Karmaveer Bhaurao Patil University, Satara

Syllabus for

M. Sc. I Computer Application

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2024-2025

Index

Preamble:

There are bright career prospects for computer application professionals or software professionals in recent scenario. With the opening of huge software and IT companies in India, the job opportunities for trained professionals have increased considerably. India is known to be a leader in software and IT sector.

Computer application graduates pass outs find job opportunities in a variety of environments in academia, research, industry, government, private, business organizations and so on.

They are involved in analyzing problems for solutions, formulating and testing, using advanced communications or multi-media equipment, or working in teams for product development.

The software and IT companies are the major employers of computer science graduates. They offer the best packages to the young graduates which are unmatched with other branches of science.

General Objectives of the Program:

1. To nurture academicians with focus and commitment to their subject.
2. To shape good and informed citizens from the students entering into the Programme.
3. To create a skilled workforce to match the requirements of the society.
4. To impart knowledge of Science is the basic objective of this Programme.
5. To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
6. To develop skill in practical work, experiments and laboratory materials and equipment's along with the collection and interpretation of scientific data to contribute to science.

Programme Outcomes:

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in their subject.
3. The students will be eligible to pursue higher studies abroad.
4. The students will be eligible to appear for the examinations for jobs in government organizations.
5. The students will be eligible to apply for jobs with a minimum requirement of M.Sc. Programme.

Program Specific Objectives of the Course:

1. The content of the syllabus have been framed as per UGC norms of CBCS Pattern.

2. The students are expected to understand the fundamentals, principles, mathematical, recent IT concepts and recent developments in the subject area.

3. The practical course is in relevance to the theory courses to improve the understanding of the concepts.

4. It is expected to inspire and boost interest of the students towards Computer Science as the main subject.

5. To develop the power of appreciations, the achievements in Computer and role in nature and society.

6. To enhance student sense of enthusiasm towards IT and to involve them in an intellectually stimulating experience of learning in a supportive environment.

Program Specific Outcomes:

After successful completion of B.Sc. Computer Application Course student will be able to:

1. Understand the basics of Computer Science.

2. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

3. Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Computer Science.

4. Identify their area of interest in academic, research and development.

5. Perform job in various fields' like IT, science, engineering, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.

M. Sc. Part I

Title: Computer Application

1. **Year of Implementation:** The syllabus will be implemented from June, 2024 onwards.

2. **Duration:** The course shall be a fulltime.

3. **Pattern: S**emester examination.

4. **Medium of Instruction:** English.

5. Structure of Course:

Structure and Titles of Courses of M.Sc. Course:

M.Sc. I SEM - I Computer Application

Level	Semester	Course Code	Course Title	No of Hours Per Week	Credit
6	I	MCAT 411	Database System & SQL	4	4
		MCAT 412	Information security and Cyber Law	4	4
		MCAT 413	Python Programming	4	4
		MCAT 414 E- I MCAT 414 E- II DSE (Elective: Any one among two)	E- I: Block Chain Architecture E- II: Advanced Web Technology	2	2
		MCAT 415	Research Methodology	4	4
		MCAP 416	Lab – I Based on: MCAT 411, MCAT 412, MCAT 413	4	2
		MCAP 417	Lab – II: Based on: MCAT 414	4	2
Total					22

M.Sc. I SEM - II Computer Application

Level	Semester	Course Code	Course Title	No of Hours Per Week	Credit
6	II	MCAT 421	Advanced Operating System	4	4
		MCAT 422	Android and Ios Application Development	4	4
		MCAT 423	Big Data Security	4	4
		MCAT 424 E- I MCAT 424 E- II DSE (Elective: Any one among two)	E- I: Blockchain Technology and Application E- II: ReactJS	2	2
		MCAT 425	Research Projects	8	4
		MCAP 426	Lab – I Based on: MCAT 421, MCAT 422, MCAT 423	4	2
		MCAP 427	Lab – II: Based on: MCAT 424	4	2
Total					22

Level	Semester	Course Code	Course Title	No of Hours Per Week	Credit
6	III	MCAT 531	MongoDB Development-I	4	4
		MCAT 532	Web Application Development Using Django.	4	4
		MCAT 533	Information Assurance and Security.	4	4
		MCAT 534 E- I MCAT 534 E- II DSE (Elective: Any one among two)	Cryptocurrency Technologies – E-I Or AngularJS E-II	2	2
		MCAT 535	Research Methodology	4	4
		MCAP 536	Lab Based on: MCAT 531, MCAT 532, MCAT 533	4	2
		MCAP 537	Lab Based on: MCAT 534	4	2
Total					22

Level	Semester	Course Code	Course Title	No of Hours Per Week	Credit
		MCAT541	MongoDB Development-II	4	4
		MCAT542	Data Warehousing.	4	4
		MCAT543	Big Data Mining.	4	4
6	IV	MCAT544 E- I MCAT544 E- II DSE (Elective: Any one among two)	Bitcoin Mining- E-I Or UI and UX Design -E-II	2	2
		MCAP545	Computer Application Practical Course VI	8	2
		MCAP546	Computer Application Practical Course VII	4	2
		MCAP547	On Job Training	4	4
Total					22

Semester I
MCAT 411: Database System & SQL

Course Objectives: Student should able to...
1. Understand the basic concepts and the applications of database systems
2. Explore advanced SQL techniques for complex data retrieval and manipulation
3. Understand the relational database design principles
4. Learn advanced database administration tasks using SQL

Credits=4	SEMESTER-I MCAT 411: Database System and SQL	No. of hours per unit/credits
UNIT - I	**Introduction to Database**	(15)
	Overview of database management systems, Evolution of database technology, Purpose of Database Systems, Instances and Schemas, Types of database models (relational, hierarchical, network, object-oriented), Database Languages – DDL, DML, DQL, DCL, Data base design and ER diagrams – ER Model - Entities, Attributes and Entity sets –	

	Relationships and Relationship sets.	
UNIT - II	**Overview of Relational DBMS**	(15)
	Concept of relational database, Normalization (1NF, 2NF, 3NF, BCNF), Constraints (Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint), Keys Concept with Examples: Primary Key, Candidate Keys, Structure of Relational Databases (concepts of a table)	
UNIT - III	**Basic and Advanced SQL**	(15)
	Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Working with multiple tables, Joins (INNER, OUTER, CROSS), Subqueries, Set operations (UNION, INTER SELECT), Overview of PL/SQL Programming PL/SQL Structure and Syntax, Control structures in PL/SQL.	
UNIT - IV	**Dynamic SQL**	(15)
	PL/SQL Procedures and Functions, Creating and executing stored procedures, Passing parameters to procedures and functions, IN parameter, OUT parameter, IN OUT parameter, Cursor: Definition, declaration, Types of cursor, Overview of triggers and their types, Trigger execution timing: BEFORE, AFTER, INSTEAD OF, Trigger event types: INSERT, UPDATE, DELETE	

Course Outcomes: Students should be able to...

1. Analyse a given database application scenario to use ER model for conceptual design of the database.

2. Apply SQL to find solutions to a broad range of queries.

3. Identify different normalization procedures used in database design

4. Design simple database systems for some application to interact with databases

Reference Books:

1. Avi Silberschatz , Henry F. Korth , S. Sudarshan ."Database System Concepts", 5th edition,: McGraw-Hill ,2010.

2. Ramez Elamsri, Shamkant B Navathe, "Fundamentals of Database Systems", 7 th Edition, Pearson ,2017.

3. Garcia-Molina, J D Ullman, Widom, "Database Systems: The Complete Book", 2nd Edition, Prentice-Hall, 2008.

4. Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, "Database Modeling and Design: Logical Design ", 4thEdition, Elsevier India Publications, New Delhi, 2005.

5. Johannes Gehrke, Raghu Ramakrishnan, " Database Management Systems", 3rd Edition, McGraw Hill Higher Education,2002

MCAT 412: Information Security and Cyber Law

Course Objectives: Student should able to...
1. Understand the fundamental s of cyber security and cyber crimes
2. Learn the component of information security programme
3. Gain knowledge of malware.
4. Understand the tools and methods in cybercrimes

Credits=4	SEMESTER-I MCAT 412: Information Security and Cyber Law	No. of hours per unit/credits
UNIT - I	**Information Security Concepts and Cryptography**	(15)
	Information Security Concepts: Information security issues, goals, architecture, Attacks, Security Services and Mechanisms, Introduction to Cryptography: Network security model, Steganography, Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Encryption & Decryption Techniques.	
UNIT - II	**Security Threats and Vulnerabilities**	(15)
	Overview of Security threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability. Vulnerability and Threats, Malware: Viruses, Worms, Trojan horses, Security Counter Measures; Intrusion Detection, Antivirus Software, Android security model, threat models, information tracking, rootkits, Threats in mobile applications	
UNIT - III	**Ethical Issues in Information Security & Privacy**	(15)
	Information Security, Privacy and Ethics, Cyber Crime and Cyber Terrorism, Hacking and Hacking Techniques: Ethical issues, Ethical Hacking, Attack vectors, Cyberspace and Criminal Behavior, Phishing e. Cyber Stalking/Bullying, Data Theft; Identity Theft; Fraud; Criminal Trespass, Criminal Mischief, Computer Fraud and Abuse, Traditional Problems Associated with Computer Crime	
UNIT - IV	**Cyber Law**	(15)
	Fundamentals of cyber law: Outline of legislative framework for cyber-Law, History and emergence of cyber law, Outreach and impact of cyber law, Major amendments in various statutes, Cyber Law (Information Technology Act, 2000), International Standards maintained for Cyber Security, Security Audit, Investigation by Investing Agency, Cyber Security Solutions	

Course Outcomes: Students should be able to...

1. Demonstrate structure, mechanics and evolution of various crime threats

2. Analyse the risks involved while sharing their information in cyber space

3. Demonstrate ability to use System Hacking concepts

4. Acquire security requirements with respect to software development

Reference Books:

1. Vivek Sood, Cyber law Simplified, Tata Mcgraw-Hill Publishing, 2001.

2. Linda Volonino, Reynaldo Anzaldua and Jana Godwin ,"Computer Forensics: Principles and Practices" Pearson Prentice-Hall ,2007

3. Merkow, M., & Breithaupt, "Information Security Principles and Practices",5th edition. Prentice Hall, 2005

4. Anderson, R.," Security engineering: A guide to building dependable Distributed Systems"' 2nd edition. John Wiley & Sons,2008

5. Eoghan ,"Digital Evidence and Computer Crime"Casey, , edition 2, Academic Press, 2004

MCAT 413: Python Programming

Course Objectives: Student should able to...
1. Understand basics of programming and learn the python language.
2. Introduce the file operations in python.
3. Define the structure and components of a Python program.
4. Learn Syntax and Semantics and create Functions in Python.

Credits=4	SEMESTER-I MCAT 413: Python Programming	No. of hours per unit/credits
UNIT - I	**Introduction to python**	(15)
	Introduction to python, History of Python, Features of Python, Installing Python IDES Python IDLE and Anaconda, Writing Your First Python Program, Data-types, Variables, Indentation, Comments Operators in Python – Assignment, Logical, Arithmetic etc., Taking User Input (Console), Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops.	
UNIT - II	**Functions and String**	(15)
	Defining, Calling, Types of Functions, Arguments, Strings: string slices, immutability, string functions and methods, Strings: A String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operation, List and Tuple : Values and Accessing Elements, Mutable , Immutable, Deleting elements from List and tuple, Built-in List & Tuple Operators.	
UNIT - III	**Object Oriented Concepts**	(15)
	Concept of object-oriented programming, Defining Classes (Attributes Methods), Creating Instance Objects, Accessing Attributes and Methods, Constructor, Concept of "Self", Concept of Base Class and Derived Class 6.2 Single Multilevel and multiple Inheritance	
UNIT - IV	**Files and Exception Handling**	(15)
	Introduction to file handling, write to files, read to files, renaming and deleting files, file methods, Read functions, read(), readline() and readlines() , Write functions, write() and writelines() ,Introduction to exception, Syntax, Errors, Exceptions.	

Course Outcomes: Students should be able to..

1. Explain and use basics of Python

2. Solve problems by using Python language.

3. Evaluate projects by using Python Framework.

4. Create application with help of python libraries.

Reference Books:

1. Greg Michaelson, "An Introduction to Functional Programming Through Lambda Calculus" ,Dover Publications Inc.,2021.

2. Jan van Eijck , Christina Unger, "Computational Semantics with Functional Programming", Cambridge University Press, 2022 .

3. Charles Dierbach ,"Introduction to Computer Science Using Python: A Computational Problem-Solving Focus",John Wiley & Sons,2023.

4. Kenneth C. Louden, "Programming Languages: Principles and Practice", Course Technology Inc., 2021.

Course Objectives: Student should able to...

1. Understand the Core Concepts of Blockchain Technology

2. Design and Implement Blockchain Solutions

3. Evaluate Security Risks and Implement Countermeasures

4. Integrate Blockchain Technology with Other Emerging Technologies.

Credits=2	SEMESTER-I MCAT 414: Block Chain Architecture	No. of hours per unit/credits
UNIT - I	**Introduction to Blockchain**	(07)
	Introduction to Blockchain Technology, History, Features, Different Versions of Blockchain, Types of Blockchain, Consortium Blockchain, Differences between blockchain architecture and database, Blockchain, Networks Hands-On Activity	
UNIT - II	**Blockchain Architecture**	(08)
	Blockchain Architecture Layers, Consensus Mechanisms: Proof of Work (PoW), Proof of Stake (PoS), Practical, Byzantine Fault Tolerance (PBFT), Smart Contracts, Scalability and Performance	
UNIT - III	**Blockchain-Based Futures System**	(07)
	Security Fundamentals, Blockchain Security Threats, Privacy Enhancements, Regulatory and Legal, Considerations. Hands-On Activity	
UNIT - IV	**Introduction to Blockchain Platforms**	(08)
	Ethereum, Hyperledger, IOTA, EOS, Multichain, Big chain, etc. Advantages and Disadvantages, Ethereum vs Bitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.	

Course Outcomes: Students should be able to..

1.Understand Blockchain Fundamentals

2.Analyze Blockchain Architectures.

3. Design and Implement Blockchain Solutions.

4.implement an ICO on Ethereum.

Reference Books:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smartcontracts explained", 2nd Edition, Packt Publishing Ltd, March 2028.

2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide tocreating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2028

3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2026.

4. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly MediaInc, 2025

Course Objectives: Student should able to...

1. Understand Fundamental Concepts of Web Technologies.

2. Design and Develop Static and Dynamic Web Pages.

3. Develop Server-Side Applications and APIs.

4. Integrate Databases into Web Applications.

Credits=2	SEMESTER-I MCAT 414: Advance Web Technology	No. of hours per unit/credits
UNIT - I	**Introduction to Web Technology**	(07)
	Introduction: Web browsers and its functions, web optimizations; Static page design; designing static web pages with HTML5.0-HTML basic, multimedia, Graphics, Form tags, CSS 2.0 concept and its properties & CSS 3.0 properties i.e. borders, backgrounds, fonts, text effects, Buffering, Weblog, Web Cache Poisoning	
UNIT - II	**BootStrap**	(07)
	Introduction to Bootstrap, History, Features, Mobile-First Strategy, Setting up Environment, First example, containers, Bootstrap elements: colors, tables, images, buttons, button groups, progress bars, Forms, utilities, Classes, alerts, custom forms, Bootstrap Grid, -Bootstrap Components, Bootstrap Plugins	
UNIT - III	**JavaScript**	(08)
	Introduction to JavaScript, Variables, identifiers and operators, control structures, Functions, Event Handling in JavaScript, Concept of array, Types of an array, Math and date object, String object and predefined String functions, DOM concept in JavaScript, DOM objects, Validations in JavaScript	
UNIT - IV	**PHP**	(08)
	Introduction to PHP Variables, Data Types, Strings, Operators, Loops, Functions, String, Array, OOP, Overview and Installation of Laravel, Laravel Features, Application Structure of Laravel, Configuration	

Course Outcomes: Students should be able to..

1. Create Well-Structured and Responsive Web Pages

2. Implement Client-Side Interactivity and Dynamic Content.

3. Utilize Frontend Frameworks and Libraries.

4. Integrate Web Applications with Databases and APIs.

Reference Books:

1. "Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett:

2. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins:

3. JavaScript: The Good Parts" by Douglas Crockford:

4. "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5" by Robin Nix

MCAT 415: Research Methodology – I

Course Objectives: Student should able to...

1.Understand the Nature and Significance of Research.

2. Formulate Research Problems and Objectives.

3. Select Appropriate Research Designs and Methodologies.

4. Conduct Literature Reviews Effectively.

Credits=4	SEMESTER-I MCAT 415: Research Methodology – I	No. of hours per unit/credits
UNIT - I	**Introduction to Research Methodology**	(15)
	Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology	
UNIT - II	**Research Design and Methodology**	(15)
	Research Design, Sampling Techniques, Data Collection methods, Instrumentation, Data Analysis Techniques	
UNIT - III	**Defining the Research Problem**	(15)
	Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology.	
UNIT - IV	**Literature Review & Writing Research Proposals**	(15)
	Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed	

Course Outcomes: Students should be able to..

1. Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.

2. Carry out literature survey, define the problem statement and suggest suitable solution for the given problem and present in the format of the research paper (IEEE).

3. Analyse the problem and conduct experimental design with the samplings.

4. Perform the data collection from various sources segregate the primary and secondary data

Reference Books:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3. Research Methods for Business Students" by Mark Saunders, Philip Lewis, and Adrian Thornhill
4.Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005

Course Objectives: Student should able to...

1. Identify, read and write files in Python and use libraries of Python
2. Explore python data structures like Lists, Tuples
3. Provide overview of transaction management, database recovery and security.
4. Understand the relational database design principles.
5. Understand the fundamentals of cyber security and cyber crimes.

Credits=2	SEMESTER-I MCAP 416: Major Practical – I Based on MCAT 411, 412, 413	No. of hours per unit
	1. Python programs for String, List and dictionary Manipulations	1
	2. Python File Operation Reading config files in python Writing log files in python read functions, read(), readline() and readlines() write functions, write() and writelines().	1
	3. Program using Python string processing functions and methods.	1
	4. Working with Lists : Appending elements to a list, Inserting an element in a list, modifying, elements to a list, deleting an element from a list.	1
	5. Working with tuple: Program of creating and accessing tuples, joining and slicing tuples, tuple functions and methods.	1
	6. Write simple Python program using operators: a) Arithmetic Operators b) Logical Operators.	1
	7. Write a program in Python to demonstrate classes and object.	1
	8. Write a program in Python to demonstrate following operations: a) Simple inheritance b) Multiple inheritance.	1
	9. To create simple tables with the primary key constraint (as a table level constraint& as a field level constraint) (include all data types). To create one or more tables with following constraints: Primary Key, Foreign Key Check Constraint Unique constraint, Not null constraint.	1

		10. To drop a table, alter schema of a table, insert / update / delete records using tables created in previous Assignments. (Use simple forms of insert / update /delete statements).	**1**
		11. Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT().	**2**
		12. Write the queries to implement the joins.	**2**
		13. Perform the queries for triggers.	**2**
		14. Write a sql statement for implementing ALTER, UPDATE and DELETE.	**2**
		15. To study the Private Key and Public Key cryptographic systems..	**2**
		16. To study the classical encryption techniques: substitution and transposition	**2**
		17. To study the prevention mechanisms to avoid Virus and other Malware in one's PC	**2**
		18. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois	**2**
		19. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.	**2**
		20. Study of different wireless network components and features of any one of the Mobile Security Apps	**2**

Course Outcomes: Students should be able to..

1. Demonstrate ability to use System Hacking concepts

2. Acquire security requirements with respect to software development

3. Identify different normalization procedures used in database design

4. Design simple database systems for some application to interact with databases.

Reference Books:

1. Vivek Sood, Cyber law Simplified, Tata Mcgraw-Hill Publishing, 2001.

2. Linda Volonino, Reynaldo Anzaldua and Jana Godwin," Computer Forensics: Principles and Practices" Pearson Prentice-Hall ,2007

3. Merkow, M., & Breithaupt, "Information Security Principles and Practices",5th edition.   Prentice Hall, 2005

4. Anderson, R.," Security engineering: A guide to building dependable Distributed Systems" 2nd edition. John Wiley & Sons,2008

Course Objectives: Student should able to...

1. Impart strong technical understanding of Blockchain technologies.

2. Develop familiarity of current technologies, tools, and implementation strategies

3. Introduce application areas, current practices, and research

   activity.

Credits=2	SEMESTER-I **MCAP 417: Block Chain Architecture** **E I** **Based on MCAT 414**	No. of hours per unit
	1. Write the following programs for Blockchain in Python: A simple client class that generates the private and public keys by using the builtin Python RSA algorithm and test it.	2
	2. Write the following programs for Blockchain in Python A transaction class to send and receive money and test it.	2

	3. Write the following programs for Blockchain in Python:
	  A. Create multiple transactions and display them.
	  B. Create a blockchain, a genesis block and execute it.
	  C. Create a mining function and test it.
		2

	4. Install and configure Go Ethereum and the Mist browser. Develop and test a sample.	2
	5. Implement and demonstrate the use of the following in Solidity: A. Variable, Operators, Loops, Decision Making, Strings, Arrays, Enums, Structs, Mappings, Conversions, Ether Units, Special Variables. B. Functions, Function Modifiers, View functions, Pure Functions, Fallback Function, Function Overloading, Mathematical	2

	functions, Cryptographic.	

	6. Implement and demonstrate the use of the following in Solidity:
	   A. Withdrawal Pattern, Restricted Access.
	   B. Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces.
	   C. Libraries, Assembly, Events, Error handling.
		2

	7. Libraries, Assembly, Events, Error handling.	**2**
	8. Write a program to demonstrate mining of Ether.	**2**
	9. Demonstrate the use of Bitcoin Core API.	**2**
	10. Demonstrate the running of the blockchain node	**2**
	11. Demonstrate the use of Bitcoin Core API.	**2**
	12. Create your own blockchain and demonstrate its use.	**2**
	13. Build Dapps with angular	**2**

	14. Write the following programs for Blockchain in Python:
	   A. Create a mining function and test it.
	   B. Add blocks to the miner and dump the blockchain.
		2

	15. Implement and demonstrate the use of the following in Solidity: A. Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces.	**2**

Course Outcomes: Students should be able to..

1. Describe the basic concepts and technology used for blockchain.
2. Describe the primitives of the distributed computing and cryptography related to blockchain.
3. Illustrate the concepts of Bitcoin and their usage.
4. Implement Ethereum block chain contract.
5. Apply security features in blockchain technologies.
6. Use smart contract in real world applications.

Reference Books:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "*Bitcoin and Cryptocurrency Technologies*
   – A Comprehensive Introduction", Princeton University Press.
2. Josh Thompson, '*Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technologyand Blockchain Programming'*, Create Space Independent Publishing Platform, 2017.
3. Imran Bashir, "*Mastering Blockchain: Distributed ledger technology, decentralization, andsmart contracts explained*", Packt Publishing.
4. Merunas Grincalaitis, "*Mastering Ethereum: Implement Advanced Blockchain ApplicationsUsing Ethereum-supported Tools, Services, and Protocols*", Packt Publishing.
5. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "*Blockchain Architecture Design AndUse Cases*"[MOOC], NPTEL:
   https://nptel.ac.in/courses/106/105/106105184/

Course Objectives: Student should able to...

1. Understand application using PHP, MySQL, JavaScript, CSS.
2. Impart necessary ability to choose the appropriate web tools/languages for creating state-of-the art web sites
3. Expose students to current trends and styles in web design and applications
4. Understand how tools woks.

Credits=2	MCAP-417: E-II Based on MCAT 414	No. of hours per unit

	1. Design the following static web pages required for an online book store web site.
	  i. HOME PAGE: The static home page must contain three
	      a. frames.
	  ii. LOGIN PAGE
	  iii. CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
		2

	2. Write *JavaScript* to validate the following fields of the Registration page.
	  1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
	  2. Password (Password should not be less than 6 characters length).
	  3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
	  4. Mobile Number (Phone number should contain 10 digits only).
	    a. Last Name and Address (should not be Empty).
		4

	3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.	2
	4. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the	4

	properties of the font of the capital (color,bold and font size).	
	5. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.	4
	6. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.	2

	7. Develop and demonstrate PHP Script for the following problems:
	  a. Write a PHP Script to find out the Sum of the Individual Digits.
	  b. Write a PHP Script to check whether the given number is Palindrome or not.
		2

	8. Implement the following web applications using
	  a. PHP
	  b. Servlets
	  c. JSP
	      i) A web application that takes a name as input and on submit it shows a hello \<name> page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You \<name > message with the duration of usage (hint:Use session to store name and time).
	      ii) Write a PHP Program to display current Date, Time and Day.
	  d. iii) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello \<name>, you are not authorized to visit the site" message, where \<name> should be replaced with the entered name. Otherwise it should send "Welcome \<name> to this site" message.
		4

	9. Implement the web applications with Database using	2

	(a) PHP, (b) Servlets and (c) JSP.	
	10. Modify the above PHP program to use an xml instead of database	2
	12. Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) Servlet and (d) JSP.	2

Course Outcomes: Students should be able to..

1. Create Well-Structured and Responsive Web Pages

2. Implement Client-Side Interactivity and Dynamic Content.

3. Utilize Frontend Frameworks and Libraries.

4. Integrate Web Applications with Databases and APIs.

Reference Book:

1. "Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett:

2. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins:

3. JavaScript: The Good Parts" by Douglas Crockford:

4. "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5" by Robin Nix

Course Objectives: Student should able to...
1. To understand basics of Linux operating system Mobile OS like iOS and Android
2. To analyze Scheduling algorithms
3. Use disk management and disk scheduling algorithms for better utilization of external memory.
4. To understand I/O management and File systems

Credits=4	SEMESTER-II MCAT 421: Advanced Operating System	No. of hours per unit/credits
UNIT - I	**Linux Operating System**	(15)
	Introduction to kernel, Types of kernel (monolithic, micro, exo), Operating system booting process GRUB-I, GRUB-II. Processes, Inter process Communication, Scheduling.	
UNIT - II	**Input/ Output in Linux**	
	Principles of I/O Hardware, Principles of I/O Software, Deadlocks, RAM Disks, Disks, Terminals. File Systems: Files, Directories, File System Implementation, Security, Protection mechanisms in different Linux versions.	
UNIT - III	**Memory management & virtual memory in Linux**	(15)
	Basic memory management, swapping, virtual memory, Page replacement algorithms, Design issues for paging systems, segmentation. Case Study: Linux memory management.	
UNIT - IV	**Android Operating System**	(15)
	The Android Software Stack, The Linux Kernel – its functions, essential hardware drivers. Libraries - Surface Manager, Media framework, SQLite, WebKit, OpenGL. Android Runtime - Dalvik Virtual Machine, Core Java Libraries. Application Framework - Activity Manager, Content Providers, Telephony Manager, Location Manager, Resource Manager. Android Application – Activities and Activity Lifecycle, applications such as SMS client app, Dialer, Web browser, Contact manager	

Course Outcomes: Students should be able to...

1. Understand the basics of operating systems like kernel, shell, types and views of operating systems.
2. Describe the various CPU scheduling algorithms and remove deadlocks.
3. Explain various memory management techniques and concept of thrashing
4. Recognize file system interface, protection and security mechanisms.

Reference Books:

1. Operating Systems Achyut S. Godbole Tata McGraw Hill 2nd edition.
2. Operating Systems D.M. Dhamdhere Tata McGraw Hill 2nd edition.
3. Understanding Operating System: Flynn & Mctloes 4th edition, thomson.
4. Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson.
5. Operating System Concepts (7th Ed) by silberschatz and Galvin, Wiley, 2000.
6. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall, 2000.
7. Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.
8. Computer Organisation and Architecture (4th Ed) by William Stallings, Prentice Hall India, 1996.

Course Objectives: Student should able to...
1. Train students for installing and using the Android Developer's Toolkit.
2. Understand the Android software stack & program building blocks .
3. Explain working with AndroidManifest, xml .
4. Explain the use of java library for views, controls, menus, dialogs, graphics, media, storage, SQLiteDatabase etc… to make interactive applications.

Credits=4	SEMESTER-II MCAT 422: Android & Ios Application Development	No. of hours per unit/credits
UNIT – I	**Introduction to Flutter**	(15)
	Features of Flutter- Advantages of Flutter-Disadvantages of Flutter. Flutter Installation-Installation in Windows- Installation in Mac OS-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	
UNIT – II	**Introduction to Layouts**	(15)
	Type of Layout Widgets- Single Child Widgets-Multiple Child Widgets- Advanced Layout Application-Introduction to Gestures- Statement Management in Flutter. Ephemeral State Management-Application State - scoped model-Navigation and Routing.	
UNIT - III	**Animation on Flutter**	(15)
	Introduction to Animation Based Classes-Work flow of the Flutter Animation- Working Application-Android Specific Code on Flutter- Introduction to Package- Types of Packages- Using a Dart Package-Develop a Flutter Plugin Package- Accessing Rest API- Basic Concepts- Accessing Product service API	
UNIT – IV	**Database using firebase**	(15)
	Introduction to JSON, working of Firebase Database work, Firebase authentication (Signup and Login to Flutter App),App to use Firebase Services, Adding Firebase to your Android App, Adding Firebase to your iOS App, Configuring Firebase Authentication,	

	Login to an App Using Firebase User Accounts, Logout Configuration, Real Time Database, Cloud Firestore, Internalization on Flutter- Using intl Package-Testing on Flutter- Types of Testing- Widget Testing- Steps Involved- Working Example- Deployment- Android, Application- IOS Application- Development Tools- Widget Sets-Flutter Development with Visual Studio Code- Dart DevTools- Flutter SDK	

Course Outcomes: Students should be able to...

1. Identify various concepts of mobile programming that make it unique from programming for other platforms,

2. Critique mobile applications on their design pros and cons,

3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

4. Program mobile applications for the Android operating system that use basic and advanced phone features, and

5. Deploy applications to the Android marketplace for distribution

Reference Books:

1. Beginning Android 4 Application Development, WEI-MENG LEE, WROX Publication-Wiley-India

2. Professional Android 4 Application Development by Reto Meier WROX Publication-Wiley-India

3. Android Programming Unleashed, B.M. Harwani, Sams Publishing

4. Beginning Android 4 Onur Cinar Apress Publication

5. Advanced Android Application Development, Fourth Edition, By Shane Conder, Lauren Darcey, Joseph Annuzzi Jr., Pearson

Course Objectives: Student should able to...

      1. Understanding Big Data Security Fundamentals.

      2. Understand Identifying Security Challenges in Big Data Environments.

      3. Understand to implement Authentication and Authorization Mechanisms.

      4. Understanding securing Big Data Storage and Processing.

Credits=4	SEMESTER-II MCAT 423: Big Data Security	No. of hours per unit/credits
UNIT - I	**Introduction to Big Data Security**	(15)
	Overview of Big Data concepts and technologies, Importance of security in Big Data ecosystems, Challenges and unique aspects of securing Big Data, Types of security threats: unauthorized access, data breaches, insider threats, etc. Common vulnerabilities in Big Data systems, Role-based access control (RBAC) in Big Data environments Authentication mechanisms: LDAP, Kerberos, OAuth, Authorization models for distributed systems	
UNIT - II	**Data Privacy and Compliance**	(15)
	GDPR, CCPA, and other data privacy regulations, Techniques for anonymization and pseudonymization of data, Privacy-preserving data mining algorithms, Cryptography for Big Data, Encryption techniques for data at rest and data in transit, Secure key management in distributed environments, Homomorphic encryption and its applications in Big Data analytics.	
UNIT - III	**Secure Data Storage & Processing**	(15)
	Securing distributed file systems (HDFS, HBase, etc.), Data encryption strategies for storage systems, Backup and disaster recovery considerations, Securing MapReduce and Spark frameworks, Secure coding practices for big data applications, Techniques for detecting and mitigating data processing vulnerabilities.	
UNIT - IV	**Monitoring and Auditing**	(15)
	Tools and techniques for monitoring Big Data security events, Logging and auditing best practices, Security information and event management (SIEM) systems, Big Data Security Tools and Technologies,	

	Introduction to security tools like Apache Ranger, Apache Knox, etc., Integration of security solutions with Big Data platforms	

Course Outcomes: Students should be able to..

1. Demonstrate a comprehensive understanding of the fundamental principles.

2. Identify & analyse various security threats and vulnerabilities specific to Big Data systems.

3. Apply appropriate security measures, including authentication mechanisms.

4. Develop an awareness of data privacy regulations and compliance requirements relevant to Big Data environments.

Reference Books:
1. "Big Data Analytics: Turning Big Data into Big Money" by Frank J. Ohlhorst
2. "Big Data: Principles and Best Practices of Scalable Realtime Data Systems" by Nathan Marz and   James Warren
3. "Big Data Analytics Methods" edited by Alan Colman, David Taniar
4. "Data Privacy: Principles and Practice" by Raymond Wacks

Course Objectives: Student should able to...

1. Understanding Blockchain Fundamentals.

2. Learning Blockchain Development.

3. Understanding Cryptography in Blockchain.

4. Examining Blockchain Security.

5. Exploring Blockchain Interoperability.

Credits=2	SEMESTER-II MCAT 424: Blockchain Technology and Applications	No. of hours per unit/credits
UNIT - I	**An Introduction to Blockchain**	(15)
	Discover Blockchain Technology- Blockchain, Growth of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Decentralization: Methods of decentralization, Routes of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.	
UNIT - II	**Cryptocurrency**	(15)
	Bitcoin- Bitcoin Working, Buy Bitcoin, Transactions, Bitcoin Mining, Value of Bitcoin, Community, Politics and Regulations, Advantages, Disadvantages Ethereum- Introduction to Ethereum, type of users in a typical Ethereum blockchain, DApp, Components of Ethereum, Hyperledger, Digital Tokens	
UNIT - III	**Blockchain Vulnerabilities**	(15)
	Endpoint Vulnerabilities, Public and Private Key Security, Vendor Risks, Untested at Full Scale, Lack of Standards and Regulation, Untested Code, IOTA, Coco Framework	
UNIT - IV	**Applications of Blockchain Technology**	(15)
	Financial Applications: Private Securities(NASDAQ Private Equity, Medici, Block stream, Coin setter, Bit shares), Insurance: Ever ledger, Nonfinancial Applications: Applications of Blockchain in the Music Industry, Decentralized Storage, Internet Applications	

Course Outcomes: Students should be able to..

1. 1. Understand the fundamentals of blockchain technology.
2. Explain blockchain architectures and platforms.
3. Demonstrate proficiency in blockchain development.
4. Analyse blockchain security and privacy, Explore blockchain applications across industries.
5. Discuss regulatory and legal aspects of blockchain.

Reference Books:

1. Mastering Blockchain Second Edition, Distributed ledger technology, decentralization, and smart contracts explained by Imran Bashir.
2. The Basics of Bitcoins and Blockchains by Antony Lewis
3. "Blockchain Revolution" by Don and Alex Tapscott
4. BLOCKCHAIN, Cybrosys Limited Edition
5. "The Blockchain Developer" by EladElrom

Course Objectives: Student should able to...
1. Introduction to React.js
2. Setting Up Development Environment.
3. Understanding Components.
4. Event Handling, Routing.
5. Best Practices and Performance Optimization

Credits=2	SEMESTER-II MCAT 424: React Js	No. of hours per unit/credits
UNIT - I	**Introduction to React Js**	(08)
	React Introduction, What is React, What is a Component, JSX Overview, create-react-app, Understanding basics of react app, Understanding virtual DOM, SPA	
UNIT - II	**Components**	(07)
	Class Components, Functional Components, Parent, Child Components, Conditional Rendering, State, setState Method, Props	
UNIT - III	**Event Handling in React**	(08)
	Event Handling in Class Components, Event Handling in Functional Components, Lifecycle, Class Component Life Cycle Methods, React Hooks, What is a React Hook, useState Hook, useEffect Hook, Building forms in React	
UNIT - IV	**React Router**	(07)
	Controlled vs Uncontrolled Components, State Management, Single Source of Truth, Lifting State Up, Prop Drilling, useContext, Redux, HTTP Methods, Fetch, Axios.	

Course Outcomes: Students should be able to..

1. Understanding of React.js Fundamentals.

2. Proficiency in Building React Components.

3. State Management.

4. Routing, API Interaction.

5. Deployment, Testing.

Reference Books:

1. "Learning React: A Hands-On Guide to Building Web Applications Using React and Redux" by Kirupa Chinnathambi
2. "React.js Essentials" by Artemij Fedosejev
3. "React Up & Running: Building Web Applications" by Stoyan Stefanov
4. "Fullstack React: The Complete Guide to ReactJS and Friends" by Anthony Accomazzo, Nate Murray, Ari Lerner, and Clay Allsopp
5. "Pro React" by Cassio de Sousa Antonio
6. "React Design Patterns and Best Practices" by Michele Bertoli

Research Project will consist of 2 parts:
    I. The Research Proposal
    II. The actual dissertation or Research Project Report

I. The Research Proposal

Students are required to submit their research ideas in the form of a research proposal to their supervisors / advisors / guides and get approval from the guide before the actual research work starts.

Format of Research Proposal (RP)

- Project Title
- Introduction and Origin of the research problem
- Interdisciplinary relevance
- Review of Research and Development in the Subject
- National / International status
- Significance of the study - Objective, methodology
- Approximate time by which each stage will be completed
- Expected results and the outcome of the research project
- Bibliography

Following can be used as a guide to evaluate a RP

- ***Does the proposal address a well-formulated problem?*** Have research gaps been identified.
- ***Is it a research problem***, or is it just a routine application of known techniques?
- ***Do the proposers have a good idea on which to base their work?*** The proposal must explain the idea in sufficient detail to convince the reader that the idea has some substance, and should explain why there is reason to believe that it is indeed a good idea.
- ***Does the proposal explain clearly what work will be done?*** Does it explain what results are expected and how they will be evaluated? How would it be possible to judge whether the work was successful?
- ***Is there evidence that the proposers know about the work that others have done on the problem?*** This evidence may take the form of Literature Review or a short review as well as representative references.

The proposal should answer three key questions:
1. What are we going to learn as the result of the proposed project that we do not know now?
2. Why is it worth knowing?

3. How will we know that the conclusions are valid?

The Research Project
Students should submit a proper research dissertation at the end of their research work for the required credits.
Format of Research Project:
- Title of Research
- Certificate
- Index
- List of Figures
- List of Tables
- Publications
- Introduction - Objectives of the Research
- Literature Review of previous research in the area and justification / Importance /Value of further research, Data, Scope and Limitations
- Actual Work Done with Experimental Setup, if any.
- Results and Discussion
- Future scope of research
- Bibliography in format –Author name, title, publication details, year

Course Objectives: Student should able to...

1. To understand basics of Big Data and Big Data Tools (Hadoop, MapReduce)
2. To understand fundamental techniques used for Big data analytics
3. To help a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.
4. To understand Mobile Computing and frameworks. Work with Android Development Tools (IDE, SDK).
5. Understand emulators, virtual devices and development platforms.

Credits=2	SEMESTER-II MCAP-426: Major Practical – I Based on MCAT 421, 422, 423	No. of hours per unit
	1. Study of Advance commands of Linux.	2

	2. Study of current directory according to the following arguments:
	   a. Suffix to be replaced
	   b. Replacement suffix
		2

	3. Shell scripting using general-purpose utilities. 4. A) Write a menu driven shell script which will print the following menu and execute the given task to display result on standard output.	2
	5. Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy)	2

	6. Write the awk program uncomment awk which removes any comment from a C program.
	   i. You can assume that the C source code contains only syntactically correct comments:
	   ii. starting with //, ending with a new line
	   iii. starting with /*, ending woth */ (can be multi-line)
		2

	iv. nesting of comments is not allowed.	
	7. Make sure that the number of lines of the C source code is not changed! When a line contains comments only, replace this line	2
	8. Write an awk program using function, which capitalizes each word in a given string.	2
	9. Write a program for process creation using C. (Use of gcc compiler)	2
	10. Develop a program to implement frame layout, table layout and relative layout.	2
	11. Use of g++ compiler.	2
	12. Develop a program to implement frame layout, table layout and relative layout.	2
	13. Develop a program to implement Arithmetic operations.	2
	14. Develop a program to implement Radio Button & CheckBox.	2
	15. Develop a program to implement list view, Grid view, and Image view and scroll view.	2

Course Outcomes: Students should be able to..

1. Analyze the services, architectures and principles used in the design of modern operating systems.

2. Execute Linux commands for files and directories, creating and viewing files, File comparisons and Disk related commands.

3. Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine.

4. Demonstrate shell programming by using shell variables and shell keywords for automated system tasks.

5. Identify the key characteristics of multiple approaches used for the design and development of the operating system.

Reference Books:

1. Operating Systems: Design and Implementation, Third Edition, Andrew S. Tanenbaum, Albert S. Woodhull, Prentice Hall, 2006.

2. Fedora Documentation, http://docs.fedoraproject.org/en-US/index.html

3. Official Ubuntu Documentation, https://help.ubuntu.com/

4. Android Developers, http://developer.android.com/index.html.

5. Radha Shankarmani, M Vijayalakshmi, Big Data Analytics, 2nd Edition, Wiley

6. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.

7. Seema Acharya, Subhashini Chhellappan, BIG Data and Analytics ,Willey

Blockchain Technology and Applications

Based on MCAT 424

Course Objectives: Student should able to...
1. To Develop an understanding of blockchain fundamentals by creating and analyzing basic blockchain models.
2. To Gain practical experience in smart contract development and deployment on blockchain platforms like Ethereum
3. To Simulate Bitcoin transactions to understand transaction mechanics.
4. To Use mining simulators to demonstrate the proof-of-work process.
5. To Apply best practices for generating and managing blockchain keys to ensure security

Credit = 2	MCAP 427 E-I: Blockchain Technology and Applications Based on MCAT 424	No. of Hours
	1. Create a simple blockchain using a spreadsheet or code, and analyze how data, hashes, and chaining work.	2
	2. Use a blockchain simulator to observe how transactions are added and validated through mining.	2
	3. Write a basic smart contract in Solidity, deploy it on an Ethereum test network, and interact with it.	2
	4. Investigate a real-world decentralized organization and present its governance model and operational structure.	2
	5. Create a comparative analysis of blockchain technology versus other distributed systems like peer-to-peer networks.	2
	6. Use a Bitcoin testnet to simulate creating, sending, and tracking Bitcoin transactions.	2
	7. Use a mining simulator to demonstrate the proof-of-work process and how mining adds blocks to the blockchain.	2
	8. Create and deploy a simple DApp on an Ethereum test network with a smart contract that performs basic functions.	2

	9. Use a trading simulator to execute trades for various cryptocurrencies and analyze market trends and performance.	2
	10. Research how community decisions and regulations affect Bitcoin's development and market behavior.	2
	11. Generate and securely manage public and private keys, discussing best practices for key security.	2
	12. Assess a blockchain application or smart contract for vulnerabilities and propose solutions to address them.	2
	13. Use testing tools to identify and address security vulnerabilities in smart contract code. 14. Investigate IOTA's Tangle structure and compare it with traditional blockchain models, discussing its strengths and weaknesses.	2
	15. Research the Coco Framework and evaluate how it enhances scalability and supports enterprise blockchain applications.	2

Course Outcomes: Students should be able to..

1. Gain practical insights into transaction processing and validation in a blockchain network through simulation.
2. Compare blockchain technology with other distributed systems, identifying their respective architectures and platforms.
3. Develop and deploy a simple decentralized application (DApp) on Ethereum's test network, integrating it with smart contracts.
4. Implement best practices for generating and managing blockchain keys, ensuring security.
5. Evaluate the Coco Framework's capabilities for enhancing scalability and supporting enterprise blockchain applications.

Reference Books:

1. Mastering Blockchain Second Edition, Distributed ledger technology, decentralization, and smart contracts explained by Imran Bashir.

2. The Basics of Bitcoins and Blockchains by Antony Lewis

3. "Blockchain Revolution" by Don and Alex Tapscott

4. BLOCKCHAIN, Cybrosys Limited Edition

5. "The Blockchain Developer" by EladElrom

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MCAP 427: E– II ReactJS

Based on MCAT 424

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Course Objectives: Student should able to...

1. Demonstrate how to use AJAX to interact with web services.

2. Discuss Module, controllers, Events.

3. Design forms and Modules in React JS

4. Learn about web services and their development

Credit = 2	MCAP-427: ReactJS Based on MCAT 424	No. of Hours
	1. Create a simple "Hello World" React component and render it on the page.	2
	2. Create a component that takes props and displays them. For example, a Greeting component that takes a name prop.	2
	3. Create a counter component that increments and decrements a number using React state.	2
	4. Build a simple form with inputs for name and email, and display the entered data below the form upon submission.	2
	5. Create a component that fetches data from an API (e.g., JSONPlaceholder) and displays it in a list.	2
	6. Create a component that displays different content based on a piece of state (e.g., a login/logout button).	2
	7. Render a list of items from an array of objects, using keys to uniquely identify each item.	2
	8. Style a React component using CSS classes and inline styles.	2
	9. Create a component with a button that changes the text displayed in the component when clicked.	2
	10. Create a parent component that passes data and functions to a child component through props.	2
	11. Set up a basic React Router with at least two routes and corresponding components.	2
	12. Use 'componentDidMount' to fetch data when a component is first rendered.	2
	13. Create a HOC that adds a timestamp to any component it wraps.	2
	14. Use the Context API to pass data deeply through the component tree without prop drilling.	2
	15. Refactor a class component using state and lifecycle methods to a functional component using hooks (useState and useEffect).	2

Course Outcome: At the end of the course students will be able to,

1. Understand AJAX and relevance.
2. Discuss Module, controllers, Events.
3. Design forms and Modules in React JS.
4. Learn about web services and their development.

Reference Books:

1. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React.js, Zaccheus Entertainment

2. React Explained: Your Step-by-Step Guide to React, OS Training, LLC

3. Beginning React, Greg Lim

4. Learning React: Functional Web Development with React and Redux, Shroff/O'Reilly

5. Learn React Hooks: Build and refactor modern React.js applications using Hooks, Packt Publishing Limited