ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS FOR AFFILIATED COLLEGES
UNDER CBCS PATTERN WITH EFFECT FROM 2022-23 ONWARDS
M.Sc. (Computer Science & Information Technology)
Programme Structure

S.No	Course Code	Courses	Title of the paper	T/P	Credits	Hours/ Week	Marks		
							I	E	Total
			I- Semester						
1	23MCI1C1	CC	Data Structures and Algorithms	T	4	5	25	75	100
2	23MCI1C2	CC	Advanced Java Programming	T	4	5	25	75	100
3	23MCI1C3	CC	Statistical Computing	T	4	5	25	75	100
4	23MCI1P1	CC	Practical-I: Algorithms & Java Programming Lab	P	4	8	25	75	100
5	23MCI1E1/ 23MCI1E2/ 23MCI1E3	DSE-I	(A)Multimedia and its Applications/ (B)Wireless Sensor Networks / (C) Cyber Security	T	4	4	25	75	100
			Library/Yoga/Counseling/Fieldtrip			3			
					20	**30**	**140**	**360**	**500**
			II -Semester						
6	23MCI2C1	CC	Advanced Database Management Systems	T	4	4	25	75	100
7	23MCI2C2	CC	Open Source Technologies	T	4	4	25	75	100
8	23MCI2C3	CC	Compiler Design	T	4	4	25	75	100
9	23MCI2P1	CC	Practical-II: Open Source Technologies & DBMS Lab	P	4	8	25	75	100
10	23MCI2E1/ 23MCI2E2/ 23MCI2E3	DSE-II	(A)Software Testing / (B)Internet of Things / (C)Cloud Services	T	4	4	25	75	100
11	23MCI2S1	SEC-I	Web Technologies	T	2	3	25	75	100
	-		Library/Yoga/Counseling/Fieldtrip			3			
					22	**30**	**165**	**435**	**600**
			III-Semester						
12	23MCI3C1	CC	Data Science & Machine Learning	T	4	4	25	75	100
13	23MCI3C2	CC	Advanced Web Technology	T	4	4	25	75	100
14	23MCI3C3	CC	Distributed Operating System	T	4	4	25	75	100
15	23MCI3P1	CC	Practical-III: Web Technology and Data Science Lab	P	4	8	25	75	100
16	23MCI3E1/ 23MCI3E2/ 23MCI3E3	DSE-III	(A)Block Chain Technology / (B)Web Services / (C)Digital Image processing	T	4	4	25	75	100
17	23MCI3S1	SEC-II	E- Commerce	T	2	3	25	75	100
	-		Library/Yoga/Counseling/Fieldtrip			3			
					22	**30**	**165**	**435**	**600**
			IV-Semester						
18	23MCI4C1	CC	Soft Computing	T	4	4	25	75	100
19	23MCI4C2	CC	Mobile Communications	T	4	4	25	75	100
20	23MCI4C3	CC	Big Data Analytics	T	4	4	25	75	100
21	23MCI4PR		Dissertation Work / Project Work/Internship programme		14	16	25	75	100
	-		Library/Yoga/Counseling/Fieldtrip			2			
					26	**30**	**100**	**300**	**4500**
		Total			**90+EC**		**570**	**1530**	**2100**

➤ CC-Core Course

➤ DSE - Discipline Specific Elective (DSE) –Students' Choice and it may be conducted by parallel sessions.

➤ NME – Non Major Elective

➤ SLC - Self Learning Course (SLC) - MOOCs-Voluntary basis

- ➤ T-Theory, P-Practical
- ➤ I-Internal, E-External, EC-Extra Credit

Practical Subjects:

The following list of parameters are considered for the evaluation of practical examination.

Total Marks: 100 (Internal: 40 marks, External: 60 Marks)

For Internal Marks:

i.	Internal test	:	20
ii.	Record Work	:	20

	Total	**:**	**40**

For External Marks:

i.	Aim, Procedure / Algorithm and Program	:	15
ii.	Coding and Compilation	:	15
iii.	Debugging	:	15
iv.	Results	:	15

	Total	**:**	**60**

A. Core Courses

Semester		Course Name
1	Core1	Data Structures and Algorithms
	Core2	Advanced Java Programming
	Core3	Statistical Computing
	Core4	Algorithms & Java Programming Lab
2	Core5	Advanced DBMS
	Core6	Open Source Technologies
	Core7	Compiler Design
	Core8	Open Source Technologies & DBMS Lab
3	Core9	Data Science & Machine Learning
	Core10	Advanced Web Technology
	Core 11	Distributed Operating System
	Core12	Web Technology and Data Science Lab
4	Core13	Soft Computing
	Core14	Mobile Communications
	Core15	Big Data Analytics
	Core16	***Dissertation Work / Project work / Internship programme

B. Discipline Specific Electives

Semester	Course Name
1	Multimedia and its Applications (or) Wireless Sensor Networks (or) Cyber Security
2	Software Testing (or) Internet of Things (or) Cloud Services
3	Block Chain Technology (or) Web Services (or) Digital Image processing

	Semester – I			
Course Code: 23MCI1C1	**Core Course 1**	**T/P**	**C**	**H/W**
	DATA STRUCTURES AND ALGORITHMS	**T**	**4**	**5**

Objectives	➢ To learn linear data structures – lists, stacks, and queues ➢ To understand Tree structure ➢ To learn different sorting and searching algorithms ➢ To understand the various algorithm design and analysis techniques
Unit – I	Introduction to Data Structure – Linear Data Structure, List, Implementation of a list, Traversal of a list, Searching and retrieving an element. Predecessor and successor, Insertion, Deletion, Sorting, Merging lists
Unit – II	Representation of Stack, Stack related terms, Operation on a stack, Implementation of a stack, Infix to Postfix Conversion, Recursion, Queues, Various Positions of Queue, Representation of Queues, Circular Queue, Single linked list, Doubly Linked List, Applications.
Unit – III	Non-linear Data Structure – Trees, Binary Trees, and Types of Binary trees, Binary Tree Representation, Traversing Binary Trees, Binary Search tree, Insertion and deletion operations, Hashing Techniques, Traversal – Shortest Path, Dijkstra's Algorithm
Unit – IV	Searching and Sorting – Introduction, Divide and Conquer, Searching, Linear Search, Binary Search, Sorting, Insertion sort, Selection sort, Bubble sort, Quick sort, Tree sort, Merge sort.
Unit – V	Introduction: Algorithm, Psuedo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation.

Text books:

Horowitz, E., &Sahni, S. (2007). *Fundamentals of data structures in C* (2nd ed.). Universities, press.

Horowitz, E., Sahni, S., &Rajasekharam. *Fundamentals of Computer Algorithms*. Galgotia publications pvt. Ltd.

Reference Books:

Horowitz, E. &Sahini, S. *Fundamentals of Data structures in C* (2nd ed.). Universities press.

Kamthane, A. N. (2004). *Programming and Data Structure*. Pearson Edition.

Krishnamoorthy, R., &Kumaravel, G. I. (2008). *Data Structures using C*. Tata McGraw-Hill Publishing Company Limited.

Lipschutz, S., &Pai, G. A. V. (2006). *Data Structures. Schaum's Outlines*. Tata Mc-GrawHill Private Limited.

Outcomes	At the end of this course, the students are able to: ➢ Implement linear data structures and solve problems using them. ➢ Implement and apply trees and graphs to solve problems. ➢ Implement the various searching and sorting algorithms.

Semester – I				
Course Code	**Core Course II**	**T/P**	**C**	**H/W**
23MCI1C2	**ADVANCED JAVA PROGRAMMING**	**T**	**4**	**5**
Objectives	➢ To become familiar with the advanced features of Java Language. ➢ To develop Web Applications using Servlets / JSP and deploy in popular servers like Tomcat. ➢ To understand Java Servlets and their life cycle. ➢ To understand Java server Pages (JSP) technology.			
Unit – I	**Java Fundamentals:** Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Objects, Methods – Inheritance - Packages and Interfaces – Thread – Thread Life Cycle, Thread States, String handling - String literal, Java String class methods, String buffer, Input Output Packages – Inner Classes, equals and hashcode in java object			
Unit – II	**Collections and Exception Handling:** Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, List Interface - Array list, Linked List, List Iterator interface, Set Interface – HashSet, Treeset, Map interface - HashMap, Tree Map– Comparable interface -Comparator interface- Comparable vs. Comparator, Exception Handling – Hierarchy of Java Exception classes - Types of Java Exceptions, Custom Exception, Throws, Throw, Finally, Multiple Catch Block			
Unit – III	**JDBC Introduction:** Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation, Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and InetAddress			
Unit – IV	**Java Enterprise Application:** Tiered Application development - Java Servers, containers –Web Container – - Servlet Architecture - Servlet Life Cycle, Http Servlet, Cookies, Working with JSP and Servlet – Web Frameworks Introduction to Spring Framework			
Unit – V	**Lambda Expressions & Functional Interfaces**: Lambda Expressions, Method Reference - Java Default Methods, Functional Interface, Streams API, Optional Class, Predicate			

Textbooks:

De, A. (2015). *Spring 4 and Hibernate 4: Agile Java Design and Development*. McGraw-Hill Education.

Schildt, H. (2014). *The Complete Reference – Java 2* (9th ed.). Tata McGraw Hill

Reference books:

Dean, J., & Dean, R. (2014). *Introduction to Programming with JAVA – A Problem Solving Approach*. Tata McGraw Hill.

Farrell, J. (2014), *Java Programming*, (7th ed.). Cengage Learning.

Matha, M. P. (2011). *Core Java A Comprehensive Study*. Prentice Hall of India.

Rao, R. N. (2016). *Core Java: An Integrated Approach*. DreamTech Press

Outcomes	At the end of the course students will get the knowledge of: ➢ creating own web application ➢ understand advanced features of Java, Servlets and JSP.

	Semester – I			
Course Code 23MCI1C3	**Core Course III**	**T/P**	**C**	**H/W**
	STATISTICAL COMPUTING	**T**	**4**	**5**
Objectives	➢ To understand the applications of various correlation methods ➢ To study and model the sampling concepts ➢ To acquire knowledge on Hypotheses test			
Unit – I	**Correlation -** Definition of Correlation- Scatter Diagram- Kari Pearson's Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination **-** Merits and Limitations of Coefficient of Correlation- Spearman's Rank Correlation (7.1-7.9.4).			
Unit – II	**Regression Analysis -** Regression and Correlation (Intro)- Difference between Correlation and Regression Analysis- Linear Regression Equations -Least Square Method- Regression Lines- Properties of Regression Coefficients- Standard Error of Estimate. (8.1-8.8)			
Unit – III	**Probability Distribution and mathematical Expectation-** Random Variable-Defined - Probability Distribution a Random Variable- Expectation of Random Variable- Properties of Expected Value and Variance (12.2-12.4).			
Unit – IV	and Non-Sampling Errors – Principles of Sampling-Merits and Limitations of Sampling- Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal, Student's t, Chi-Square ($x2$) and Snedecor's F- Distributions (14.1-14.16).			
Unit – V	**Statistical Inference- Estimation and Testing of Hypothesis -** Statistical Inference- Estimation- Point and interval- Confidence interval using normal, t and $x2$Distributions- Testing of Hypothesis- Significance of a mean - Using t Distribution (15.1-15.10.2).			

Text books:

Sehgal K.L. (2011)*Quantitative Techniques and Statistics*, First Edition, Himalaya Publishing House, 2011.

Reference books:

Bali N. P., Gupta P. N., Gandhi C. P. (2008) *A Textbook of Quantitative Techniques*, First Edition, Laxmi Publications.

Christopher Chatfield (2015) *Statistics for Technology- A Course in Applied Statistics*, Third Edition", CRC Press.

David Makinson (2011) *Sets, Logic and Maths for Computing*, Springer, 2011.

Srivastava U. K., Shenoy G. V., Sharma S. C. (2005) *Quantitative Techniques for Managerial Decisions*, Second Edition, New Age International Publishers.

Outcomes	At the end of the course, the students are able to ➢ do Data analytics from a database formed from the real-world problem ➢ predict the exact reason for the real time issues

Semester – I				
Course Code	**Core Practical -I**	**T/P**	**C**	**H/W**
23MCI1P1	**ALGORITHMS & JAVA PROGRAMMING LAB**	P	4	8
Objectives	➢ To understand different data structures and algorithms Practically ➢ To implement the Web applications using advanced Java techniques.			
Data Structures & Algorithms	1. Implementing Stack as an array. 2. Implementing Stack as a linked list. 3. Convert Infix expression to Postfix expression using stack. 4. Convert Infix expression to Prefix expression using Stack. 5. Implementing Queue as an Array. 6. Implement Queue as a linked list. 7. Binary tree traversals. 8. Implement Binary Search Tree. 9. Linear Search 10. Binary Search 11. Bubble Sort 12. Insertion Sort 13. Merge Sort 14. Quick Sort 15. Selection Sort			
Java Programming	1. Write a java Program to count the occurrences of each character in string 2. Write a java program to create list of employee object and filter the employees whose salary is more than 10000 and year of experience is greater than 5 using list interface in collection and stream API 3. Write Arithmetic program using method reference 4. Write a java program to validate voter eligibility and throw the custom exception if age is less than 18 5. Demonstrate Event Handling for various types of Events 6. Write a Program to remove the duplicate element from an array 7. Write a Java Program to perform Matrix operations 8. Write a Program to perform the String Operations 9. Write a java program to remove all numeric values from string 10. Write a java program to remove duplicates from ArrayList in Java 11. Write a java program to sort the student objects by age using collection 12. Write a Program to implement the concept of interface 13. Write a Program to implement Package 14. Write a Program to Implement File Handlings 15. Write a Fibonacci series program in java using recursion 16. Write a Program to utilize JDBC on Applet/Application			
Note: One experiment from **Data Structures and Algorithms** and another one from **Java Programming** is compulsory for University Examination				
Outcomes	At the end of the session, the students can ➢ relate the ways to solve advance programs using the algorithms ➢ develop, implement, and demonstrate java web applications.			

Semester – I				
Course Code: 23MCI1E1	**DSE – 1**	**T/P**	**C**	**H/W**
	(a) MULTIMEDIA AND ITS APPLICATIONS	**T**	**4**	**4**
Objectives	➢ To get in-depth knowledge in an industry standard multimedia development tool and associated scripting language. ➢ To work with all aspects of images, sound, and video.			
Unit – I	**Introduction to multimedia**: Definition-Where to use multimedia-Components of multimedia-Delivering multimedia **Text**: Fonts and faces-Usage of text in multimedia-Computer and text-Font editing and design tools-Hypermedia and hypertext			
Unit – II	**Images:** Image Fundamentals-Still images-Bitmap images-Vector images-Image file formats **Color:** Color models-Color palettes-Color dithering-Color flashing			
Unit – III	**Digital audio:** Objectives-Characteristics of sound-Digital audio files-MIDI audio-MIDIvs digital audio-Multimedia system sounds-Audio file formats-Adding sound to multimedia project **Digital video:** Video basics-Analog video-Digital video standards-Digital video containers-Shooting and editing video			
Unit – IV	**Animation:** Principles of animation-Animation Techniques-Animation file formats **Multimedia systems:** Multimedia hardware-Multimedia software-Multimedia Authoring systems-Multimedia skills			
Unit – V	**The internet and multimedia:** Internet history-Internetworking-Multimedia on the web **Designing for the world wide web**: Developing for the web-Text for the web-Images for the web-Sound for the web-Animation for the web-Video for the web.			
Textbooks: Buford, J. F. K. *Multimedia systems*. Pearson education Vaughan, T. *Multimedia : making it work* (9th ed.). TataMcgraw Hill publications.				
Reference books: Andleigh, Prabhat K. Thakrar, Kiran. (2013). *Multimedia systems and design*. PHI Learning. New Delhi Parekh, R. (2015) *Principles of multimedia* (2nd ed.). TataMcgrawHill education, New Delhi				
Outcomes	At the end of the session, the students can ➢ Summarize the key concept in current multimedia technology ➢ Learn ways to present multimedia projects			

Semester – I				
Course Code 23MCI1E2	**DSE – 1**	**T/P**	**C**	**H/W**
	(b) WIRELESS SENSOR NETWORKS	**T**	**4**	**4**
Objectives	➢ To study the concepts of sensor networks. ➢ To familiarize the Architecture of WSN. ➢ To understand the concept of data centric routing and networking in WSN.			
Unit – I	**Introduction :** Motivation- Definitions and background - challenges and constraints- Applications - Single Node Architecture – Hardware components - Energy consumption of sensor nodes - Operating systems and execution environments - Examples of sensor nodes.			
Unit – II	**Network Architecture**: Sensor network scenarios- optimization goals- design principles- service interfaces - gateway concepts - Physical layer – wireless channel and communication fundamentals - physical layer and transceiver design considerations in WSNs - MAC protocols – Fundamentals of MAC protocols- Low duty cycle protocols and wakeup concepts- contention based protocols- schedule based protocols - The IEEE 802.15.4 MAC protocol.			
Unit – III	**Link Layer protocols and Time Synchronization problem:**Link Layer Protocols – Tasks and requirements- Framing- Link Management - Naming and addressing – Fundamentals- address and name management- Assignment of MAC address- Distributed assignment of locally unique addresses- content based and geographic addressing. Time Synchronization- Localization and positioning – Time synchronization problem- protocols- properties of localization and positioning procedures- lateration problem- single hop localization- positioning in multihop environments			
Unit – IV	**Routing protocols and Data centric routing :** Routing protocols – Forwarding and routing- MANET protocols- gossiping and agent based unicast forwarding- Energy-efficient unicast- Broadcast and multicast- geographic routing- Mobile nodes - Data centric and content based networking –Data centric routing- Data aggregation- data centric storage			
Unit – V	**Transport Layer and Security :** Transport layer and quality of service – The transport layer and QoS in wireless sensor networks- Coverage and deployment- Reliable data transport- single packet delivery- block delivery- congestion control and rate control - Security – Challenges of security- security attacks- Protocols and mechanisms for security- IEEE 802.15.4 and ZigBee Security			

Textbooks:

Holger Karl & Andreas Willig (2005) *Protocols And Architectures for Wireless Sensor Networks*, John Wiley.

Sohraby, K., Minoli, D., &Znati, T. (2007). *Wireless sensor networks: technology, protocols, and applications*. John Wiley & sons.

Reference books:

Dargie, W., &Poellabauer, C. (2010). *Fundamentals of wireless sensor networks: Theory and practice*. John Wiley & Sons.

Zhao, F., Guibas, L. J., &Guibas, L. (2004). *Wireless sensor networks: an information processing approach*. Morgan Kaufmann.

Outcomes	➢ Discuss about Networked wireless sensor devices- design challenges and topology. ➢ Understand the architecture and analyze the Localization- synchronization issues and approaches. ➢ Discuss about the data centric routing, Reliability, and congestion control.

Semester – I					
Course Code 23MCI1E3	**DSE – 1**		**T/P**	**C**	**H/W**
	(C)CYBER SECURITY		**T**	**4**	**4**
Objectives	➢ To understand the basics of Cyber Security and to gain firm knowledge on Cyber Security Essentials. ➢ To explore the laws governing Cyber Security.				
Unit – I	**Introduction to Cybercrime:** Definition and Origins of the Word - Cybercrime and Information Security - Who are Cybercriminals? - Classifications of Cybercrimes - Cybercrime: The Legal Perspectives - Cybercrimes: An Indian Perspective - Cybercrime and the Indian ITA 2000 - A Global Perspective on Cybercrimes - Cybercrime Era: Survival Mantra for the Netizens				
Unit – II	**Cyberoffenses:** Introduction - How Criminals Plan the Attacks - Social Engineering – Cyberstalking - Cybercafe and Cybercrimes - Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing				
Unit – III	**Cybercrime:** Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era - Security Challenges Posed by Mobile Devices - Registry Settings for Mobile Devices - Authentication Service Security - Attacks on Mobile/Cell Phones - Mobile Devices: Security Implications for Organizations - Organizational Measures for Handling Mobile - Organizational Security Policies and Measures in Mobile Computing Era - Laptops				
Unit – IV	**Tools and Methods Used in Cybercrime:** Introduction - Proxy Servers and Anonymizers – Phishing - Password Cracking - Keyloggers and Spywares - Virus and Worms - Trojan Horses and Backdoors – Steganography - DoS and DDoS Attacks - SQL Injection - Buffer Overflow - Attacks on Wireless Networks				
Unit – V	**Cybercrimes and Cybersecurity:** The Legal Perspectives – Introduction - Cybercrime and the Legal Landscape around the World - Why Do We Need Cyberlaws: The Indian Context - The Indian IT Act - Challenges to Indian Law and Cybercrime Scenario in India - Consequences of Not Addressing the Weakness in Information Technology Act - Digital Signatures and the Indian IT Act - Amendments to the Indian IT Act - Cybercrime and Punishment - Cyberlaw, Technology and Students: Indian Scenario. **Careers in Cybersecurity:** Introduction - IT Security Organization - Career Paths in Cybersecurity– Cybersecurity Certifications - Guide Path				

Text books:

Nina Godbole, SunitBelapure(2013) *Cyber Security*, Wiley India Pvt. Ltd. New Delhi

Reference books:

Chander, Harish, *Cyber Laws and IT Protection*. PHI Learning Private Limited. New Delhi.

Dieter Gollmann . (2006). *Computer Security*. 2nd edition. John Wiley & Sons

Godbole, N. (2009). *Information Systems Security: Metrics Frameworks and Best Practices*. Wiley India. New Delhi

Marther, T., Kumaraswamy, S.,&Latif, S. (2009). *Cloud Security and Privacy: An Enterprise Perceptive on Risk and Compliance*. O'Reilly.

Pfleeger, C. P., Pfleeger, S. L. *Analyzing Computer Security*. Pearson Education. India.

Tripathi, S. P., Goel, R. Shukla, P. V. *Introduction to Information Security and Cyber Laws*. Dreamtech Press.

Outcomes	➢ The students will be able to implement basic security algorithms. ➢ The students will be able to differentiate various governing bodies of Cyber Law.

Semester – II				
Course Code	**Core Course IV**	**T/P**	**C**	**H/W**
23MCI2C1	**ADVANCED DATABASE MANAGEMENT SYSTEMS**	**T**	**4**	**4**

Objectives	➢ To Acquire Knowledge of Database Models. ➢ To understand distributed database architecture. ➢ To learn the concepts of spatial temporal databases
Unit – I	**Relational and parallel Database Design:** Basics, Entity Types, Relationship Types, ER Model, ER to Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF,4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism.
Unit – II	**Distributed and Object based Databases:** Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.
Unit – III	**Spatial Database:** Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing.
Unit – IV	**XML Databases:** XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments
Unit – V	**Temporal Databases:** Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

Text books:

Silberschatz, A., Korth, H. F., &Sudarshan, S. (2011). *Database System Concepts* (6th ed.). McGraw-Hill International Edition.

Date C. J., Kannan A., & Swamynathan S. (2016). *An Introduction to Database Systems* (8th ed.). Pearson Education Reprint

Reference books:

Connolly, T., &Begg, C. (2014). *Database Systems a practical approach to Design, Implementation and Management*. Pearson Education

Elmasri, R., &Navathe, S. B. (2016). *Fundamental of Database Systems* (7th ed.). Pearson.

Outcomes	➢ Know basic notions and definitions in data analysis, machine learning. ➢ Know standard methods of data analysis and information retrieval. ➢ Able to formulate the problem of knowledge extraction as combinations of data filtration, analysis, and exploration methods

Semester – II				
Course Code	**Core Course V**	**T/P**	**C**	**H/W**
23MCI2C2	**OPEN SOURCE TECHNOLOGIES**	**T**	**4**	**4**

Objectives	➢ Understand concepts, strategies, and methodologies related to open source software development. ➢ Be familiar with open source software products and development tools currently available on the market. ➢ Be able to utilize open source software for developing a variety of software applications, particularly Web applications.
Unit – I	**Introduction** : Need of Open Sources – Advantages of Open Sources – Applications – Commercial aspects of Open Source movement – Certification courses issues – Open source Operating Systems : LINUX – Introduction – General Overview – Kernel mode and User mode process – Advanced concepts : Scheduling - Time Accounting – Personalities – Cloning and Backup your Linux System – Linux Signals – Development with Linux.
Unit – II	**PHP:** Introduction - What is PHP? - Basic Syntax of PHP – programming in web environment - Common PHP Script Elements - Using Variables - Constants – Data types - Operators ; Statements - Working With Arrays -Using Functions – OOP - String manipulation and regular expression - File and Directory Handling- Including Files - File Access - Working With Forms : Processing Forms - Form Validation – Introduction to advanced PHP concepts – Simple programs using PHP.
Unit – III	**MySQL**: Introduction - Setting up an account - Starting, Terminating and writing your own MySQL Programs - Record Selection Technology - Working with Strings - Date and Time - Sorting Query Results module - Generating Summary - Working with Metadata - Using Sequences – MySQL and Web - PHP and SQL database: PHP and LDAP – PHP Connectivity – Sending and receiving emails – PHP Database Connectivity: Retrieving data from MYSQL - Manipulating data in MySQL using PHP - Simple programs using MySQL.
Unit – IV	**PYTHON** : Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.
Unit – V	**Open Source tools and technologies**: Web Server - Apache Web Server - Working with Web Server - Configuring and using apache web services - Open source software tools: Browsers - Processors - Compilers - Model driven architecture tools - Eclipse IDE platform : Architecture - History - Simultaneous Releases - Case study : E-Governance - Government Policy toward Open Source.

Text books:

Lee, J., & Ware, B. (2003). *Open Source Web Development with LAMP using Linux, Apache, MySQL, PERL and PHP*.

Reference books:

Chun, W. J. (2006). *Core Phython Programming*. Prentice Hall of India.

Card, R., Dumas, E., &Mevel, F. (2003). *The Linux Kernel Book*. John Wiley publications sons.

Lerdorf, R., &Tatroe, L. (2002). *Programming PHP*. O'Reilly Publications

Suchring, S. (2002). *MySQL Bible*. John Wiley sons.

Outcomes	➢ Familiar with open source software products and development tools currently available on the market ➢ Develop web applications using open source software

	Semester – II			
Course Code	**Core Course VI**	**T/P**	**C**	**H/W**
23MCI2C3	**COMPILER DESIGN**	**T**	**4**	**4**

Objectives	➢ To teach concepts of language translation and phases of compiler design ➢ To describe the common forms of parsers ➢ To inculcate knowledge of parser by parsing LL parser and LR parser ➢ To demonstrate intermediate code using technique of syntax directed translation ➢ To Illustrate the various optimization techniques for designing various optimizing compilers
Unit – I	**Introduction-**Compilers: Analysis of source program; Phases of Computer – Tools of Computer – Grouping of phases, Simple one-pass compiler – grouping of phases. Simple one-pass compiler – Overview – Syntax definition – Syntax – directed translation – Parsing – translator for simple expressions – Lexical analysis – Removal of white space and comments – constants – Recognizing identifiers and keywords – A lexical analyzer – Role of lexical analyzer – Input buffering – Specification of tokens – Recognition of tokens.
Unit – II	**Symbol Tables-**Incorporating a symbol table – Symbol tables – Entries – list data structures for symbol table– Hash tables – Scope information – Parsing – Principles & Top down parsing – Predictive parsing– left recursion – Role of Parser – Context free grammar – Writing a grammar – Top down parsing – simple bottom up parsing – Shift reduce
Unit – III	**Syntax-directed translation**:-A translator for simple expressions – Abstract and concrete syntax – Adapting translation scheme – Optimizing translator – Syntax-directed definitions – Construction of syntax trees – Bottom up evaluation of S-attributed definitions, L-attributed, Top-Down translation, Type-Checking type systems, Specifications of simple type checker.
Unit – IV	**Runtime Organization-**Source language issues: Storage organization – Storage allocation strategies – Parameter Passing – Intermediate code generation – Intermediate languages – Declarations – Assignments – Boolean expressions – case statements.
Unit – V	**Code Generation-**Issues in design of code generator: target machine – Run time storage management – Basic blocks and flow graphs – A simple code generator – Code optimization – Introduction – Principles sources of optimizations of basic blocks – Loops in flow graphs.

Text books:
  Aho, A. S., Sethi, R., & Ullman, J. D. (1986). *Compilers Principles, Techniques and Tools*.
      Addison Wesley Publishing Company.
 Reference books:
  Allen I. Holub, 2001, *Compiler Design in C*, Prentice Hall of India,.
  Fischer Leblanc, *Crafting Compiler*, Benjamin Cummings, Menlo Park, 1988.
  Godfrey Winster S., Aruna Devi S., Sujatha R., "Compiler Design", yesdee Publishers, Third
      Reprint 2019.
  Holub, A. I. (1993). *Compiler Design in C*. PHI.
  Kennath C. Louden, 2004, *Compiler Construction Principles and Practice*, Vikas publishing
      House,.

Outcomes	At the end of the course students will be able to: ➢ Use compiler construction tools and describes the Functionality of each stage of compilation process ➢ Construct Grammars for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques ➢ Analyze different representations of intermediate code. ➢ Construct new compiler for new languages.

Semester – II					
Course Code 23MCI2P1	**CorePractical II**		**T/P**	**C**	**H/W**
	OPEN SOURCE TECHNOLOGIES AND DBMS LAB		**P**	**4**	**8**
Objectives	➢ To develop technical solutions for problems using the open source software readily available at free of cost. ➢ To install Wamp Server and learn programming in PHP. ➢ To understand the programming basics in Python Programming ➢ To learn about database management software				
Open Source Technologies	**PHP** 1. Create a simple HTML form and accept the username and display the name through PHP echo statement. 2. Write a PHP script to redirect a user to a different page. 3. Create a PHP script which display the capital and country name from the given array. Sort the list by the name of the country 4. Write a PHP script using nested for loop that creates a chess board. 5. Write a PHP function that checks if a string is all lower case. 6. Write a PHP script to calculate the difference between two dates. 7. Connect with MySQL and create student marksheet **Python** 1. Create a simple calculator to do all the arithmetic operations 2. Write a program to use control flow tools like if. 3. Write a program to use for loop 4. Create new module for mathematical operations and use in your program 5. Write a program to read and write files, create and delete directories 6. Write a program with exception handling 7. Write a program using classes 8. Connect with MySQL and create address book 9. Write a program using string handling and regular expressions				

DBMS Lab	1. Create a table department containing the columns deptno, deptname and description columns. Deptno is the primary key in department table. Create a table employee consists of columns, empno, empname, date_of_joining, basic, hra, da, deductions, gross, net. Initially only enter values for the columns empno, empname, and basic (essential columns). The calculation of hra is 10% of basic and da is 5% of basic. Empno is the primary key in the table and establish referential integrity between employee and department table. Empno should be unique and has to be generated automatically.
	2. Perform the following operations in the above two tables:
	   a) Initially only the few columns (essential) are to be added. Add the remaining columns in the table employee.
	   b) Basic column should not be null
	   c) Add constraint that basic should not be less than 5000.
	   d) Calculate hra,da,gross and net by using PL/SQL program.
	   e) The default value for date-of-birth is 1 jan, 1970.
	   f) Display the average salary of all the departments.
	   g) Display the average salary department wise.
	   h) Display the maximum salary of each department and also all departments put together.				

i) Commit the changes whenever required and rollback if necessary.
j) Use substitution variables to insert values repeatedly.

3. Assume some of the employees have given wrong information about date-of-birth.
   a) Update the corresponding table to change the value.
   b) Find the employees whose salary is between 5000 and 10000 but not exactly 7500.
   c) Find the employees whose name contains 'en'.
   d) Try to delete a particular deptno.
   e) Create alias for columns and use them in queries.
   f) List the employees according to ascending order of salary.
   g) List the employees according to ascending order of salary in each department.
   h) The retirement age is 60 years. Display the retirement day of all the employees.
   i) If salary of all the employees is increased by 10% every year, what is the salary of all the employees at retirement time.
   j) Find the employees who are born in leap year.
   k) Find the employees who are born on february 29.
   l) Find the departments where the salary of at-least one employee is more than 20000.
   m) Find the departments where the salary of all the employees is less than 20000.
   n) On first January of every year a bonus of 10% has to be given to all the employees.
4. Create a user and grant all permissions to the user.
5. Use revoke command to remove the user permissions.
6. Write a PL/SQL program to find the total and average of 5 subjects and display the grade.
7. Write a program to check whether the given number is prime or not.
8. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise display the remainder in words.
9. Write a function to accept employee number as parameter and return basic + hra together as single column.
10. Insert row in employee table using a trigger.
11. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
12. Create a trigger before deleting a record from employee table. Trigger will insert the row to be deleted into table called delete_emp and also record user who has deleted the record and date and time of delete.
13. Write a cursor to display the list of employees who are working as managers or analyst.
14. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the employee table that are updated. If none of the employee's salary are updated, we get a message, "None of the salaries were updated". Else we get a message, like, for example, "Salaries for 50 employees are updated" if 50 rows are updated.
15. A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a

	particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author.When writing a particular book, each author works with one editor, but may submit another work for publication to be supervised by other editors.
	
	To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following :
	  a) Analyze the data required.
	  b) Normalize the attributes.
	  c) Create the logical data model using E-R diagrams.

Note:	One experiment from **Open Source Technologies** and another one from **DBMS** is compulsory for University Examination
Outcomes	Students were able to ➢ relate the ways to solve advance programs using Open Source ➢ develop, implement, and demonstrate Python and PHP programs ➢ get expertise on database management software

Semester – II				
Course Code	**DSE - 2**	**T/P**	**C**	**H/W**
23MCI2E1	**(a) SOFTWARE TESTING**	**T**	**4**	**4**

Objectives	➢ Describe the principles and procedures for designing test cases. ➢ To understand test management and test automation techniques. ➢ To apply test metrics and measurements.
Unit – I	**Introduction**: Introduction to software testing-Goals of software testing-Software testing foundations-Software testing activities-Testing levels based on software activity-Coverage criterion-Module driven test design
Unit – II	**Software development life cycle models:** Phases of software project-Quality, Quality assurance and Quality control-Verification and Validation- Waterfall model-Prototyping and rapid application development model-Spiral or iterative model-The V model-Comparison of various life cycle models.
Unit – III	**Types of testing:** White box testing-Static testing-Structural testing-Black box testing-Domain testing-Integration testing-Top down integration-Bottom up integration-Scenario testing-System and Acceptance testing – Performance testing
Unit – IV	**Practical Considerations:**Regression Testing – Integration and Testing – Test process -Test plans – Identifying correct outputs. Testing Object-oriented software – Testing Web applications and Web services – Testing GUI – Real-time software and Embedded software
Unit – V	**Common People issues in Testing :** Perceptions and Misconceptions about Testing – Comparing between Testing and Development Functions – Career paths for Testing Professionals - Role of the Ecosystem and Call for action - **Test Management and Automation :** Planning – Management – Process – Reporting – Best Practices – Software Test Automation – Case Study : Selenium

Text books :

Ammann, P., & Offutt, J. (2016). *Introduction to software testing*. Cambridge University Press.

Desikan, S., & Ramesh, G. (2006). *Software testing: principles and practice*. Pearson Education India.

Reference books :

Beizer, B. (2003). *Software testing techniques*. Dreamtech Press.

Chauhan, N. Software Testing. Oxford University Press.

Craig, R. D., &Jaskiel, S. P. (2002). *Systematic software testing*. Artech house.

Pusuluri, N. R. (2006). *Software testing Concepts and tools*. Dreamtech Press

Outcomes	➢ Understand the basic testing procedure ➢ Able to support in generating test cases and test suites ➢ Able to test he applications manually by applying different testing methods and automation tools.

Semester – II				
Course Code	**DSE - 2**	**T/P**	**C**	**H/W**
23MCI2E2	**(b) INTERNET OF THINGS**	**T**	**4**	**4**

Objectives	➢ To understand the characterization and significance of the Internet of Things ➢ To recognize the building block of Internet of Things ➢ To learn about data and analytics for IoT
Unit – I	**Introduction:** Genesis of IoT – IoT and Digitization – IoT Impact – IoT Challenges – IoT Network Architecture and Design – Drivers – IoT Architecture – IoT Functional Stack – IoT Data Management and Compute Stack
Unit – II	**The "Things" of IoT:** Sensors, Actuators and Smart Objects – Sensor Networks – Connecting Smart Objects – Communication Criteria – IoT Access Technologies – IEEE 802.15.4 – Standardization and Alliances – Physical Layer – MAC Layer – Topology – Security – Competitive Technologies
Unit – III	**IP as IoT Network Layer**: Key advantages of Internet Protocol – Adoption or Adaptation of the Internet Protocol – Need for Optimization – Constrained nodes – Constrained Networks – IP Versions – Optimization IP for IoT – Profiles and Compliances
Unit – IV	**Application Protocols for IoT:** Transport Layer – IoT application Transport Methods – SCADA – Generic Web based protocols – IoT application layer protocol – CoAP - MQTT
Unit – V	**Data and Analytics for IoT:** Introduction to Data Analytics for IoT - Machine Learning - Big Data Analytics Tools and Technology - Edge Streaming Analytics - Network Analytics – Securing IoT – Case Studies : IoT in Industry - Agriculture, Healthcare, Activity Monitoring

Text books:

Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., & Henry, J. (2017). *IoT fundamentals: Networking technologies, protocols, and use cases for the internet of things*. Cisco Press.

Reference books:

Kranz, M. (2016). *Building the internet of things: Implement new business models, disrupt competitors, transform your industry*. John Wiley & Sons.

McEwen, A., &Cassimally, H. (2013). *Designing the internet of things*. John Wiley & Sons.

Raj, P., & Raman, A. C. (2017). *The Internet of Things: Enabling technologies, platforms, and use cases*. Auerbach Publications.

Outcomes	At the end of the course, the student ➢ will understand the characterization and significance of the Internet of Things ➢ is capable to recognize the building block of Internet of Things ➢ will get better insight about data and analytics for IoT

Semester – II				
Course Code	DSE - 2	T/P	C	H/W
23MCI2E3	(c) CLOUD SERVICES	T	4	4

Objectives	➢ To understand the fundamentals of Cloud Computing. ➢ To understand the management of cloud services and implement cloud IT model.
Unit – I	**Understanding Cloud Computing** : Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing– Companies in the Cloud Today – Cloud Services
Unit – II	**Developing Cloud Services** : Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds
Unit – III	**Cloud Computing For Everyone** : Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation
Unit – IV	**Using Cloud Services** : Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files
Unit – V	**Other Ways To Collaborate Online** : Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

Text books:

Miller, M. (2008). *Cloud computing: Web-based applications that change the way you work and collaborate online*. Que publishing.

Velte, A. T., Velte, T. J., Elsenpeter, R. C., &Elsenpeter, R. C. (2010). Cloud computing: a practical approach..

Reference books:

Buyya, R., Broberg, J., &Goscinski, A. M. (Eds.). (2010). *Cloud computing: Principles and paradigms*. John Wiley & Sons.

Hurwitz, J. S., & Kirsch, D. (2020). *Cloud computing for dummies*. John Wiley & Sons.

Hurwitz, J., Kaufman, M., &Halper, F. (2012). Cloud services for dummies. *USA: IBM Limited Edition*.

Outcomes	➢ Understand the concepts, characteristics, deliver models and benefits of cloud computing. ➢ Able to choose among various cloud technologies for implementing applications.

Course Code	SEC	T/P	C	H/W
23MCI2S1	**Web Technologies**	T	2	3
Objectives	➢ Study the various HTML tags and design simple web pages ➢ To study the scripting language Java Script			
Unit-I	**Structuring Documents for the Web:** Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups. Links and Navigation: Basic Links, Creating Links with the \<a> Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the \<img> Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.			
Unit-II	**Tables:** Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables. Forms: Introducing Forms, Form Controls, Sending Form Data to the Server. Frames: Introducing Frameset, \<frame> Element, Creating Links Between Frames, Setting a Default Target Frame Using \<base> Element, Nested Framesets, Inline or Floating Frames with \<iframe>.			
Unit-III	**Cascading Style Sheets:** Introducing CSS, Where you can Add CSS Rules. CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. More Cascading Style Sheets: Links, Lists, Tables, Outlines, The :focus and :activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout wit, Page Layout CSS , Design Issues.			
Unit-IV	**Java Script:** How to Add Script to Your Pages, Variables and Data Types – Statements and Operators, Control Structures, Conditional Statements, Loop Statements – Functions - Message box, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes.			
Unit-V	**Working with JavaScript:** Practical Tips for Writing Scripts, JavaScript Objects: Window Object - Document object - Browser Object - Form Object - Navigator object Screen object - Events, Event Handlers, Forms – Validations, Form Enhancements, JavaScript Libraries			

Textbooks:

Jon Duckett, *Beginning HTML, XTML, CSS and Java script* , Wiley Publishing

Reference Books:

Chris Bates, "*Web Programming*", Wiley Publishing 3d Edition.

M. Srinivasan, "*Web Technology: Theory and Practice*", Pearson Publication

Outcomes	➢ Designing client-side web pages and websites with interactive features ➢ Designing server-side web pages to handle databases and dynamically changing content ➢ Host and test websites for personal and commercial use

Semester – III				
Course Code	**Core Course VII**	**T/P**	**C**	**H/W**
23MCI3C1	**DATA SCIENCE & MACHINE LEARNING**	**T**	**4**	**4**

Objectives	- To acquire fundamental knowledge of concepts underlying data science and get hands-on experience with real-world data analysis. - Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning
Unit – I	**Introduction to Data Science**: Big Data and Data Science hype – Datafication - Current landscape of perspectives - Skill sets needed, Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model.
Unit – II	**Data Analysis and Basic Tools:** Exploratory Data Analysis (EDA) and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means - Feature Generation and Feature Selection.
Unit – III	**Feature Extraction:** User (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests - Recommendation Systems: Building a User-Facing Data Product Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction: Singular Value Decomposition - Principal Component Analysis
Unit – IV	**Machine Learning:** Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.
Unit – V	**Bayesian and Computational Learning :** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Textbooks:

  Mitchell, T. M. (2013) *Machine Learning*. McGraw-Hill Education (India) Private Limited.

  O'Neil, C., & Schutt, R. (2014). *Doing Data Science. Straight Talk from the Frontline*. O'Reilly Edition.

Reference books:

  Leskovek, J., Rajaraman, A., & Ullman, J. (2014) *Mining of Massive Datasets* (v2.1). Cambridge University Press. (free online)

  Murphy, K. P. (2013) *Machine Learning: A Probabilistic Perspective*. ISBN 0262018020.

Outcomes	- Know basic notions and definitions in data analysis, machine learning. - Know standard methods of data analysis and information retrieval. - Able to formulate the problem of knowledge extraction as combinations of data filtration, analysis, and exploration methods

Semester – III				
Course Code	**Core Course VIII**	**T/P**	**C**	**H/W**
23MCI3C2	**ADVANCED WEB TECHNOLOGY**	**T**	**4**	**4**

Objectives	➢ Study object-oriented programming with PHP. ➢ Understand PEAR DB techniques. ➢ Learn XML Document structure. ➢ Learn AJAX, Node, Angular and develop applications.
Unit – I	**Introduction to Web Technology:** Hypertext Markup Language and its components, HTML tags and attributes, Text formatting tags, List tags, Image tags, HTML tables, HTML Forms, Document Object Model (DOM), Cascading Style Sheets – Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Contextual Selector, Attribute Selector, CSS Properties, JavaScript - Data types, Operators, Variables, length, substring, Conditional Statements - if, Loops - for, & Functions, HTML DOM and JavaScript - Finding HTML Elements, Changing HTML elements, DOM events. Introduction to React Native – Building Native mobile apps with JavaScript
Unit – II	**Object oriented programming using PHP and Databases-**Introduction - Creating a Class - Creating an Object – Introspection - Serialization- Inheritance (Extending a class)-. Constructors and Destructors - Interfaces-. Encapsulation- Web Techniques- Introduction - Variables- Server Information - Processing Forms- Setting Response Headers- Maintaining State - Using PHP to Access a Databases- MySql Database Function - Relational Databases and SQL - PEAR DB basics- Advanced Database Techniques - Sample Application.
Unit – III	**XML and AJAX-**Introduction to XML - XML Document Structure- PHP and XML- XML Parser- The XML DOM (XML Document Object Model) -Simple XML- Changing a Value with Simple XML - AJAX- AJAX Web Application Model- AJAX-PHP Framework - Performing AJAX Validation- Handling XML Data Using PHP and AJAX-Connecting Database Using PHP and AJAX.
Unit – IV	**Introduction to Node js :** First Node API - Hello Node.js - A Rich Module Ecosystem - When To Use Node.js - When Node.js May Not Be The Best Choice - Front-end Vs. Back-end JavaScript - Diving In: Your First Node.js API - Serving JSON - Basic Routing - Dynamic Responses - File Serving - Express - Real-Time Chat
Unit – V	**Introduction to Angular:**What is Angular- Why is Angular- Type Script- Difference between Angular JS and Angular- Setting up Angular Environment- Angular Features and Advantages- Disadvantages **Core Concepts of Angular:**Modules - Ngmodule- Declarations- Imports-Providers- Bootstrap – Component: Creating the Component - Template- Class- Metadata- Angular Routing- Angular Forms: Template Driven Form- Reactive Form- Component Communication: Parent Communication And Child Communication- Service: What Is Service- Httpservice- How To Create Service

Text books:

Bayross, I. (2005). *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP* (4th ed.). bpb Publications.

David Gutman (2019) *Fullstack Node.js The Complete Guide to Building Production Apps with Node.js*, Fullstack.io.

Nate Murray, Felipe Coury, Ari Lerner, and Carlos Taborda (2020), *ng-book The Complete*

Guide to Angular, Fullstack.io publications

Porika, S., & Kishore, P. (2015). *Web Technologies and Applications*. BS Publications.

Reference books:

Bonnie Eisenman (2016), *Learning React Native*, O'Reilly Media, Inc

Brown, E. (2019). *Web development with node and express: leveraging the JavaScript stack*. O'Reilly Media.

Deital, & Deital. (2000). *XML How to program*. Pearson Education.

Lane, D., & Williams, H. E. *WebDatabase Application with PHP and MySQL* (2nd ed.).

Nimbalkar, A. B., &Sakherkar, S. R. *Advanced Web Technologies*. NiraliPrakasan Publishers.

Outcomes	At the end of the course, the students will be able to: ➢ Create Object oriented applications using PHP ➢ Design and develop secure web applications using XML & PHP according to industry standards ➢ Understand the basics of AJAX, Node js and Angular

Semester – III				
Course Code	**Core Course IX**	**T/P**	**C**	**H/W**
23MCI3C3	**DISTRIBUTED OPERATING SYSTEM**	**T**	**4**	**4**

Objectives	➢ To study Distributed operating system concepts ➢ To understand hardware, software and communication in distributed OS ➢ To learn the distributed resource management components. ➢ Practices to learn concepts of OS and Program the principles of Operating Systems
Unit – I	Introduction: Operating System Definition – Functions of Operating System – Types of Advanced Operating System – Design Approaches – Synchronization Mechanisms – concepts of a Process – Critical Section Problem – Process Deadlock – Models of Deadlock – Conditions for Deadlock – System with single-unit requests, Consumable Resources, Reusable Resources
Unit – II	Distributed Operating Systems: Introduction- Issues – Communication Primitives – Inherent Limitations –Lamport's Logical Clock, Vector Clock, Global State, Cuts – Termination Detection – Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport's Algorithm - Token Based Algorithms –Distributed Deadlock Detection – Distributed Deadlock Detection Algorithms – Agreement Protocols
Unit – III	Distributed Resource Management: Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed shared Memory – Architecture – Algorithm – Protocols – Design Issues – Distributed Scheduling – Issues – Components – Algorithms.
Unit – IV	Failure Recovery and Fault Tolerance – Concepts – Failure Classifications – Approaches to Recovery – Recovery in Concurrent Systems – Synchronous and Asynchronous Check pointing and Recovery –Check pointing in Distributed Database Systems – Fault Tolerance Issues – Two-Phase and Nonblocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols.
Unit – V	Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management – Reliability/Fault Tolerance – Database Operating Systems – concepts – Features of Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

Textbooks:

Mukesh Singhal N.G.Shivaratri (2000) Advanced Concepts in Operating Systems, McGraw Hill.

Tanenbaum, A. S. (1995). *Distributed operating systems*. Pearson Education India.

Referencebooks:

Abraham Silberschatz, Peter B.Galvin, G.Gagne (2003) *Operating Concepts*, 6th Edition Addison Wesley publications.

Andrew S. Tanenbaum, (2001) *Modern Operating Systems*, 2nd Edition Addison Wesley.

Outcomes	➢ Clear understanding on several resource management techniques like distributed shared memory and other resources ➢ Knowledge on mutual exclusion and Deadlock detection of Distributed operating system. ➢ Able to design and implement algorithms of distributed shared memory and commit protocols ➢ Able to design and implement fault tolerant distributed systems.

Semester – III				
Course Code	**Core Practical III**	**T/P**	**C**	**H/W**
23MCI3P1	**WEB TECHNOLOGY AND DATA SCIENCE LAB**	**P**	**4**	**8**

Objectives	➢ To explore the advanced web technology concepts ➢ To get exposure about HTML, CSS, JavaScript, PHP and MySQL, XML, Node and Angular ➢ To get trained in Data Science practically ➢ To implement the applications using R Tool

Advanced Web Technology	1. Create a web page with advanced layouts and positioning with CSS and HTML.
	2. Design the following static web pages required for an online book store web site.
	  a) HOME PAGE: The static home page must contain three frames.
	  b) LOGIN PAGE
	  c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
	  d) REGISTRATION PAGE.
	3. Write JavaScript to validate the following fields of the Registration page.
	  • First Name (Name should contains alphabets and the length should not be less than 6 characters).
	  • Password (Password should not be less than 6 characters length).
	  • E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
	  • Mobile Number (Phone number should contain 10 digits only).
	  • Last Name and Address (should not be Empty).
	4. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
	5. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
	  • **Input**: Click on Display Date button using onclick( ) function **Output**: Display date in the textbox
	  • **Input**: A number n obtained using prompt **Output**: Factorial of n number using alert
	  • **Input**: A number n obtained using prompt **Output**: A multiplication table of numbers from 1 to 10 of n using alert
	  • **Input**: A number n obtained using prompt and add another number using confirm **Output**: Sum of the entire n numbers using alert.
	7. Create a web page through which the user can enter his / her details to become an authenticated user of that page.
	8. Create a web page with rollover menus. Rollover menus should be created using JavaScript.
	9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
	10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
	11. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
	12. Design an XML document to store information about a student in an engi-

	neering college affiliated to University. The information must include USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document. 13. Create an application that loads a text string into an XML DOM object and extracts the info from it with JavaScript. 14. Develop web APIs using Node js 15. Developapplications using angular

Data Science	1. Write an R script, to create R objects for calculator application and save in a specified location in disk.
	2. DESCRIPTIVE STATISTICS IN R
	(a) Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.
	(b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
	3. READING AND WRITING DIFFERENT TYPES OF DATASETS
	a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
	b. Reading Excel data sheet in R.
	c. Reading XML dataset in R.
	4. VISUALIZATIONS
	a. Find the data distributions using box and scatter plot.
	b. Find the outliers using plot.
	c. Plot the histogram, bar chart and pie chart on sample data
	5. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule to get the result.
	6. Implement k-nearest neighbour's classification using R.
	7. CORRELATION AND COVARIANCE
	a. Find the correlation matrix.
	b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
	c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data
	8. REGRESSION MODEL
	Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).
	9. Implement Naïve Bayes theorem to classify the English text.
	10. CLUSTERING MODEL
	Develop a Clustering algorithms for unsupervised classification.
	Plot the cluster data using R visualizations.
	11. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)
	
	      VAR1 VAR2 CLASS
	      1.713 1.586 0

	0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1 12. Implement the finite words classification system using Back-propagation algorithm
Note:	One experiment from **Advanced Web Technology** and another one from **Data Science** is compulsory for University Examination
Outcomes	At the end of the course, students are able to ➤ develop web applications using advanced web technologies ➤ understand the concepts of Data science practically. ➤ analyzedata using R Tool.

Semester – III				
Course Code	**DSE - 3**	**T/P**	**C**	**H/W**
23MCI3E1	**(a)BLOCK CHAIN TECHNOLOGY**	**T**	**4**	**4**

Objectives	➢ To impart knowledge about both the conceptual as well as application aspects of Blockchain. ➢ To familiar with the fundamental design and architectural primitives of Blockchain, the system and the security aspects, along with various use cases from different application domains.
Unit – I	**Introduction-**Introduction to blockchain - Types of blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain - Decentralization – Decentralization using blockchain – Methods of Decentralization – Routes to Decentralization – Blockchain and full ecosystem Decentralization – Smart Contract - Decentralization Organizations – Decentralization applications – Platforms of Decentralization.
Unit – II	**Cryptography & Technical Foundation-**Cryptography and Technical Foundations – Introduction – Cryptographic primitives – Asymmetric Cryptography – Public and Private keys – Financial marketing and trading.
Unit – III	**Bitcoin-**Bitcoin – Transactions – Blockchain – Alternative Coins – bitcoin limitations – Namecoin – Litecoin – Primecoin.
Unit – IV	**Smart Contracts &Ethereum -**Smart Contracts – Ethereum 101 – Introduction – Ethereumblockchain – Elements of Ethereumblockchain – Pre-complied contracts – Accounts – Block – Ether – Messages – Mining – Clients and Wallets – Trading and investment – The ethereum network – Applications developed on ethereum – Scalability and security issues.
Unit – V	**Alternative Blockchains -**Alternative Blockchains – Blockchains – Platforms – Blockchain-Outside of Currencies – Internet of Things – Government – Health – Finance – Scalability and other challenges – Scalability – Privacy – Security.

Textbooks:

Bashir, I. (2017). *Mastering blockchain*. Packt Publishing Ltd..

Narayanan, A., Bonneau, J., Felten, E., Miller, A., &Goldfeder, S. (2016). *Bitcoin and cryptocurrency technologies: a comprehensive introduction*. Princeton University Press..

Reference Books:

Bashir, I. (2020). *Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more*. Packt Publishing Ltd..

Grincalaitis, M. (2019). *Mastering Ethereum: Implement advanced blockchain applications using Ethereum-supported tools, services, and protocols*. Packt Publishing Ltd.

Thompson, J. (2017). Blockchain: the blockchain for beginnings, guild to blockchain technology and blockchain programming. *Create Space Independent Publishing Platform*.

Outcomes	➢ Understand the foundation of Blockchain, which is fundamentally a public digital ledger to share information in a trustworthy and secure way. ➢ Know about the application of crypto currencies to various other domains, including business process management, smart contracts, IoTetc.

	Semester – III			
Course Code	**DSE - 3**	T/P	C	H/W
23MCI3E2	**(b)WEB SERVICES**	T	4	4

Objectives	➢ To understand web services and implementation model for SOA. ➢ To understand XML concepts. ➢ To understand paradigms needed for testing web services and to explore different test strategies for SOA – based applications
Unit – I	Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.
Unit – II	Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services.
Unit – III	Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP: Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging.
Unit – IV	Describing Web Services – WSDL introduction, non-functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDLtools, WSDL port type, limitations of WSDL.
Unit – V	Registering and Discovering Services: The role of service registries, Service discovery,Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation

Textbooks:

Papazoglou, M. (2012). Web services and soa: principles and technology 2nd. *Harlow, Essex: Pearson Education Limited*.

Nagappan, R., Skoczylas, R., &Sriganesh, R. P. (2003). *Developing Java web services: architecting and developing secure web services using Java*. John Wiley & Sons.

Reference books:

Chatterjee, S., & Webber, J. (2004). *Developing enterprise Web services: an architect's guide*. Prentice Hall Professional.

Coyle, F. P. (2002). *XML, Web services, and the data revolution*. Addison-Wesley Professional.

McGovern, J., Tyagi, S., Stevens, M., & Mathew, S. (2003). *Java web services architecture*. Elsevier.

Outcomes	The students will be able to ➢ Understand the principles of SOA. ➢ identify and select the appropriate framework components in creation of web service solution ➢ apply OOP principles to create web service solutions.

	Semester – III			
Course Code	DSE - 3	T/P	C	H/W
23MCI3E3	(c) DIGITAL IMAGE PROCESSING	T	4	4
Objectives	➢ To become familiar with digital image fundamentals ➢ To get exposed to simple image enhancement techniques in Spatial and Frequency domain. ➢ To learn concepts of degradation function and restoration techniques.			
Unit – I	Elements of Digital Image Processing System – Acquisition Storage, processing – Communication, display – structure of the Human eye – Image formulation in the eye – Image Sampling and quantization – basic relationship between pixels. Basic image transformation – Introduction to Fourier transform and DFT – properties of two dimensional Fourier transform – separable image transforms – Walsh, Hardmard, Discrete cosine –HaarmStant, Karhunern-Leove Transforms – Hotelling transforms.			
Unit – II	Spatial domain methods – Enhancement by point processing – contrast stretching dynamic range compression – Gray level and bit plane slicing – Histogram processing – Image subtraction – Image averaging – Spatial filtering – Smoothing, Sharpening filters – Frequency domain methods – Low pass, High pass and Homomorphic filtering – Color image processing.			
Unit – III	Degradation models – Diagonalization of circulant and block circulant matrices and its effect on the degradation model – Algebraic approach to restoration – Inverse filtering – Least mean square filter – Interactive restoration – Restoration in the spatial domain.			
Unit – IV	Need and scope of image data compression – Coding, interpixel, psychovisual redundancy – Fidelity criteria – Image compression models – Lossless compression – Variable length, bit plane and losses predictive coding – Lossy compression – Lossy predictive coding – Transform coding – image compression standards			
Unit – V	Basic Problems in pattern recognition system design – Linear discriminant function pattern classification using statistical approach – Bayes classifier – Perception criterion function – relaxation algorithm – Ho Kashyap procedure – Syntactic pattern recognition – Concepts of formal language theory – Formulation of syntactic pattern recognition system – AI approach to pattern recognition problems – Applications of pattern recognition.			

Textbooks:

Gonzalez, Woods. (1993). Digital Image Processing. Addison Wesley.

Tou, J. T. & Gonzalez, R. C. (1974). pattern Recognition principles. Addison Wesley.

Reference books:

Baxes, G. A. (1994). *Digital image processing: principles and applications*. John Wiley & Sons, Inc.

Jain. (1995). A Fundamental of Digital Processing. Prentice Hall.

Pratt. (1991). Digital Image Processing (2nd ed.). Wiley.

Outcomes	➢ Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms. ➢ Operate on images using the techniques of smoothing, sharpening and enhancement. ➢ Understand the restoration concepts and filtering techniques. ➢ Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

Course Code 23MCI3S1	SEC-II	T/P	C	H/W
		T	2	3
	E-Commerce			

Objectives	➢ Introduces information systems for business and management. ➢ To familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
Unit-I	Welcome to electronic commerce: Electronic commerce framework - Electronic commerce and Media convergence - The anatomy of E-commerce Applications - Electronic commerce consumer Applications - Electronic commerce organization Applications.
Unit-II	The Network Infrastructure for Electronic commerce Market: Forces Influencing the I-way - Components of the I-way - Network access Equipment - The Last Mile: Local Roads and Access Ramps-Global Information Distribution Networks - Public policy Issues Shaping the I-way.
Unit-III	The Internet as a Network Infrastructure: The Internet Terminology – Chronological History of the Internet – NSFNET: Architecture and Components - National Research and Education Network - Globalization of the AcademicInternet – Internet Governance - The Inernet Society.
Unit-IV	Electronic Payment Systems: Types of Electronic payment systems - DigitalToken-Based Electronic Payment systems - Smart Cards and Electronic Payment systems - Credit Card Based Electronic payment systems – Risk and Electronic payment systems - Designing Electronic payment systems.
Unit-V	Mobile and Wireless Computing Fundamentals: Mobile Computing Framework – Wireless Delivery Technology and Switching Methods - Mobile Information Access Devices -Mobile Data Internetworking Standards - Cellular Data Communication Protocols - Mobile Computing Applications - Personal Communication Service.

Text Book :

Ravi Kalakota, Andrew B. Whinston (2009) *Frontiers of Electronic Commerce*, Pearson Education.

Reference Books :

Bhushan Dewan (2001) *e-commerce*, S. Chand &Company Ltd.

Murthy, C. S. V. (2007). *E-Commerce-Concepts, Models And Strategies*. Himalaya Publ..

Rayport, J. F., & Jaworski, B. J. (2004). *Introduction to e-commerce*. McGraw-Hill Irwin MarketspaceU.

Outcomes	➢ Students will be able to understand the basic concepts and technologies used in the field of management information systems ➢ Students will have the knowledge of the different types of management information systems ➢ Students will be able to understand the processes of developing and implementing information systems

Semester – IV				
Course Code	**Core Course X**	**T/P**	**C**	**H/W**
23MCI4C1	**SOFT COMPUTING**	**T**	**4**	**4**
Objectives	➢ To learn the key aspects of soft computing ➢ To know about the components and building block hypothesis of Genetic algorithm. ➢ To study the fuzzy logic components			
Unit – I	**Introduction:** Soft Computing-Soft Computing Constituents-Soft Computing versus Hard Computing-Characteristics-Applications-Fuzzy Set Theory: Introduction –Fuzzy and soft computing-Fuzzy Parametrization-Fuzzy rules and fuzzy sets-Operations on fuzzy sets-Properties of fuzzy sets-Fuzzy relations: Concept-Fuzzy Composition-Fuzzy Tolerance & equivalence relation-Membership Functions-Features-Fuzzification-Methods of membership value assignments-Defuzzification methods			
Unit – II	**Artificial Neural Networks:** Fundamental Concepts-Application and scope of neural networks-Basic Terminologies-Learning Methods-Fundamental models of artificial neural networks-Mcculloch pits model-Hebb Network model-Linear separability			
Unit – III	**Supervised Learning:** Networks: Perceptron Network – Adaline and Madaline Networks –Back Propagation Network – Radial Basis Function Network – Associative Memory Networks – Bidirectional Associative Memory – Hopfield Network. Unsupervised Learning Networks: Kohonen Self-Organizing Feature Maps – Counter Propagation Networks – ART Network.			
Unit – IV	**Fuzzy Arithmetic:** Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules – Aggregation of Fuzzy Rules – Fuzzy Reasoning – Fuzzy Inference and Expert Systems – Fuzzy Decision Making –Fuzzy Logic Control Systems.			
Unit – V	**Genetic Algorithm**: Fundamental Concept – Basic Terminologies – Traditional Vs Genetic Algorithm – Elements of GA – Encoding – Fitness Function – Genetic Operators: Selection –Cross Over – Inversion and Deletion – Mutation – Simple and General GA – The Schema Theorem –Classification of Genetic Algorithm – Genetic Programming-Applications of GA			

Text books:

Roy, S., &Chakraborty, U. (2013). *Soft computing*. Pearson Education India.

Ross, T. J. (2005). *Fuzzy logic with engineering applications*. John Wiley & Sons.

Sivanandam, S. N., &Deepa, S. N. (2007). *Principles of soft computing (with CD)*. John Wiley & Sons.

Reference books:

Jang, J. S. R., Sun, C. T., & Mizutani, E. (1997). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence Pearson Education.

Rajasekaran, S., &Pai, G. V. (2017). *Neural networks, fuzzy systems and evolutionary algorithms: Synthesis and applications*. PHI Learning Pvt. Ltd.

Outcomes	➢ Gain knowledge about the soft computing techniques ➢ Understand fuzzy concepts and develop a Fuzzy expert system to derive ➢ Learn the Machine learning concepts

	Semester – IV			
Course Code	**Core Course XI**	**T/P**	**C**	**H/W**
23MCI4C2	**MOBILE COMMUNICATIONS**	**T**	**4**	**4**
Objectives	➢ To understand the basic concepts of mobile computing and basics of mobile telecommunication system. ➢ To be familiar with the network layer protocols and Ad-Hoc networks. ➢ To know the basis of transport and application layer protocols. ➢ To gain knowledge about Wireless telephony applications.			
Unit – I	**Introduction :** Introduction - Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing –Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control – Comparisons			
Unit – II	**Telecommunication systems :** Telecommunication Systems – GSM – Architecture – Sessions – Protocols – Hand Over and Security – DECT - UMTS and IMT – 2000 – Satellite Systems.			
Unit – III	**Wireless LAN and Network Layer :** Wireless Lan - IEEE 802.11 – Hiper LAN – Bluetooth – Security and Link Management - Mobile network layer - Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.			
Unit – IV	**Mobile Transport Layer :** Mobile transport layer - Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance			
Unit – V	**Application Layer :** Support for Mobility – File systems – WWW - WAP Architecture – WDP – WTLS – WTP –WSP – WAE — WML Script – Wireless Telephony Application – Push / Pull services.			

Textbooks:

Schiller, J. H. (2003). *Mobile communications*. Pearson education.

Pattnaik, P. K., & Mall, R. (2015). *Fundamentals of Mobile Computing*. PHI Learning Pvt. Ltd.

Reference books:

Agrawal, D. P., &Zeng, Q. A. (2015). *Introduction to wireless and mobile systems*. Cengage learning.

Lee, W. C. (1998). *Mobile communications engineering: theory and applications*. McGraw-Hill Education..

Merk, L., &Niclous, M. (2006). *Principles of Mobile Computing*. Dreamtech Press.

Outcomes	• Explain the basics of mobile telecommunication systems and illustrate the generations of telecommunication systems in wireless networks. • Determine the functionality of MAC, network layer and identify a routing protocol for a given Ad hoc network • Explain the functionality of Transport and Application layers • Develop a WML script for telephony applications.

Semester – IV				
Course Code	**Core Course XII**	**T/P**	**C**	**H/W**
23MCI4C3	**BIG DATA ANALYTICS**	**T**	**4**	**4**
Objectives	➢ To understand the competitive advantages of big data analytics ➢ To understand the big data frameworks ➢ To learn data analysis methods and stream computing ➢ To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics			
Unit – I	**Introduction To Big Data :** Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs TraditionalData - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems –WebData – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.			
Unit – II	**Hadoop Framework :** Distributed File Systems - Large-Scale FileSystem Organization – HDFS concepts –MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN			
Unit – III	**Data Analysis :** Statistical Methods:Regression modelling, Multivariate Analysis - Classification: SVM & KernelMethods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods,Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics			
Unit – IV	**Mining Data Streams :** Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream –MiningData Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications -Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.			
Unit – V	**Big Data Frameworks:** Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations –Hbase Clients – Examples.Cassandra: Data Model – Examples – Cassandra Clients – HadoopIntegration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts.Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation –HiveQL Queries			

Textbooks:

Loshin, D. (2013). Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph.

Franks, B. (2012). Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics. Wiley and SAS Business Series.

Reference books:

Berthold, M., & Hand, D. J. (2007). Intelligent Data Analysis (2nd ed.). Springer.

Cotton, R. (2013). Learning R – A Step-by-step Function Guide to Data Analysis. O'Reilly Media.

Minelli, M., Chambers, M., &Dhiraj, A. (2013). Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses. Wiley.

Sadalage, P. J., & Fowler, M. (2012). NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Addison-Wesley Professional.

Outcomes	At the end of this course, the students will be able to: • Understand how to leverage the insights from big data analytics • Analyze data by utilizing various statistical and data mining approaches • Perform analytics on real-time streaming data

Semester – IV				
Course Code **23MCI4PR**	**DISSERTATION WORK / PROJECT WORK/ INTERNSHIP PROGRAME**		**C** **14**	**H/W** **16**
Objectives	➢ To get exposure about the work environment in the industry ➢ To gain training on software development practically ➢ To gain practical knowledge and participate in Industry projects			
	For Internal Marks: Two review meetings 2 × 10 = 20 Marks Overall Performance = 30 Marks ----------------- **Total** = 50 Marks ----------------- **For External Marks:** Thesis = 100 Marks Viva-Voce = 50 Marks ----------------- **Total** = 150 Marks -----------------			
Outcomes	After Completing this course, the students are able to: ➢ Knowledge of the most advanced research in the candidate's specialization area (Track) of Software Development ➢ In-depth understanding of academic theory and the preparation of high-quality research pertinent to the field of study			