SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962
A^{++} Accredited by NAAC (2021) with CGPA 3.52

Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

Master of Computer Applications
Part II

under
Faculty of Science and Technology

(To Be Implemented From Academic Year 2024-25)

Programme Structure

Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
M.C.A. (Science) Part – I (Level-6.0)

	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures + Tutorial/ (Hours/ week)	Practical (Hours/ week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
Semester-I										
Major Mandatory	MMT-101	4	--	4	80	32	3	20	8	1
	MMT-102	4	--	4	80	32	3	20	8	1
	MMPR-103	--	8	4	80	32	3	20	8	1
	MMT-104	2	--	2	40	16	2	10	4	1
Major Elective	MET-105	4	--	4	80	32	3	20	8	1
	MET-106									
Research Methodology	RM-107	4	--	4	80	32	3	20	8	1
Total				22	440			110		
Semester-II										
Major Mandatory	MMT-201	4	--	4	80	32	3	20	8	1
	MMT-202	4	--	4	80	32	3	20	8	1
	MMPR -203	--	8	4	80	32	3	20	8	1
	MMT-204	2	--	2	40	16	2	10	4	1
Major Elective	MET-205	4	--	4	80	32	3	20	8	1
	MET-206									
OJT/FP	OJT-207	--	--	4	80	32	3	20	8	1
Total				22	440			110		
Total (Sem I + Sem II)				44						

<table>
<tr><td>• MMT–Major Mandatory Theory
• MMPR–Major Mandatory Practical
• MET–Major Elective Theory
• MEPR–Major Elective Practical
• RM - Research Methodology
• OJT/FP- On Job Training/ Field Project</td><td>• Total Marks for M.C.A.-I : 1100
• Total Credits for M.C.A. -I (Semester I & II) : 44
• Separate passing is mandatory for University and Internal Examinations</td></tr>
<tr><td colspan="2">*Evaluation scheme for OJT/FP shall be decided by concerned BOS</td></tr>
<tr><td colspan="2">• Requirement for Entry at Level 6.0: Completion of Level 5.5</td></tr>
<tr><td colspan="2">• Requirement for Exit after Level 6.0:
Students can exit after completion of Level 6.0 with Post Graduate Diploma in Computer Application</td></tr>
<tr><td colspan="2">• Requirement for Entry at Level 6.5: He/ She have completed MCA Part-I (Level 6.0)</td></tr>
</table>

Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
M.C.A. (Science) Part – II (Level-6.5)

	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures + Tutorial (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
Semester-III										
Major Mandatory	MMT-301	4	--	4	80	32	3	20	8	1
	MMT-302	4	--	4	80	32	3	20	8	1
	MMPR -303	--	8	4	80	32	3	20	8	1
	MMT-304	4	--	2	40	16	2	10	4	1
Major Elective	MET-305	4	--	4	80	32	3	20	8	1
	MET-306									
Research Project	RP-307	--	--	4	80	32	--	20	8	--
Total				22	440			110		
Semester-IV										
Major Mandatory	MMT-401	4	--	4	80	32	3	20	8	1
	MMT-402	4	--	4	80	32	3	20	8	1
	MMPR-403	--	8	4	80	32	3	20	8	1
Major Elective	MET-404	4	--	4	80	32	3	20	8	1
	MET-405									
Research Project	RP-406	--	--	6	100	40	--	50	20	--
Total				22	420			130		
Total (Sem III + Sem IV)				44						

• MMT–Major Mandatory Theory • MMPR–Major Mandatory Practical • MET–Major Elective Theory • MEPR–Major Elective Practical • RP- Research Project	• Total Marks for M.C.A..-II : **1100** • Total Credits for M.C.A.-II (Semester III & IV) : 44 • ***Separate passing is mandatory for University and Internal Examinations***
# Evaluation scheme for Research Project shall be decided by concerned BOS	
## Evaluation scheme for Research Project shall be decided by concerned BOS	
• **Requirement for Exit after Level 6.5:** **Students can exit after completion of Level 6.5 with Master of Computer Application**	

Course Codes

M.C.A. Semester-I		
Course Code	**Major Mandatory**	
MMT-101	Advanced Data Structures (4 credits)	**MSU0325MML929G1**
MMT-102	Database Management System (4 credits)	**MSU0325MML929G2**
MMPR-103	Practical-I (4 credits)	**MSU0325MMP929G1**
MMT-104	Cyber Security (2 credits)	**MSU0325MML929G3**
RM-107	Research Methodology (4 credits)	**MSU0325RML929G**
	Major Elective	
MET-105	Computer Networks (4 credits)	**MSU0325MEL929G1**
MET-106	Computer Architecture (4 credits)	**MSU0325MEL929G2**
M.C.A. Semester-II		
	Major Mandatory	
MMT-201	Advanced Operating System (4 credits)	**MSU0325MML929H1**
MMT-202	Java Programming (4 credits)	**MSU0325MML929H2**
MMPR-203	Practical-II (4 credits)	**MSU0325MMP929H1**
MMT-204	Web Technology (2 credits)	**MSU0325MML929H3**
OJT-207	Internship (4 credits)	**MSU0325OJ929H**
	Major Elective	
MET-205	Network Security (4 credits)	**MSU0325MEL929H1**
MET-206	Software Engineering (4 credits)	**MSU0325MEL929H2**
M.C.A. Semester-III		
	Major Mandatory	
MMT-301	Artificial Intelligence (4 credits)	**MSU0325MML929I1**
MMT-302	Front End Development (4 credits)	**MSU0325MML929I2**
MMPR-303	Practical-III (4 credits)	**MSU0325MMP929I1**
MMT-304	PHP (2 credits)	**MSU0325MML929I3**
RP-307	Research Project (4 credits)	**MSU0325RP929I**
	Major Elective	
MET-305	Cloud Computing (4 credits)	**MSU0325MEL929I1**
MET-306	Data Science (4 credits)	**MSU0325MEL929I2**
M.C.A. Semester-IV		
MMT-401	Mobile Application Development (4 credits)	**MSU0325MML929J1**
MMT-402	Back End Development (4 credits)	**MSU0325MML929J2**
MMPR-403	Practical-IV (4 credits)	**MSU0325MMP929J1**
RP-406	Research Project (6 credits)	**MSU0325RP929J**
	Major Elective	
MET-404	Block Chain Technology (4 credits)	**MSU0325MEL929J1**
MET-405	Machine Learning (4 credits)	**MSU0325MEL929J2**

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Artificial Intelligence
Course Code: MMT-301
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Apply problem solving by intelligent search approach.
2. Represent knowledge using knowledge representation techniques.
3. Understand working of Artificial Neural Networks.
4. Derive solutions for problems with uncertainty using Fuzzy theory.
5. To develop a good understanding of Natural Language Processing and Genetic algorithm

UNIT-I **(15 Hours)**
Introduction of AI and Problem Solving: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, uninformed search and informed search, heuristic search, hill climbing, Best first search, A* algorithm, AO* algorithm, constraint satisfaction, Game playing: Minmax search procedure, refining Minmax, Alpha –Beta pruning

UNIT-II **(15 Hours)**
Knowledge Representation: Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate logic, WFF, Free and Bound Variables, Normal Forms, Inference Techniques, Resolution, Unification, Modes Pones, Frames, Frame Representation Language, Semantic Net, Forward and Backward Reasoning

UNIT-III **(15 Hours)**
Artificial Neural Networks: Introduction, Basic Concepts of **A**rtificial Neural Networks, Model of an Artificial Neuron, Activation Functions, Feed forward Network, Recurrent Network, Introduction to deep learning and deep neural network. **Fuzzy Set Theory**, Fuzzy Membership, Fuzzy Operations, Fuzzy Logic Systems.

UNIT-IV **(15 Hours)**
Natural Language Processing: Introduction, Phases of NLP, advantages, disadvantages, applications. **Genetic Algorithm**: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Introduction to **Expert System.**

Reference Book

1. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill
2. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers , Inc., San Francisco, California, 2000.
3. Saroj Kaushik , Artificial Intelligence, Cengage Learning
4. B. Yegnanarayana, Artificial Neural Networks, Prentice-Hall of India
5. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran, G. A. Vijayalakshmi Pai, Prentice-Hall of India, 2003
6. Artificial Intelligence: A Modern Approach, 2nd edition, by Russell and Norvig, Prentice Hall

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Front End Development
Course Code: MMT-302
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. understand the basics of web design
2. gain proficiency in HTML and CSS
3. understand the importance CSS
4. utilize the JavaScript with websites

UNIT I **(15 Hours)**

Introduction to web design principles, overview of web development technologies and tools, understanding the role of HTML, CSS, and JavaScript, HTML basics, HTML elements, Attributes, heading, paragraphs, Styles, Formatting, Quotations, colors, links, images, table, list tags, Iframe, File paths, HTML layouts, Introduction to CSS syntax and selectors, applying styles to HTML elements, managing layouts using CSS

UNIT II **(15 Hours)**

Overview of JavaScript and its role in web development, setting up the development environment, Writing and executing JavaScript code, Declaring and assigning variables, working with numbers, strings, booleans, and arrays, Type coercion and type conversion, Conditional statements, Switch statements, Loops, Break and continue statements, Element Access in Javascripts, Event and event handling, dialog boxes, Defining and invoking functions, working with arrays, Introduction to objects and properties, Object-oriented programming concepts

UNIT III **(15 Hours)**

Introduction to Nodejs, Architecture of Nodejs Application, Advantages of Node JS, Synchronous and Asynchronous Programming, Call back Function in nodejs, Promises in Nodejs, Mongodb with Nodejs, Design the Schema in Nodejs, Design the Rest API's, GET, POST, PUT, DELETE, JSON web Token Authentication in nodejs, Create the Auth APP in nodejs

UNIT IV **(15 Hours)**

NodeJS Modules, Functions, Buffer, Module, Module Types, Core Modules, Local Modules, Module.Exports, NPM, Installing Packages Locally, Adding dependency in package.json, installing packages globally, updating packages, Fs.read File, Writing a File, Writing a file asynchronously, Opening a file, Deleting a file, Other IO Operations, When to use Event Emitters, Binding Functions to Events, Event Requests, Event Listening

References

1. Head First HTML and CSS by Elizabeth Robson and Eric Freeman
2. HTML, CSS, and JavaScript All in One by Meloni and Kyrin's
3. HTML5andCSS3 All-in-One For Dummies –by Andy Harris
4. Node.js web development by David Herron
5. Beginning Node.js, Express & MongoDB Development by Greg Lim
6. Node.js Design Patterns by Mario Casciaro and Luciano Mammino

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Practical-III
Course Code:MMPR-303
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

Practical's will be based on MMT-302 and MMT-304

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: PHP
Course Code:MMT-304
Total Credits: 02
Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Understand the basic concept of PHP language.
2. Understand the Object-oriented PHP.
3. Understand the construction of PHP scripts for development of dynamic web content
4. Understand the PHP connection with MYSQL

UNIT-1 **(15 Hours)**

PHP installation, , Basics PHP Syntax, Variables, Variables Scope, echo and print Statements, Data Types, PHP Strings, Operators, Loops, Conditional Statements, Functions, recursive functions, Arrays, Classes & Object Concepts, Object Properties & Methods, Object constructors and destructors, Static Method, Class Inheritance, Abstract Class, Implement Inheritance.

UNIT-2 **(15 Hours)**

Form Handling, PHP Form Validation, Embedding PHP in web pages, redirecting output to browser. Cookies, Sessions, Introduction to MySQL, Data types, attributes, working with databases, working with tables, altering table structure; Database Connectivity-Using the MYSQLI extension, setting up the connection, handling errors, querying the database, working with prepared statements, auto commit mode, committing and rolling back a transaction.

References:
1. Ellie Quigley, PHP and MySQL
2. Luke Welling, Laura Thomson, “PHP and MySQL Web Development 4/E”, Pearson
3. “Web Technologies Black Book”, dreamTech
4. Matt Doyle, Beginning PHP 5.3, (Wrox – Wiley Publishing)
5. Joel Murach, Ray Harris, Murach’s PHP and MySQL -
6. Brett McLaughlin, PHP & MySQL: The Missing Manual

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Cloud Computing
Course Code:MET-305
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Deal with the fundamentals and essentials of Cloud Computing
2. Understand the basic ideas and principles in data centre design; cloud management techniques and cloud software deployment considerations
3. Understand the impact of emerging technologies on cloud computing
4. Understand cloud storage technologies and relevant distributed file systems
5. Expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research
6. Anticipate and adapt to future developments in the cloud computing industry

UNIT I **(15 Hours)**

Definition, characteristics, and benefits of Cloud Computing, Evolution and history of Cloud Computing, Cloud service providers and their offerings, Overview of cloud architectures and components, Introduction to virtualization, Types of virtualization, Virtualization platforms, Managing virtual machines and virtual networks, Infrastructure as a Service (IaaS) and its components, Platform as a Service (PaaS) and its advantages, Software as a Service (SaaS) and its applications, Comparison and use cases of different service models,

UNIT II **(15 Hours)**

Public, private, and hybrid clouds, Pros and cons of each deployment model, Cloud service provider selection criteria, Cloud migration strategies and considerations, Object storage, Block storage e.g. Amazon EBS, Azure Disk Storage, Database as a Service e.g. Amazon RDS, Azure Cosmos DB, Data backup and disaster recovery in the cloud, Cloud security challenges and threats, Identity and access management in the cloud, Encryption and data protection mechanisms, Compliance standards and regulations e.g. HIPAA, GDPR, Scaling principles and techniques, Load balancing and auto-scaling

UNIT III **(15 Hours)**

Designing highly available and fault-tolerant architectures, Monitoring and performance optimization, DevOps principles and practices, Continuous Integration and Continuous Deployment (CI/CD), Edge computing and Internet of Things (IoT), Edge computing architectures and use cases, Deploying applications at the network edge, Edge computing innovations, Artificial Intelligence (AI) and Machine Learning (ML) in the cloud, Future directions and career opportunities in Cloud Computing

UNIT IV **(15 Hours)**

Serverless Computing, Blockchain, Cloud Security and Resilience, Evolution of Cloud Gaming, Database options in the cloud, Relational and NoSQL databases, Serverless databases and scalability, Cloud-based AI services and frameworks, Latest trends and future directions in cloud computing, Introduction to quantum computing principles, Quantum computing's potential impact on cloud computing, Exploring quantum computing applications in the cloud, Overview of future trends and directions in cloud computing, Evolving cloud computing business models, Anticipating and adapting to future developments

References

1. Cloud Computing For Dummies by Judith Hurwitz
2. Cloud Computing: From Beginning to End by Mr Ray J Rafaels
3. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More by Kris Jamsa
4. Virtual Machine in Cloud Computing by Manan Shah, Charusmita Shah

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Data Science
Course Code:MET-306
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Gain an in-depth understanding of Data Science processes, data wrangling, data exploration, data visualization, hypothesis building, and testing
2. Install the required Python environment and other auxiliary tools and Libraries
3. Gain an in-depth understanding of supervised learning
4 Use the matplotlib library of Python for data visualization.
5 Get introduced to emerging data science techniques

UNIT-I **(15 Hours)**
Introduction of Data Science, Need of Data Science, Role of Data Scientist, Tools for Data Science, Applications Of Data Science, Facets of Data, Benefits of Data, Data Science Process, The Big Data and Hadoop Ecosystem, Data Science and NoSQL Databases ,Introduction of Data Science Python Libraries.

UNIT-II **(15 Hours)**
Categories Of Data, Basic Terminologies In Statistics, Sampling Techniques, Types Of Statistics Descriptive Statistics, Measures Of Centre, Measures Of Spread, Information Gain And Entropy Confusion Matrix, terminologies In Probability, Probability Distribution, Types Of Probability Bayes' Theorem, Inferential Statistics, Point Estimation, Interval Estimation, Estimating Level Of Confidence, Hypothesis Testing.

UNIT-III **(15 Hours)**
Data Analysis: Introduction to data analysis, Types of data analysis, Process of Data Analysis, tools of Data Analysis, Applications of Data Analysis, **Data Wrangling** : Pre-processing Data in Python, Dealing with Missing Values in Python ,Data Formatting in Python, Data Normalization in Python, Binning in Python, Turning categorical variables into quantitative variables, Exploratory Data Analysis, Feature engineering. Introduction of mathematical computing with NumPy and Scientific Computing with Python (Scipy). visualization of data using Matplotlib and Seaborn

UNIT-IV **(15 Hours)**
Capstone projects, Auto ML, Auto EDA, Deep Learning, Data Ethics and Privacy, Introduction to Big Data Technologies: Hadoop and Spark, current and future trends in Data Science, AI ethics, and data-driven decision-making.

References:
1. Data Science from Scratchby Joel Grus, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA
2. Machine Learning, Tom Mitchell.
3. Hari Shreedharan, Using Flume Flexible, Scalable, and Reliable Data Streaming, O'Reilly Media
4. Kord Davis, Ethics of Big Data: Balancing Risk and Innovation, O'Reilly.
5. Tom White, Hadoop – A Definitive Guide, O'Reilly.
6. Goodfellow, I., Bengio, Y., Courville, A., &Bengio, Y. (2016). Deep learning (Vol.1). Cambridge: MIT press.
7. Deep Learning with Python, François Chollet

M. C. A. Science (Part II) (Level-6.5) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Research Project
Course Code:RP-307
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. find current research domains in computer science
2. identify different research journals in computer science domains
3. understand citations, impact factors, references etc.
4. identification of appropriate societal issues.
5. development of applications to address identified societal issue.

- Student has to identify research problem in the semester-III and have to carry out thorough literature review / student can develop a application project which will address societal issues.

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Mobile Application Development
Course Code:MMT-401
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Learn about the features and installation of Android and kotlin
2. Learn about basic programming with Android Kotlin
3. Develop mobile applications using database Connections
4. Develop simple mobile applications in Flutter using Dart language
5. Create a full-fledged mobile app and deploy

UNIT-I (15 Hours)

Introduction to Android platform and the Android Studio IDE, Android Architecture, Setting up development environment, How to create project in Android Studio using Kotlin, Deploying sample application on a real device, Emulator-Android Virtual Device, Android Manifest.xml, Resources & R.java Activity lifecycle, Android Components-Activities, Services, Broadcast Receivers & Content providers,

UNIT-II (15 Hours)

Activities and Activity lifecycle. First sample Application Views & notifications, Components for communication -Intents & Intent Filters , Android TextView and EditText, Kotlin Android Toast, Android Button, Android Custom Toast, Android Explicit Intent, Android Implicit Intent,

UNIT-III (15 Hours)

Android ListView, Recycler View, Adapters, Introduction to SQLite Database, Using Room Persistence Library, Data Saving, Retrieving, Loading, Storing Data in your app, Storing Data using SQLite, Kotlin Android SQLite Database CRUD, publishing app.

UNIT-IV (15 Hours)

Features of Flutter- Advantages of Flutter- Disadvantages of Flutter. Flutter Installation-Installation in Windows, Creating Simple Application in Android Studio - Architecture of Flutter Applications Widgets- Gestures- Concept of State- Layers- Introduction to Dart Programming-Variables and Data types- Decision Making and Loops. Functions- Object Oriented Programming. Introduction to Widgets- Widget Build Visualization, Type of Layout Widgets- Single Child Widgets- Multiple Child Widgets- Advanced Layout Application-Introduction to Gestures- Statement Management in Flutter.

References:

1. Professional Android 4 Application Development Reto Meier Wrox
2. Android Application Development: Programming with the Google SDK 2009 by Rick Rogers, John Lombardo, Zigurd Mednieks, G. Blake Meike
3.Beginning App Development with Flutter by Rap Payne
4..Flutter in Action by Eric Windmill
5. Marco L. Napoli, “Beginning Flutter: A Hands on Guide to App Development™, John

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Back End Development
Course Code:MMT-402
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Students will be able to develop application using MVC
2. Students will be able to understand Entity Framework
3. Students will be able to understand Web API

UNIT I **(15 Hours)**

Introduction to MVC, Benefits of using ASP.NET MVC, Role of Model, View, and Controller,ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining a data model, Creating strongly-typed views, Razor View Engine: Razor Basics, Razor design goals, Implementation of Razorview, Razor syntax

UNIT II **(15 Hours)**

Using Entity Framework: Crud Operations, Crud Operation Using BO Class, Crud Operations Using Generic BO Class. Authentication and Authorization: Windows Authentication, Forms Authentication, Role Based Authentication, Working with URLs and Routing: Understanding the Routing Mechanism, Adding a Route Entry, Using Parameters, Using Defaults, Using Constraints

UNIT III **(15 Hours)**

Introduction to MongoDB (No-sql), Difference between NoSQL and RDBMS, Benefits of NoSQL, Objectives, Design Goals, The Mongo Shell, JSON Introduction, JSON Structure, Collections in MongoDb, Documents In mongoDb, Inserting data into database, Filter queries in Mongodb Database, Schema Validation in MongoDb database, Indexing In collections, Aggregation in MongoDb, Embedded Document in MongoDb

UNIT IV **(15 Hours)**

Schema Design Pattern, Case Studies & Tradeoffs, Storage Classes, Automatic Storage Class, Static Storage Class, External Storage Class, Register Storage Class, Performance Using Indexes, Monitoring And Understanding Performance, Performance In Sharded Environments, Aggregation Framework Goals, The Use of The Pipeline, Comparison With SQL Facilities

Overview of Express.js and its role in web application development, Defining routes for handling different HTTP methods and URLs, Creating and using middleware functions for various purposes, Integrating and using templating engines, Serving static files with Express.js.

References

1. ProfessionalASP.NETMVC5,byJon Galloway, Brad Wilson,K.Scott Allen, David Matson
2. ASP.NETMVC4 and the WebAPI: Building a REST Service from Start to Finish by Jamie Kurtz

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Practical-IV
Course Code:MMPR-403
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

Practical's will be based on MMT-401 and MMT-402

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Block Chain Technology
Course Code:MET-404
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Understand the concept of Blockchain Technology, transactions, block, PoW, Consensus
2. Understand the simulation of blockchain technology without any central controlling or trusted agency and how bitcoin cryptocurrency work.
3. Understand the concept of digital currency, how it can be protected against fraud, scam, hacking and devaluation.
4. Understand the concept of bitcoin and Etherum.

UNIT-I **(15 Hours)**
History of Blockchain Technology: Basics of blockchain, History, Uses of Blockchain, Structure of a block, Transactions, Understand the difference between centralized, decentralized and distributed peer to peer networks, Types of blockchains, Objectives of consensus mechanisms, famous hacks, wallet, security and safeguards Public Ledger, Distributed Consensus.

UNIT-II **(15 Hours)**
Cryptographic Primitives and Overview of what is blockchain: Cryptographic hash functions – collision free, hiding, puzzle friendly (properties), Hash Chain, Hash tree- Merkle Tree, Public Key cryptography, Digital signatures. Use of hash functions and digital signatures in blockchain, recording transaction, confirmation and verification of transaction, consensus building: distributed consensus, Consensus mechanism: PoW, PoS, PoB, PoA, blockchain architecture, Merkle root tree.

UNIT-III **(15 Hours)**
Bitcoin and Etherum: History of bitcoin, Double Spending, Script (FORTH), Mining Process, History, Architecture, Account Types , Gas, Transactions, Introduction to etherum, Ethereum Virtual Machine, Ethereum Mining process, Solidity. Hyperledger Fabric: Features of hyperledger, Architecture, ordering service, Transaction Flow, Membership and Identity Mangement.

UNIT-IV **(15 Hours)**
Privacy, Security issues in Blockchain :Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity Preservation, Case Study: Blockchain in Government Digital Identity, Healthcare, Land Registration, Supply Chain Management.

References:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Bitcoin and Cryptocurrency Technologies, Princeton University Press
2. Don Tapscott,AlexTapscott, Blockchain Revolution, ISBN No. 9781101980132
3. Mark Gates, Blockchain ultimate Guide to understanding Blockchain, Bitcoin, Cryptocurrencies, Smart Contracts and Future of money, Wise Fox Publishing
4. Vikram Dhillon, David Metcalf, Max Hooper, Blockchain Enabled Applications, Apress, ISBN No.13:978-1-4842-3081-7
5. Melanie Swan, Blockchain Blueprint for a new economy, O'Reilly, First Edition, ISBN No.978-1-491-92049-7
6. MayukhMukhopadhyay, Ethereum Smart Contract Development, Packt publishing, First Edition, ISBN No.978-1-78847-304-0
7. Chris Dannen, Introducing Ethereum and Solidity, Apress, ISBN No.978-1-4842- 2535-6
8. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design And Use Cases"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Machine Learning
Course Code:MET-405
Total Credits: 04
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. To understand fundamental concepts of machine learning and its various algorithms
2. To understand various strategies of generating models from data and evaluating them
3. To apply ML algorithms on given data and interpret the results obtained
4. To design appropriate ML solution to solve real world problems in AI domain

Unit-I **(15 Hours)**

Introduction to Machine learning, essential concepts in Machine learning, Machine learning basics: Key terminology, Key tasks of machine learning, choosing the right algorithm, Steps in developing a machine learning application. Supervised Learning : k-Nearest Neighbours classification algorithm, binary and multi-label classification.

Unit-II **(15 Hours)**

Creating scatter plots with Matplotlib, Normalizing numeric values. Decision tree, entropy and Gini index , Information gain, Tree construction, plotting trees in Python, Testing and storing the classifier, Naïve Bayesian decision theory, Conditional probability, classifying with conditional probabilities, Document classification with naïve Bayes, classifying text with python, classifying spam email with naïve Bayes.

Unit-III **(15 Hours)**

Support Vector Machines (SVM) - Introduction , goal of SVM, Working of SVM , Support Vectors, Hyperplane , Margin Model evaluation and improvement, Regularization, Bias Variance, Hyper-parameter Tuning , SVM Kernels: SVM Kernels, Polynomial Kernel, Radial Basis Function (RBF) Kernel, Pros and Cons of SVM Classifiers.

Unit-IV **(15 Hours)**

Recommender System: Introduction, Understanding Recommendation Systems, Content Based Filtering, User Based Collaborative Filtering, Item Based Collaborative Filtering, Methods and tricks of the trade, Issues in Recommendation Systems.

References:

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020)
2. Tom M. Mitchell- Machine Learning - McGraw Hill Education, International Edition
3. Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly
   Media, Inc. 2nd Edition
4. Illustrated edition Christopher M. Bishop Pattern Recognition and Machine Learning - Springer, 2nd edition
5. Trevor Hastie, Robert Tibshirani, and Jerome Friedman - The Elements of Statistical Learning: Data Mining, Inference, and Prediction - Springer, 2nd edition

M. C. A. Science (Part II) (Level-6.5) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Research Project
Course Code:RP-406
Total Credits: 06
Course Outcomes: Upon successful completion of this course, the student will be able to:

1. investigate and design a model for research problem identified.
2. implementation of model with appropriate software tools.
3. benchmark the experimental results.
4. writing a research article.
5. identification of appropriate societal issues.
6. development of applications to address identified societal issue.

- Student have to design a model and implement for the research problem identified in semester-III / student can carry out a project which will address societal issues.
- It is preferable to publish the research work carried out in the form of Seminar/ Workshop/ Conference proceedings /Research journal publications.

Scheme of Teaching

1. Each contact session for teaching or practical should be of 60 minutes each.
2. Minimum 45 periods should be conducted for each subject of 80 Marks.
3. One Practical Batch should be of 30 students.
4. Practical evaluation should be conducted before the commencement of University examination

Examination Pattern

Theory:

- **For 4 credit course-** University examinations: 80 marks, Internal evaluation: 20 marks
    - Two tests should be conducted of MCQ type questions. Each test will be of 10 marks
- **For 2 credit course-** University examinations: 40 marks, Internal evaluation: 10 marks
    - One test should be conducted of MCQ type questions of 10 marks.
- The internal marks will be communicated to the University at the end of each semester,but before the semester end examinations. These marks will be considered for the declaration of the results.

Practical:

Practical evaluation will be through university appointed panels of one external and one internal examiner.

On Job Training:

Student has to make a presentation of the work carried out during On Job Training in front of panel external and internal examiners. He has to submit the report of work carried out as part of On Job Training.

Research Project:

- **For 4 credit course-** University examinations: 80 marks, Internal evaluation: 20 marks
    - Project viva by university appointed external and internal examiners.
    - Internal evaluation will be carried out by internal guide.
- **For 6 credit course-** University examinations: 100 marks, Internal evaluation: 50 marks
    - Project viva by university appointed external and internal examiners.
    - Internal evaluation will be carried out by internal guide.

Research Methodology:

- University examinations: 80 marks, Internal evaluation: 20 marks
    - Two tests should be conducted of MCQ type questions. Each test will be of 10 marks

Nature of Question Paper and Scheme of Marking

Theory:

1) There will be seven (7) questions of 16 Marks and out of which four (4) to be attempted from question no 2 to 6.

2) Question No.1 is compulsory and is of multiple choice questions. There will be 8 multiple choice question each carries 2 marks

3) Question No.2 to Question No. 6 should consist 2 sub question each carries 8 marks

4) Question No. 7 should be a short note, where 4 questions will be given, out of which two questions should be attempted

Practical:

1) Duration of Practical Examination: 3 Hrs

2) Nature of Question paper: There will be three questions out of which any two questions to be attempted and each question carries 30 Marks.

3) The final practical examination will be conducted by the university appointed examiners both internal as well as external at the end of semester for each lab course and marks will be submitted to the university by the panel. The pattern of final Practical Examination will be as follows;

1	Coding and Execution of Program	60 Marks
2	Viva-voce	20 Marks
3	Journal	20 Marks
4	Total	100 Marks

The practical examination will be conducted semester wise in order to maintain the relevance of the respective theory course with laboratory course.

On Job Training:

Student has to make a presentation of the work carried out during On Job Training in front of panel external and internal examiners. He has to submit the report of work carried out as part of On Job Training.

Research Project:

- Student has to identify research problem in the semester-III and have to carry out thorough literature review / student can develop a application project which will address societal issues.

- Student have to design a model and implement for the research problem identified in semester-III / student can carry out a project which will address societal issues.
- It is preferable to publish the research work carried out in the form of Seminar/ Workshop/ Conference proceedings /Research journal publications.

Equivalence of courses

M. C. A. Part I (Semester I and II)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
I	CC-101	Computer Organization	4	**MET-106**	Computer Architecture	4
I	CC-102	Operating System	4	**MMT-201**	Advanced operating system	4
I	CC-103	Python Programming	4	---	***No equivalence**	
I	CC-104	Database Management System	4	**MMT-102**	Database Management System	4
I	CC-105	Mathematical Foundations	4	---	***No equivalence**	4
II	CC-201	Design and Analysis of Algorithms	4	**MMT-101**	Advanced Data Structures	4
II	CC-202	Web Technology	4	---	***No equivalence**	4
II	CC-203	Software Engineering	4	**MET-206**	Software Engineering	4
II	CC-204	Java Programming	4	**MMT-202**	Java Programming	4
II	CC-205	Computer Oriented Numerical Methods	4	---	***No equivalence**	4

*** Two more chances be given to the student.**

M. C. A. Part II (Semester III and IV)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
III	CC-301	Artificial Intelligence	4	**MMT-301**	Artificial Intelligence	4
III	CC-302	PHP	4	---	***No equivalence**	
III	CC-303	Computer Networks	4	MET-105	Computer Networks	4

III	CC-304.1	Cyber Security	4	---	***No equivalence**	
III	CC-304.2	Natural Language Processing	4	---	***No equivalence**	4
III	CC-304.3	Computer Graphics	4	---	***No equivalence**	
III	CC-304.4	Machine Learning	4	MET-405	**Machine Learning**	4
III	CC-304.5	Theory of Computation	4	---	***No equivalence**	
III	CC-304.6	Cloud Computing	4	**MET-305**	Cloud Computing	4
III	CC-305.1	Management Information System	4	---	***No equivalence**	4
III	CC-305.2	Supply Chain Management	4	---	***No equivalence**	4
III	CC-305.3	Knowledge Management	4	---	***No equivalence**	4
III	CC-305.4	Business Process Management	4	---	***No equivalence**	4
III	CC-305.5	E-Commerce	4	---	***No equivalence**	4
III	CC-305.6	Semantic Web	4	---	***No equivalence**	4
IV	CC-401	Data Science	4	**MET-306**	**Data Science**	4
IV	CC-402	Advance Web Technology	4	**MET-302**	**Front End Development**	4
IV	CC-403	Android Development with Kotlin	4	**MMT-401**	**Mobile Application Development**	4
IV	CC-404.1	Block Chain Technology	4	**MET-404**	**Block Chain Technology**	4
IV	CC-404.2	Deep Learning	4	---	***No equivalence**	4
IV	CC-404.3	Network Security	4	MET-205	Network Security	4
IV	CC-404.4	Optimization Techniques	4	---	***No equivalence**	4

IV	CC-404.5	Robotics	4	---	***No equivalence**	4
IV	CC-404.6	Internet of Things	4	---	***No equivalence**	4
IV	CC-405.1	Business Intelligence	4	---	***No equivalence**	4
IV	CC-405.2	Enterprise Resource Planning	4	---	***No equivalence**	4
IV	CC-405.3	Human Resource Management	4	---	***No equivalence**	4
IV	CC-405.4	Big Data Analytics	4	---	***No equivalence**	4
IV	CC-405.5	Social Media Management	4	---	***No equivalence**	4
IV	CC-405.6	Web Mining	4	---	***No equivalence**	4

*** Two more chances be given to the student.**