
- Identify the cloud services for various applications of IoT.

REFERENCES

1. **Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill, January 2020 (Unit 1).**
2. **Arshdeep Bahga and Vijay Madisetti, "Internet of Things, A Hands-on Approach", Universities Press, 2015 (Units 2 ,3 & 5).**
3. Mayur Ramgir, "Internet of Things-Architecture, Implementation and Security", Pearson, August 2019.
4. Olivier Hersent, David Boswarthick, Omar Elloumi," The Internet of Things-Key applications and Protocols", Wiley, 2012. (Unit 4)
5. Adrian McEwen, "Designing the Internet of Things", Wiley, 2014.
6. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill, October 2015.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
		a	b	c	d	e	f	g	h	i	j	k	l	m	a	b	
P20MCA301.1	Acquire knowledge and understand fundamental embedded system design paradigms and architecture.	S	M	S	S	M	M	M	M	W	M	S	S	M	S	M	
P20MCA301.2	Illustrate the design, communication model and enabling technologies for IoT.	S	S	S	S	S	M	M	M	W	S	S	S	M	S	M	
P20MCA301.3	Analyze the system management and domain for various applications of IoT.	S	M	S	S	S	M	M	M	M	M	S	S	M	S	M	
P20MCA301.4	Classify the various protocols that are used for developing IoT applications.	S	M	S	S	M	M	M	M	W	M	S	S	M	S	M	
P20MCA301.5	Identify the cloud services for various applications of IoT.	S	M	S	S	S	S	M	M	M	M	S	S	M	S	M	


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P20MCA302 - CYBER SECURITY ESSENTIALS

L	T	P	C	M
2	0	0	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the various types of cybercrimes.
- Formulate the security problems in wireless devices and networks.
- Identify the different types of cybercrimes and its associated cyber laws.
- Gain knowledge about computer forensics and challenges in computer forensics.
- Discuss the social impacts of cybercrime and privacy protection in an organization.

UNIT I - INTRODUCTION TO CYBERCRIME 9

Introduction: Cybercrime - Cybercrime and Information Security - Cyber Criminals- Classification of Cybercrimes-Cyber Offenses: Attacks-Social Engineering- Cyberstalking- Cyber Cafe and Cybercrimes-Botnets.

UNIT II - CYBERCRIME: MOBILE AND WIRELESS DEVICES 9

Cybercrime : Mobile and Wireless Devices: Proliferation of Mobile and Wireless Devices- Credit Card Frauds in Mobile and Wireless Computing Era -Security Challenges Posed by Mobile Devices -Registry Settings for Mobile Devices -Authentication Service Security : Cryptographic Security for Mobile Devices - LDAP Security for Hand- Held Mobile Computing Devices -Attacks On Mobile Phones - Tools and Methods used in Cybercrime: Proxy Servers and Anonymizers - Phishing - Password Cracking - Key Loggers and Spywares - Buffer Overflow -Attacks on Wireless Networks.

UNIT III - CYBER SECURITY: LEAGAL PERSPECTIVE 9

Introduction - Cyber Security Evolution - Cyber Security Objectives - Cyberlaws: The Indian Context - Indian IT Act - Digital Signature and the Indian IT Act - Amendments to the Indian IT Act - Cybercrime and the Punishment -Cyberlaw - Technology and Students: Indian Scenario.

UNIT IV - COMPUTER FORENSICS 9

Introduction - Historical Background of Cyber Forensics - Digital Forensics Science - Need for Computer Forensics -Cyber Forensics and Digital Evidence - Forensics Analysis of E-Mail - Digital Forensics Life Cycle -Chain of Custody Concept - Network Forensics - Computer Forensic Investigation - Computer Forensic and Steganography -Challenges in Computer Forensics - Forensics Auditing - Anti-forensics.

UNIT V -SOCIAL IMPLICATIONS

9

Introduction - Cost of Cybercrime and IPR Issues -Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing -Social Computing and Associated Challenges -Protecting People's Privacy in the Organization - Organizational Guide Lines for Internet Usage -Safe Computing Guidelines and Computer Usage Policy - Incident Handling -Forensics Best Practices for Organizations - Media and Asset Protection -Importance of endpoint Security in Organizations.

TOTAL = 30 Hours

COURSE OUTCOMES:

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

- Acquire the knowledge about cybercrime and attacks in cybercrime.
- Explore the tools and methods used to protect wireless devices and networks from various attacks.
- Analyze various Indian acts imposed in cybercrime.
- Apply and know the importance of computer forensics in the digital world.
- Exhibit the media and asset protection of an organization.

REFERENCES

1. Nina Godbole, Sunit Belapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", 2019, Wiley Publications (Unit I - V).
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, Joseph Weiss, "Cyber Security Policy Guidebook", 2017, Wiley Publications. (Unit -1)
3. Mayank Bhushan, Rajkumar Singh Rathore, Aatif jamshed "Fundamental of Cyber Security Principles, Theory and Practices", BPB Publications.
4. Thomas J. Mowbray, "Cyber Security Managing Systems, Conducting Testing and Investigating Intrusions", 2019, Wiley Publications.
5. Khadsare S, "Cyber Security HandBook ", 2017, Mrs. Deepthy Chaudry publications.

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	PS O a	PS O b
P20MCA302.1	Acquire the knowledge about cybercrime and attacks in cybercrime.	S	M	M	M	W	W	W	W	M	W	W	M	W	S	S
P20MCA302.2	Explore the tools and methods used to protect wireless devices and networks from various attacks.	S	S	S	M	W	W	W	W	M	W	W	W	W	S	S
P20MCA302.3	Analyse various Indian acts imposed in cybercrime.	S	S	S	W	M	W	W	M	M	M	W	W	W	S	S
P20MCA302.4	Apply and know the importance of computer forensics in the digital world.	S	S	S	W	M	M	M	M	M	M	S	M	W	S	S
P20MCA302.5	Exhibit the media and asset protection of an organization.	S	S	S	M	S	M	M	M	M	M	S	M	W	S	S


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P20MCA303 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Explain the principles of Artificial intelligence like problem solving, inference, perception.
- Understand the methods for knowledge representation, and learning.
- List the characteristics of Intelligent agents
- Design and implement the machine learning techniques for real world problems
- Gain experience in doing research using Artificial intelligence and Machine learning techniques.

UNIT I -INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

Foundation of AI-History of AI-State of Art.-Intelligent Agents: Agents and Environments - Concepts of Rationality-Nature of Environments-Structure of Agents. Problem Solving: Problem Solving by Search: Problem Solving Agents-Searching for Solutions-Uniform Search Strategies-Heuristic Search Strategies- local Search Algorithms and Optimization Problems.

UNIT II - KNOWLEDGE AND REASONING 9

Logical Agents: Knowledge Based Agents-Logic-Propositional Logic-Propositional Theorem Proving-Model Checking-Agent based on Propositional Logic. First-Order Logic: Syntax and Semantics- Using First-Order Logic-Knowledge Engineering. Inference in First-Order Logic: Propositional Vs. First-Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining -Resolution. Fuzzy Sets to Fuzzy Logic System in AI: Fuzzy sets - operations - Logic - rules - fuzzy inference system - fuzzification and defuzzification.

UNIT III - BAYESIAN LEARNING 9

Basic Probability Notation- Inference - Independence - Bayes Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm.

UNIT IV - MACHINE LEARNING PARAMETRIC MODELS 9

Supervised Learning - Regression and classification - Evaluating and choosing best Hypothesis - Perceptron - Artificial Neural Networks - Fuzzy neurons and Fuzzy Neural networks - Multi - class Classification - Backpropagation - Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization.

UNIT V - MACHINE LEARNING NON- PARAMETRIC MODELS

9

k- Nearest Neighbors- Learning Decision Trees – Inducing – attribute tests - Generalization and Overfitting – application - Ensemble learning - Boosting - Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels – Case Study.

TOTAL = 45 Hours

COURSE OUTCOMES:

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

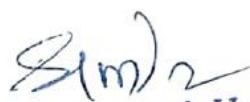
- Apply AI techniques in problem solving context.
- Implement Knowledge and Reasoning in the real-world problems.
- Design a model with the required Learning features in AI applications.
- Analyze the working model and features of Decision tree.
- Apply k-nearest algorithm for the appropriate research-oriented problems.

REFERENCES

1. **Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition Pearson Education Limited, 2015 (Unit 1-5).**
2. Calum Chace, “Surviving AI: The Promise and Peril of Artificial Intelligence”, Three CS publication, Second Edition, 2015.
3. Christopher M Bishop, “Pattern Recognition and Machine Learning”, Spring 2011 Edition.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning: Data Mining, Inference and Prediction”, Springer 2nd Edition.
5. Ethem Alpaydin, "Introduction to Machine Learning", Second Edition, MIT Press, 2010.
6. Tom M. Mitchell, “Machine Learning”, India Edition, 1st Edition, McGraw-Hill Education Private Limited, 2013.
7. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill Education, 2012.
8. Nikola K. Kasabov, Foundation of Neural Networks, Fuzzy Systems, and Knowledge Engineering, The MIT Press, 1998.

CO No	Course Outcome(CO) On completion of the course the student should	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

	be able to :																
P20MCA303.1	Apply AI techniques in problem solving context.	S	S	S	S	S	W	S	W	W	S	W	S	M	S	S	
P20MCA303.2	Implement Knowledge and Reasoning in the real world problems.	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	
P20MCA303.3	Design a model with the required Learning features in AI applications.	S	S	S	S	S	S	S	M	W	S	S	S	S	S	S	
P20MCA303.4	Analyze the working model and features of Decision tree.	S	S	S	S	S	S	S	S	W	S	S	S	S	S	S	
P20MCA303.5	Apply k-nearest algorithm for the appropriate research oriented problems.	S	S	S	S	S	S	S	S	M	S	S	S	M	S	S	


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L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand Arduino UNO and Raspberry Pi architecture.
- Setup the IDE and write embedded code.
- Learn real world application scenarios of IoT with societal and economic impact.
- Apply design concept to IoT solutions.
- Develop comprehensive approach towards building small low cost embedded IoT system.

The following experiments should be practiced in Arduino Platform

- 1 (a) Write a script to turn the Arduino LED on and off every second.
(b) Write a script that allows the user to turn the Arduino LED on and off with a time delay.
- 2 Write a script to control Arduino LED. When the user enters the value 1, the LED has to turn on and similarly, when the user enters the value 0, the LED has to turn off. Also when the user enters "Quit", the application has to end.
- 3 Write a script using Arduino UNO to turn on LED and buzzer alarm.
- 4 Write a script to read a photosensor connected to an Arduino and turn on and off an LED based on light intensity level. So, when your room is dark, your LED must turn on.
- 5 Write a script to control the stepper motor (brushless DC motor) using Arduino UNO.
- 6 Write a script for distance measurement using Ultrasonic sensor and Arduino UNO.

The following experiments should be practiced in Raspberry Pi Platform

- 1 Write a script to blink on alternative LEDs on and off every second using Raspberry Pi.
- 2 Write a script with Raspberry Pi to make the LEDs blink on and off like a heartbeat: 2 quick flashes in succession and then a longer delay.
- 3 Write a script using Raspberry Pi to make the LEDs blink when a button is pressed.
- 4 Write a script using Raspberry Pi so that whenever you press the button a variable is incremented by one and is printed on the screen. This should work as a simple button counter. Start at 0, and each time you press the button it counts up on the screen.
- 5 Write a script to turn LED On and Off when the value "1/0" is received from smartphone using Bluetooth.

- 6 Write a script to detect the vertical (Y-axis) and horizontal (X-axis) movement of Analog Joystick.
- 7 Write a script to talk to a TMP102 Temperature sensor and display the temperature data into the terminal screen. Note: The temperature sensor can measure the temperature for: light/humidity/wind speed/air pressure/people entering your room etc.)


TOTAL: 60 hours

COURSE OUTCOMES:

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

- Design and develop an environment friendly IoT enabled devices.
- Provide embedded system solutions for societal needs.
- Work individually and in a group to develop embedded systems.
- Apply skills to conduct interfacing of Arduino board with components, actuators and sensors.
- Configure and work with Raspberry Pi controller circuits.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	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
P20MCA304.1	Design and develop an environment friendly IoT enabled devices.	S	M	S	S	M	M	M	M	W	M	S	S	M	S	M
P20MCA304.2	Provide embedded system solutions for societal needs.	S	S	S	S	S	M	M	M	W	S	S	S	M	S	M
P20MCA304.3	Work individually and in a group to develop embedded systems.	S	M	S	S	S	M	M	M	M	M	S	S	M	S	M
P20MCA304.4	Apply skills to conduct interfacing of Arduino board with components, actuators and sensors.	S	M	S	S	M	M	M	M	W	M	S	S	M	S	M
P20MCA304.5	Configure and work with Raspberry Pi controller circuits.	S	M	S	S	S	S	M	M	M	M	S	S	M	S	M


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**P20MCA305 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
LABORATORY**

L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Familiarize with the machine learning algorithms and implement in practical situations.
- Demonstrate AI algorithms and techniques.
- Learn to use different algorithms for real time data sets.

List of Experiments

1. Write a program to illustrate problem solving as a search and also apply local search algorithms.
2. Write a program to demonstrate logical agents.
3. Evaluate forward chainer and rule base on at least four different databases. Try to create at least one database that demonstrates an interesting feature of the domain, or an interesting feature of forward chaining in general.
4. Demonstrate agent based on propositional logic.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file.
8. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
9. Apply the technique of pruning for a noisy data from any sample data set and derive the decision tree. Analyze the results by comparing the structure of pruned and unpruned tree.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
11. Implement Support Vector Classification for linear kernel.
12. Implement Logistic Regression to classify the problems such as spam detection, Diabetes predictions so on.

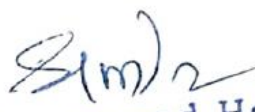
TOTAL: 60 hours

COURSE OUTCOMES:

- Increase the problem-solving skills using AI techniques.
- Apply knowledge, reasoning and Learning algorithms in real-world context applications that increase the performance of system.
- Organize the data set using classification techniques.
- Analyze and predict the data sets using ML techniques.
- Create an application to test the data with appropriate algorithms in Neural Network system.

<u>CO No</u>	<u>Course Outcome(CO)</u> <u>On completion of the course the student should be able to :</u>	<u>PO a</u>	<u>PO b</u>	<u>PO c</u>	<u>PO d</u>	<u>PO e</u>	<u>PO f</u>	<u>PO g</u>	<u>PO h</u>	<u>PO i</u>	<u>PO j</u>	<u>PO k</u>	<u>PO l</u>	<u>PO m</u>	<u>PSO a</u>	<u>PSO b</u>
<u>P20MCA305.1</u>	<u>Increase the problem solving skills using AI techniques.</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>M</u>	<u>S</u>	<u>W</u>	<u>W</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>M</u>	<u>S</u>	<u>S</u>
<u>P20MCA305.2</u>	<u>Apply knowledge, reasoning and Learning algorithms in real-world context applications that increase the performance of system.</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>M</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>
<u>P20MCA305.3</u>	<u>Organize the data set using classification techniques.</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>M</u>	<u>W</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>W</u>
<u>P20MCA305.4</u>	<u>Analyze and predict the data sets using ML</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>W</u>

	<u>techniques.</u>																
<u>P20MCA305.5</u>	<u>Create an application to test the data with appropriate algorithms in Neural Network system.</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>W</u>	<u>S</u>	<u>S</u>	<u>M</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>S</u>


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P20MCA306 - MINI PROJECT LABORATORY

L	T	P	C	M
0	0	4	2	100

Course Objective:

- Understand the software engineering principles in developing software solutions to the society-needs problems and deploy as a Microservice.
- Apply advancement in techniques and tools to support the frequent releases of software product
- Build the strong network of stakeholders to get better experiences in Industrial/IT knowledge.

SCOPE OF THE COURSE:

Every student is required to carry out in-house Mini Project work under the supervision of a faculty member of the department. The students can do a project in a group of size between 4 and 5. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work once in a month during the semester at an appropriate time decided by the Department. There will a final presentation of the Mini Project work at the end of the semester. It is recommended that Mini Project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution.

The purpose of the project is to apply Microservices and DevOps concepts in the required fields, help the student to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories, this project will helps the student make ease and provides enough experience to carry out the larger project in the fifth and sixth semester.

AIM:

Students should identify society-needs problems that analyze/plan the requirements, schedule, cost estimation & methodologies/technologies to be proposed, design and implement into IT outlook software solution. The domain of the problem may be identified from the emerging area of an application and deploy into Microservices like as follows:

- Feedback application
- Registration and login form
- Contact Form
- Payment Form
- Catalogue Form

- Review/Comments
- Profile creation/setting
- Booking services
- Order & Cart Form
- GPS Location tracking
- Sensors reading using Arduino/Raspberry Pi
- Consuming any third party web services.

The evaluation of the project would be based on the need of the hour and request from stakeholders, usefulness of the problem statement, formulation of the problem, stakeholders need and the usage statistics of the solution and the technical merit of the solution.

The project design, development and testing phases can be as shown below:

PHASES:

1. Requirements Engineering Phase:

- Problem identification.
- Feasibility study of domain.
- Requirement elicitation and analysis.

The above mentioned topic should document the Software Requirements Specification (SRS) for the identified development, operations and micro services along with the following.

- Timeline chart/Project schedule
- Estimation with chart

2. Team Formation Phase:

- Teams formation, roles identified, activities framed

3. Design Phase:

- Architectural design.
 - Case studies in sample application for each type of architecture, popular enterprise applications, cloud computing platforms comparison, DevOPs solution fundamentals, applications of SOA and MSA (Microservice, Architecture), OOAD and SOAD comparison, Identifying simple services based on SOA and MSA.
 - UML Diagram (Use case, Conceptual classes, process flow diagram, sequence & activity diagram, etc.,)
 - System architecture
- Front-End Design.

- UI design
- Component Design.
 - API Design
- Back-end design.
 - E-R model
 - Database Design

4. Implementation Phase:

- Development, operations and micro services proposal scheme
- Front-end and Back-end Coding in a suitable language using necessary platforms and tools.

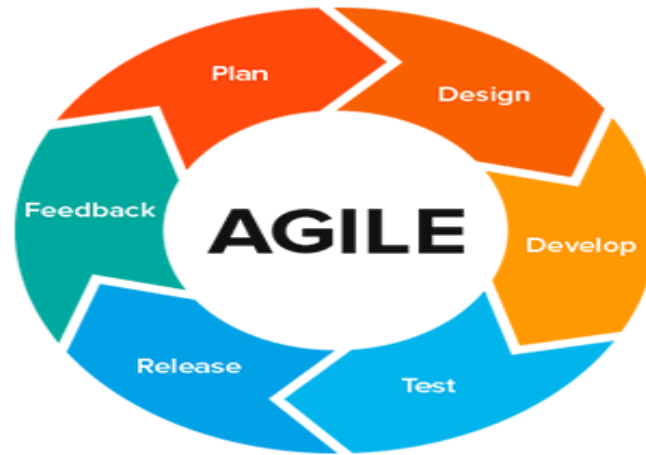
5. Testing And Validation Phase:

- Develop test cases
- Component Testing
- System Testing
- Acceptance Testing
- Testing reports

6. Deployment & Feedback Phase:

- Web services and micro services
 - Implementing XML, DOM and SAX
 - Creation of web services in Java/.NET/Python environment, RESTful web services.
- Implementation of Microservices architecture with python.
- Creation of container services.
- Cloud deployment.
- Case Study of middleware services for IoT, mobile services
- Reviews & Feedback Collection

Project Development Should be based on Agile methodology,



MINI PROJECT PROPOSAL (SYNOPSIS) STRUCTURE

Mini Project proposal should be prepared in consultation with the guide. It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis. Mini Project synopsis may contain 15-25 pages and sequence of contents strictly should be in the following order:

1. Cover and Title page
2. Synopsis Approval Performa duly filled and signed by the student
3. Index
4. Acknowledgement
5. Introduction and objective of the Mini Project
6. System Study (Literature Survey, Proposed Methodology)
7. Feasibility Study
8. System Requirements
9. System Design
10. Development & Feedback
11. Deployment & Conclusion
12. Scope of future application
13. References

COMMUNICATION OF SYNOPSIS APPROVAL

A list of approved synopsis will be put on the notice board of the Institute as per the dates mentioned in the activity schedule. In case of non-approval, the suggestions for reformulating the Mini Project will be communicated to the student. Students can resubmit the modified synopsis to Project In-Charge of the Department of Master of Computer Applications as per the specified time given in activity schedule.

MINI PROJECT REPORT STRUCTURE

The Mini Project should be prepared in consultation with the guide and may contain 100-150 pages (including coding). Mini Project Report should strictly follow the points given below:

Details

1. Cover and Title page
2. Synopsis Approval Certificate
3. Index
4. Acknowledgement
5. Certificate of Originality
6. Introduction, Aims / Objectives
7. System Study
 - Problem Identification
 - Literature Study
 - The scope of problem
8. Feasibility Study
 - 8.1. Technical Feasibility
 - 8.2. Economic Feasibility
 - 8.3. Operational Feasibility
9. Proposed Methodology
10. S/W Engineering Paradigm applied
11. System Specification
12. System Design (DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure, etc.)
13. UI Design/Development
14. Coding
15. Validation & Verification
16. Testing (Testing techniques, Testing strategies, Use Cases)
17. Implementation and Maintenance
18. System Security & Performance measurements
20. Reports, Pert Chart/Gantt Chart, Summary/Conclusion
21. Future scope of the Mini Project
22. Bibliography/References/Glossary
23. Document Approval

SYNOPSIS SUBMISSION OF A MINI PROJECT REPORT

Only one Copy of the Mini Project report in bound form is to be submitted to the Project In-Charge of the Department of Master of Computer Applications. Another copy of the Mini Project Report must be retained by the student which should be produced before the examiner at the time of the Viva-voice.

MINI PROJECT EVALUATION

As per the norms Mini Project Report shall be evaluated by the examiner at the end of the semester. However there will be continuous monitoring of the Mini Project progress report during the semester and distribution of marks shall be as follows:

- 5 reviews – 40 (8 marks for each review)

- Documentation - 20
- Viva 1 – 10
- Project evaluation – 30

LIST OF BROAD AREAS OF APPLICATIONS AND RELATED TOOLS

- **Technology:** Visual studio 2008, .NET framework, J2EE, Spring, AngularJS.
- **Front-End Development:** UI Design Tools, PHP, React js, etc.,
- **Back-End Development:** NoSQL, SQL Server, Oracle 10g, MySQL, MongoDB, Django, Sybase
- **Languages:** C, C++, C#, Java, VC++, Python
- **Internet Technologies:** HTML, DHTML, XML, CSS, JavaScript, DOM, JQuery, AJAX, node.js, ASP, JSP, Java Servlet, Perl & CGI script, VBscript, Swing, XSL, Java Beans, UML, EDA, Broadvision, ATG, NET Dynamics, Silver Stream, Cold Fusion, etc.,
- **Web Server:** IIS, APACHE, TOMCAT, GlassFish, etc.,
- **Networking Technologies:** ATM, Frame Relay, TCP/IP, SNMP, GSM, VOIP, PPP, IP-PSTN, SONET/SDH
- **Wireless Technologies:** 2G, 3G, 4G, Bluetooth, Wi-fi, ISDN, Edge, etc.,
- **Real-time OS/ Embedded Skills:** QNX, LINUX, OSEK, DSP, VRTX, RTXC, Nucleus, etc.,
- **Operating System:** Windows XP/VISTA/7, Windows Server 2008, MS-DOS, LINUX SUN, VRTX, SOLARIS, HP/UX, PSOS, IRIX, Ubuntu, Mac OS, Fedora, Debian, etc.,
- **Project Management Tools:** JIRA, Kanban, GitHub, Smartsheet, Zoho Sprint, pivotal Tracker, etc.,

Course Outcome:

The students are able to

- Become an expert as a software engineer to execute the project with expected product.
- Obtain good exposures to lead the teams and maintain good relationship between IT industries and customers.
- Become a specialist to deploy and manage the Microservices.

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
P20MCA306.1	Become an expert as a software engineer to execute the project with expected product.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
P20MCA306.2	Obtain good exposures to lead the teams and maintain good relationship between IT industries and customers.	W	W	M	S	S	S	S	S	S	S	S	W	S	S	S
P20MCA306.3	Become a specialist to deploy and manage the Microservices.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S


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P20MCA307 - Soft Skills and Aptitude Career Enhancement Laboratory - III	L	T	P	C	Marks
	0	0	2	1	100

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

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

1. Soft Skills
 - a. Career Planning
 - b. Resume Writing
 - c. Interview Skills
 - d. Group Discussion Techniques
 - e. Mock GD's
 - f. Mock Interview.

Solving problems with reference to the following topics :

2. Quantitative Aptitude and Logical Reasoning Topics
 - a. Permutation and Combination
 - b. Probability
 - c. Crypto Arithmetic
 - d. Functions & Polynomials
 - e. Geometry & Mensuration
 - f. Syllogism
 - g. Cubes & Dice
 - h. Visual Reasoning
 - i. Inequalities
 - j. Analogies
 - k. Number Series
 - l. Company Specific Questions - 2

Demonstrating English language skills with reference to the following topics:

3. Verbal Ability
 - a. Select the best alternative for the underlined part of the sentence
 - b. Writing a quote for the given picture
 - c. Writing story on a given picture
 - d. Critical Reasoning
 - e. Theme detection
4. Speaking

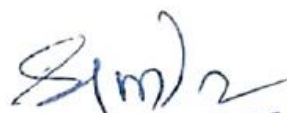
Interviews and presentation
5. Writing

Essay writing and story writing
6. Reading

Reading comprehension

TOTAL: 30 hours

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
Programme													
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO – 1	W	W	M	W	W	S	S	S	W	W	M	W	S
CO – M	W	W	W	W	W	S	S	M	W	M	M	S	M
CO – 3	W	W	W	W	W	S	S	S	W	S	M	W	M
CO – 4	W	W	W	W	W	S	S	S	W	M	M	W	M


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ELECTIVES

P20MCA510 - FULL STACK WEB DEVELOPMENT

L	T	P	C	M
2	0	2	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the architecture of Web Application Architecture.
- Learn the basic concepts of Node JS and creating the applications in Node js.
- Be familiar with the file systems concepts of in Node.js..
- Gain a working knowledge of React and learn how to create an application.
- Acquire in-depth knowledge in Mongo DB.

Unit – I Introduction **9**

Web Application Architecture - Understanding Basic web development framework - Components of Web Applications Architectures – Web Services – Java Script Primer – Understanding Node.js, capabilities of Node.js - Uses – Setting up Node.js.

Unit – II Basics of Node.js **9**

Working with Node.js Packages – Creating applications – Data to Console – Events, Listeners, Timers and call backs in Node.js – Handling Data I/O in Node.js.

Unit – III Advance Node.js **9**

File Systems in Node.js – HTTP Services – Socket Services in Node.js – Scaling Applications - Additional Modules

Unit – IV Working with React.js **9**

Features of React – Advantages – Limitations – Setting up the environment – creating a React Application – Command – Creating React Components.

Unit – V Building Database using Mongo DB **9**

Understanding NoSQL and Mongo DB – Building the MongoDB Environment – User Accounts – Access Control – Adding MongoDB Driver to Node.js – Connection – Objects Used in MongoDB – Accessing and Manipulating Databases, Collections – Manipulating MongoDB Documents from Node.js, Connecting to MongoDB Database using Mongoose.

List of Programs:

1. Install Node JS and execute simple programs.
2. Create / Design a function to invoke its properties.
3. Design an application to handle the Data I / O in Node JS.

4. Create a module that display the current Time / Date.
5. Build an HTTP Server with Node.JS using HTTP APIs.
6. Design an application by reading to and writing from the File systems of Node.js.
7. Create a React Application that reads data from one to another component.
8. Create a Counter Component using React.
9. Develop an application using Node JS, React with MongoDB.

TOTAL= 60 Hours

COURSE OUTCOMES:

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

- Explain the architecture of Web Application Architecture.
- Demonstrate applications using Node.js.
- Design the web application using the several services of Node.js.
- Explain the basics of React and design the applications.
- Develop complete web services using Node.js, React and Mongo DB.

REFERENCES

1. **Frank Zammetti, Modern Full-Stack Development Using TypeScript, React, Node.js, Webpack, and Docker, Apress, 2020. (Unit I to V)**
2. Brad Dayley, Node.js, MongoDB and AngularJS Web Development: The Definitive Guide to Building JavaScript-Based Web Applications from Server to Frontend, Addison-Wesley Professional, 2014.
3. David Herron, Node.js Web Development: Create real-time server-side applications with this practical, step-by-step guide, Packt Publishing; 3rd Revised edition,2016.
4. Dinesh Rajput, Designing Applications with Spring Boot 2.2 and React JS, BPB Publications, 2019.
5. David Choi, Full-Stack React, TypeScript, and Node: Build cloud-ready web applications using React 17 with Hooks and GraphQL, Packt Publishing, 2020.

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 O a	P O b
P20MCA510.1	Explain the architecture of Web Application Architecture.	S	S	S	S	S	S	S	M	M	S	W	S	M	S	S
P20MCA510.2	Demonstrate applications using Node.js.	S	S	S	S	S	S	S	M	M	S	W	S	M	S	S
P20MCA510.3	Design the web application using the several services of Node.js.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA510.4	Explain the basics of React and design the applications.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA510.5	Develop complete web services using Node.js, React and Mongo DB.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S


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P20MCA511 - ADVANCED JAVA PROGRAMMING

L	T	P	C	M
2	0	2	3	100

Course Objectives:

This course will enable the student to:

- Understand the architecture of Java Enterprise Edition and the concepts of Java archives (JAR).
- Learn the architecture of Java Bean and design applications using Enterprise Java Bean.
- Be familiar with networking concepts in Java and implement a simple client / server application.
- Gain a working knowledge of Servlet and learn how to create a JSP application.
- Acquire an in-depth knowledge in Java Enterprise applications with Spring Boot framework.

UNIT I - JAVA NETWORKING 9

Java Network Programming - Networking basics - InetAddress - TCP/IP client sockets - TCP/IP Server Sockets - URL - URL Connections - Datagram - RMI Technology - A simple client/server application using RMI.

UNIT II - JAVA SERVLET & JSP 9

Introduction - The life cycle of a servlet - Using Tomcat for servlet development - A simple servlet - The servlet API - The javax.servlet package - Reading servlet parameters - The javax.servlet.http package - Handling HTTP requests and responses - Using Cookies - Session Tracking - Introduction to JSP - JSP overview - Setting JSP environment - JSP application development: Generating Dynamic content.

UNIT III - ENTERPRISE JAVA BEAN 9

EJB's Architecture: Overview of EJB's Software Architecture - Building and Deploying EJBs - Roles in EJB - EJB Session Beans - EJB Entity Beans: When to use Entity Beans - Entity Bean life cycle - EJB Clients: EJB Bean as a client to another Bean - Servlet client - Applet client - Deployment: Deployment Descriptor class - Session Descriptor class - Entity Descriptor class - Building a simple application with EJB.

UNIT IV - JAVA ENTERPRISE EDITION 9

Introduction - Enterprise Architecture Styles - J2EE Architecture - Containers - J2EE Technologies - Developing J2EE Applications - Naming and directory services - Using JNDI - JNDI Service providers - Choosing a J2EE Implementation: Implementing the J2EE

Specifications - J2EE packaging and Deployment: J2EE packaging overview - Configuring J2EE packages - Java Archives (JAR): Creating JAR, Extracting JAR.

UNIT V - JAVA ENTERPRISE FRAMEWORK - SPRING BOOT

9

Spring Boot: Introduction - Bootstrapping - Layout of Spring Boot application - Application properties - Exception Handling -Servlet filter -Rest Template - Scheduling - Admin Server - Admin Client - Sending Email - Securing web applications - File Handling - Upload and Download files. Spring Cloud: Features- components- Differences between Spring Boot and Spring Cloud.

TOTAL = 60 Hours

List of Programs:

1. Create a two-way chat application using java sockets. (Unit I)
2. Create a simple client - server RMI application (Unit I)
3. Create simple registration form in servlet. (Unit II)
4. A Servlet can be used with an HTML form tag to allow users to upload files to the server. An uploaded file could be a text file or image file or any document. (Unit II)
5. Develop a student application that prints the student details using java beans. (Unit III)
6. Develop a basic JNDI tasks of getting an initial context to a naming system and looking up an object in that naming system. (Unit IV)
7. Develop a J2EE securing web application that implements the different security techniques such as:
 - (i) Authentication (ii) Authorization (iii) Data Integrity (iv) Auditing (Unit IV)
8. Create a simple Spring Boot application using STS. (Unit V)

COURSE OUTCOMES:

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


- Implement Java networking applications for client/server communications.
- Demonstrate applications using Java Servlets and JSP.
- Design the EJB application with the beans, categorize the different kinds of beans, and illustrate the software architecture of EJB.
- Explain the basics of a J2EE platform in terms of service providers and different types of servers. Configure and deploy the J2EE applications.
- Develop java enterprise applications using Spring Boot framework.

REFERENCES

1. Herbert Schildt, "Java - The Complete Reference", 11th Edition, Tata McGraw Hill, 2019. - (Unit I, Unit II).
2. Hans Bergsten, "Java Server Pages", 3rd Edition, O'Reilly Media, December 2003. - (Unit II - Chapters: 1, 3, 4 and 5).
3. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming(J2EE 1.3 Edition), ", A Press Publishers, 2018 - (Unit IV: Chapters: 1, 2, 23 & 24)
4. Tom Valesky, Enterprise Java Beans, Pearson Education, 2002. - (Unit III)
5. Craig walls, "Spring Boot inaction", Manning Publications, 1st edition,2016.
6. Moisés Macero García,"Learning microservices with SpringBoot", Apress; 2nd edition,2020
7. Greg L. Turnquist , "Learning SpringBoot 2.0" , Packt Publishing, 2nd Edition,2017

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
P20MCA511.1	Implement Java networking applications for client/server communications.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA511.2	Demonstrate applications using Java Servlets and JSP.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA511.3	Design the EJB application with the beans, categorize the different kinds of beans, and illustrate the software architecture of EJB.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA511.4	Explain the basics of a J2EE platform in terms of service providers and different types of servers. Configure and deploy the J2EE	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S

	applications.															
P20MCA511.5	Develop java enterprise applications using Spring Boot framework.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S


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P20MCA512 ADVACNED WEB PROGRAMMING

L	T	P	C	M
2	0	2	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Design interactive user interfaces for real time web applications.
- Apply the knowledge of client side scripting in the given scenarios
- Apply the knowledge of server-side scripting in the given scenarios.
- Implement the concepts of advanced server side scripting in the real time scenarios
- Connect the front end with databases and deploy the application in cloud server or in a local server.

UNIT I - UI DEVELOPMENT 8

Introduction to BootstrapBS4 : Containers – Topography - UI elements – Grid – JS Components - JS alert – JS Button – JS Modal – JS Tab – JS Toasts – JS Tooltip

UNIT II – CLIENT-SIDE SCRIPTING 10

JQuery : Introduction-Basics - Syntax – Selectors - Events – JQuery HTML -Get – set – add – remove – CSS classes - Dimensions– JQuery traversing -Ancestors – Descendants – Sibling – Filtering - JQuery AJAX- Load- Get/Post

UNIT III – BASICS OF PHP SERVER-SIDE SCRIPTING 9

PHP Basics – Installation – Syntax – Comments – Variables – Datatypes – Strings – Constants – Loops – If ..else – Arrays – RegEx- OOPS – Classes and objects – Constructors – De- constructor- Access modifiers – Inheritance – Constants – Abstract classes – Interfaces – Static methods – Properties – Iterables

UNIT IV – ADVANCED CONCEPTS OF PHP SERVER SIDE 10

PHP FORMS – PHP AJAX – Database – XML – Live Search – Poll– PHP File Handling – PHP JSON – PHP sessions – Filters – Call-back functions – RESTAPI development using POSTMAN tool

UNIT V – DATABASE AND DEPLOYMENT 8

Creating a database in MariaDB – Creating a table in MariaDB- PHP functions in MariaDB - Connecting MariaDB with PHP – Checking the connection – Executing the request – Deployment in cloud server– Amazon - Deployment in Local Server – XAMPP.

List of Programs:

1. Design a responsive web page that uses the features of Bootstrap (Unit I)
2. Create the following simple applications in JQuery (Unit II)
 - Create a Zebra Stripes table effect
 - Scroll to the top of the page
 - Restrict "number"-only input for textboxes including decimal points
 - Animate an element, by changing its height and width
 - Toggle between fading in and fading out different boxes
3. Create the following simple applications in PHP (Unit III)
 1. Sorting arrays in descending numerical order
 2. PHP form validation
 3. PHP super globals – \$_GLOBAL, \$_REQUEST, \$_POST, \$_GET,\$_SERVER
 4. Regular expressions to do a case – insensitive count of the number of occurrences of a particular string
 5. Connect, login, and close an FTP connection
 6. Send a simple email
4. Design a simple application that uses the Geolocation API to return the coordinates of where the browser is located.(Unit IV)
5. Create a simple user registration and login web application using the features of Bootstrap, JQuery, PHP, WEB API and MariaDB. (Unit V)
6. Development of a dashboard application using Bootstrap, HTML5 and PHP REST API (Unit V)

TOTAL = 60 Hours

Course Outcomes:

- Design top- notch unique user interface design that enhances the visual representation of an application.
- Develop efficient client-side script that respond immediately to user’s actions and do not require trip to the server.

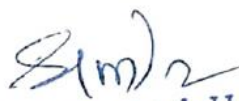
- Create resourceful dynamic web pages using scripts on web server
- Apply server-side scripts in real time applications that retrieve and generate content
- Develop a web application that connects front end with back end and deploy it in the cloud or local server.

References:

1. Jorg Krause, “Introducing Bootstrap 4: Create Powerful Web Applications Using Bootstrap 4.5”, Apress, Second edition, 2020 (Unit I).
2. Mary Delamater,Zak Ruvalcaba,”Murach’s Javascript and JQuery”,Mike Murachs and Associates, Fourth Edition , 2020 (Unit II).
3. Adrian W. West, Steve Prettyman ,” Practical PHP 7, MySQL 8, and MariaDB Website Databases: A Simplified Approach to Developing Database-Driven Websites”, Apress, Second Edition, 2018 (Unit III,IV,V).
4. Russell J.T. Dyer, Learning MySQL and MariaDB, O'Reilly Media, First Edition, 2015.
5. Jennifer Kyrnin , Bootstrap in 24 Hours, Sams Publishing, First edition, 2015.
6. Benjamin Jakobus, Jason Marah , “Mastering Bootstrap 4” Packt Publishing Limited, 2016.
7. Jacob Lett, “Bootstrap Reference Guide: Bootstrap 4 and 3 Cheat Sheets Collection”, Bootstrap Creative, 2018.

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	PS O a	PS O b
P20MCA512.1	Design top-notch unique user interface design that enhances the visual representation of an application.	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA512.2	Develop efficient client-side script that	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S

	respond immediately to user's actions and do not require trip to the server.																
P20MCA512.3	Create resourceful dynamic web pages using scripts on web server.	S	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA512.4	Apply server-side scripts in real time applications that retrieve and generate content.	S	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S
P20MCA512.5	Develop a web application that connects front end with back end and deploy it in the cloud or local server	S	S	S	S	S	S	S	S	M	W	S	W	S	M	S	S


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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:

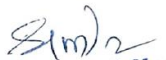
At the end of the course the student should be able to:

- 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, Rahul Rai, "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.	W	W	W	W	W	W	S	W	W	W	W	W	W	W	W
P20MCA513.2	Explain the architecture of Microservices.	W	S	S	W	W	M	M	W	W	S	S	S	W	S	W
P20MCA513.3	Describe DevOps and the common tools used in DevOps.	S	S	S	W	S	S	S	S	W	W	W	W	W	S	S
P20MCA513.4	Apply Microservices in DevOps.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
P20MCA513.5	Develop, integrate and deploy projects using DevOps.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S


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