Master of Computer Applications

Syllabus

AFFILIATED COLLEGES

Program Code: 38M

2021 – 2022 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC,
Ranked 13th among Indian Universities by MHRD-NIRF,
World Ranking : Times - 801-1000, Shanghai - 901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
The **M.C.A.** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	To emerge as a System Analyst/ Software Engineer/ Data Analyst.
PEO2	The students can come up with a good solution for Business Models
PEO3	Design and Development of solutions to System Security
PEO4	Emerge as a Good Teacherand Researcher.

Program Specific Outcomes (PSOs)	
After the successful completion of **MCA** program, the students are expected to	
PSO1	Obtain sound knowledge in the basic concepts of computer science including theory and programming familiar with relevant trends in computer science domains.
PSO2	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PSO3	Acquire professional skills in software design process and practical competence in broad range of open source programming languages to withstand technological change and provide solutions to new ideas and innovations.
PSO4	Able to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer applications.
PSO5	Provide various computing skills like analysis, design and development of innovative software products to meet the industry needs with legal, ethical and social acceptable solutions for computer based technical problems.

Program Outcomes (POs)	
On successful completion of the **M.C.A.**program	
PO1	Develop creativity and problem solving skills with the knowledge of computing and mathematics.
PO2	Ability to develop and carry out experiments, interpret and infer data.
PO3	Design algorithms and develop software to aid solutions to industry and governments.
PO4	Review the latest technology and tool handling mechanism.
PO5	Analyze the outcome to solve global environment related issues.
PO6	Apply the knowledge in lifelong learning journey to equip themselves.
PO7	Identify the perspective of business practices, risks and limitations.
PO8	Work with professional and ethical values.
PO9	Formulate the responsibilities of human rights and entrepreneurial spirit.
PO10	Understand the methods to communicate effectively and work collectively.

Template for Scheme of Examination

BHARATHIAR UNIVERSITY, COIMBATORE 641 046

M.C.A. (CBCS PATTERN)

(Affiliated Colleges)

*(For the students admitted from the academic year **2021 – 22** onwards)*

Course Code	Title of the Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
FIRST SEMESTER							
	Core I Java Programming	4	4	-	50	50	100
	Core II Relational Database Management Systems RDBMS	4	4	-	50	50	100
	Core III Computer Networks	4	4	-	50	50	100
	CoreIV Operating Systems	4	4	-	50	50	100
	Elective I	4	4	-	50	50	100
	Practical I : Java Programming Lab	3	-	5	50	50	100
	Practical II : RDBMS with ORACLE Lab	3	-	5	50	50	100
SECOND SEMESTER							
	Core V Datamining and Big Data Analytics	4	4	-	50	50	100
	Core VI.NET Programming	4	4	-	50	50	100
	Core VII Operations Research	4	4	-	50	50	100
	Core VIII Software Project Management	4	4	-	50	50	100
	Elective II	4	4	-	50	50	100
	Practical III : Datamining Lab	3	-	4	50	50	100
	Practical IV : NET Programming Lab	3	-	4	50	50	100
	Practical V: Web Application Development and Hosting	2	-	2	25	25	50
	Total						
THIRD SEMESTER							
	Core IX: PHP Programming	4	4	-	50	50	100
	Core X Software Testing	4	4	-	50	50	100
	Core XI Network Security and Cryptography	4	4	-	50	50	100
	Core XII Cloud Computing	4	4	-	50	50	100
	Elective III	4	4	-	50	50	100
	Practical VI : PHP Programming Lab	3	-	4	50	50	100

	Practical VII : Software Testing Lab	3	-	4	50	50	100
	Practical VIII : Mini Project	2	-	2	50	50	100
	Total						
FOURTH SEMESTER							
	Main Project	6			100	100	200
	Total						
	Grand Total	**90**					**2450**
ONLINE COURSES							
1.	# SWAYAM – MOOC – Online Course	2					
2.	**#Job oriented Certificate course**	2					

* Mini Project report - 50 marks; Viva-voce – 50 marks

** Major Project report - 100 marks; Viva-voce – 100 marks

During II or III Semester (Optional)

First
Semester

Course code		JAVA PROGRAMMING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of C and C++ Programming	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to enable the students:

1. To understand basic concepts of object oriented programming, methods data types, class and objects, packages, interfaces and threads.
2. To apply and analyze Java Concepts in Databases through JDBC,
3. To understand and apply Servlet technology RMI for a distributed architecture.
4. To enable the students to learn various exception handling mechanisms, Graphics and File functions.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of Java programming	K1,K2
2	Understand Java methods	K1,K2,K3
3	Obtain knowledge about concepts, syntax and use of packages, interfaces, threads and exception handling for writing programs	K1,K2K3,K4,K5
4	Familiarize the JDBC object services and make use these services for database access programs	K1,K2,K3,K4, K5
5	Apply multithreading, string manipulation, Java Beans and Servlets concepts	K1,K2,K3,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12Hours

Introduction: History of JAVA, JAVA class libraries – Basics of a typical JAVA environment – Arithmetic, Equality and Relational Operators – Thinking about Objects, Applet: Adding Integers (Example) – Control Structures: if, if/else, while, for, switch, do/while, break and continue – Operators: Assignment, Increment and Decrement and Logical – Primitive Data types..

Unit:2	CLASS, METHODS AND PACKAGES	12Hours

Methods: program modules in JAVA – Methods – Method definitions – JAVA API packages – Duration of identifiers – Scope rules – Method overloading - Arrays – References and Reference parameters – Passing arrays to methods – Multiple subscripted arrays – Class scope – Controlling access to members – Creating packages – Constructors – Overloaded constructors – Set and Get methods – Final instance variables – Packages access – Using this reference – Finalizers – static Class members – Data abstraction and Information Hiding – Superclasses and Subclasses – protected members – Constructers and Finalizers in subclass – inner class definitions – Type wrapper class for primitive types.

Unit:3	STRING AND GRAPHICS	12Hours
String constructors – String methods: length, CharAt, getChars, hashCode, value of, intern and miscellaneous string methods – Substrings and concatenating strings – stringBuffer class – stringTokenizer Class – Graphics contexts and Graphics Objects – color and Font controls – Drawing lines, Rectangles, Ovals, Arcs, Polygons and Polylines - The JAVA2D API – Swing overview – Jlabel – Event handling model – JtexField, JpasswordField, Jbutton, JcheckBox, Jradio Button, JcomboBox, Jlist, JtextArea, Jslider – Mouse event handling, Adapter classes – Layout managers – Panels – Using menus with frames – Boxlayout manager.		
Unit:4	**EXCEPTION HANDLING AND FILES**	**11Hours**
The basics of JAVA exception handling – Try blocks – Throwing, Catching and Rethrowing an exception – Throws clause – finally block – Class Thread: an overview – Thread states – Thread priorities and scheduling – Thread synchronization – Runnable interface – Thread groups – Loading, displaying and scaling images – Files and Streams – Creating, Reading and Updating a sequential access file – Creating, Writing and Reading a random access file – Class file – Reading, Inserting and Updating a database (Use JDBC to a MS Access)		
Unit:5	**SERVLET**	**11Hours**
Overview of Servlet technology - Handling HTTP GET and POST requests – Session tracking – RMI: defining, implementing the RMI – Define the Client – Compile Execute the server and the client – Networking : Reading a file on a web server – Establishing a simple server and a simple client (using stream sockets) – Random and BitSet Class – Class arrays – Interface Collection and Class Collections – Sets – Maps – JAVABEANS : Preparing a class to be a JavaBean – Creating a JavaBean – Adding Beans and Properties to a JavaBean – Connecting Beans with Events in the BeanBox – the BeanInfo class.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60Hours**

Text Books	
1	Deitel and Deitel, " Java How to Program", Third Edition, PHI/Pearson Education Asia.
2	Keyur shab,"Java 2 programming", Tata McGraw-Hill Pub. Company Ltd.
Reference Books	
1	C.Xavier,"Programming with Java 2",SciTech Publications (India) P. Ltd.
2	Cays S. Horstmann, Gary Cornell, "Core Java2 Volume I – Fundamentals", Pearson Edition, 2001 5. Cays S. Horstmann, Gary Cornell, "Core Java2 Volume II – Fundamentals", Pearson Edition, 2003
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/java-programs
2	https://www.tutorialspoint.com/java/index.htm
3	https://nptel.ac.in/courses/106/105/106105191/

Course Designed By:

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	S	S	M	S	S
CO2	S	S	S	M	S	S	M	L	M	M
CO3	M	S	M	S	S	L	S	M	S	S
CO4	S	S	S	S	M	S	M	S	M	M
CO5	S	S	S	S	S	M	S	M	M	S

*S-Strong; M-Medium; L-Low

Course code		RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basic knowledge about database	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to understand the basics of database management systems.
2. To enable the students to understand ER model, structure of relational database and indexing.
3. To enable the students to apply advance database concepts to create secured, distributed databases.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understood the basic principles of database management systems, parallel & distributed databases	K1,K2
2	Gained knowledge over various database models, schemas and SQL statements	K1,K2
3	Construct Logical database design	K2,K3
4	Apply normalization and functional dependency in database design with security concern	K2,K3, K4,K6
5	Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS	K2,K3, K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	DATABASE SYSTEM	12Hours

Overview of database systems: Managing data- A historical perspective – File systems versus a DBMS - Advantages of a DBMS- Describing and storing Data in a DBMS - Queries in a DBMS - Transaction management – Structure of a DBMS. Database design & ER diagrams – Entities, Attributes, and Entity Sets – Relationships and Relationship Sets- Additional feature of the ER model- conceptual Database design with the ER model.

Unit:2	RELATIONAL MODEL	12Hours

Relational Model: Integrity constraints over relations – Enforcing integrity constraints – Querying relational data – Logical database design : ER to Relational –Introduction to Views – Destroying / Altering Tables & Views. Relational Algebra and Calculus: Relational Algebra – Relational Calculus

Unit:3	SQL	12Hours

SQL: Queries, Programming, Triggers: The form of a basic SQL Query – UNION, INTERSECT and EXCEPT – Nested Queries – Aggregate operators – Null values –Complex integrity constraints in SQL - Triggers & Active data bases. Transaction Management

Overview: The ACID Properties - Transactions & Schedules – Concurrent execution of Transactions – Lock-based concurrency control – Performance of Locking –Transaction support in SQL.		
Unit:4	**NORMAL FORMS AND SECURITY**	**12Hours**
Schema Refinement and Normal forms: Introduction to Schema refinement – Functional dependencies – Reasoning about functional dependencies – Normal forms –Properties of Decompositions – Normalization – Schema Refinement in data base design – other kinds of dependencies. Security : Introduction to Database security -Access control – Discretionary Access control – Mandatory Access control – Additional issues to security. Concurrency control : 2PL, serializability and Recoverability – Introduction to Lock Management - Lock Conversions –Specialized Locking techniques - Concurrency control without locking.		
Unit:5	**DISTRIBUTED DATABASE**	**10Hours**
Parallel & Distributed databases: Introduction – Architecture for parallel databases – Parallel Query evaluation – Parallelizing individual operations –Parallel Query Optimization – Introduction to distributed Databases – Distributed DBMS architecture sorting data in a distributed DBMS. Object Database Systems: Motivation Example – Structured data types – Operation on structured data types – Encapsulation & ADTS – Inheritance - Objects, OIDS and Reference Types - Database design for and ORDBMS – OODBMS – Comparing RDBMS, OODBMS and ORDBMS.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60Hours**

Text Books	
1	Raghu Ramakrishnan, Johannes Gehrke –“Database Management Systems”, Third Edition, McGraw-Hill Higher Education.
2	Silberschatry, Korth, Sundarshan, “Database system Concepts”, Fourth Edition, Mc Graw-Hill Higher Education
Reference Books	
1	Elmasri, Navathe, “Fundamentals of Database Systems”, Third Edition, Pearson Education Asia
2	S.S. Khandare, “Database Management and Oracle Programming”, First Edition, 2004, S.Chand and Company Ltd. 5. Nilesh Shah, “Database Systems using Oracle”, 2002, Prentice Hall of India. 6. Rajesh Narang, “Database Management Systems”, 2004, Prentice Hall of India
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/what-is-rdbms
2	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
3	https://nptel.ac.in/courses/106/105/106105175/

Course Designed By:

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	S	L	S	S
CO2	S	S	S	S	S	S	M	M	S	S
CO3	M	S	S	M	L	M	S	M	S	S
CO4	S	M	S	S	S	L	M	S	S	S
CO5	S	M	M	M	S	M	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code		COMPUTER NETWORKS	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Basics of Networks	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are :

1. To make the students understand the basics of computer networks and its importance in communication and resource sharing.
2. To enable the students to understand OSI reference model and related models.
3. To enable the students to learn and apply algorithms related to network scheduling and error detection and correction .
4. To enable the students to understand and apply the design issues in construction of computer networks.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics knowledge about computer networks.	K1,K2, K3
2	Understand the basics of physical layer and public switched telephone networks.	K1,K2
3	Understand the fundamentals of elementary data link protocol and sliding window protocols	K1,K2, K3
4	Apply various operations of algorithms in networks	K2,K3, K4
5	Analyze about various types of protocol and layers	K2,K3,K 4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction: Use of computer networks – Network Hardware – Network software – Reference models – Example of networks.

Unit:2	PHYSICAL LAYER	12 hours

The Physical Layer: The Theoretical basis for data communication – Guided transmission Media – Wireless transmission – Communication satellites – The Public switched Telephone network – Cable Television - Mobile telephone system.

Unit:3	DATA LINK LAYER	12 hours

Data link layer: Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Protocol Verification - Example data link Protocols.

Unit:4	NETWORK LAYER	12 hours

Network layer : Network layer design issues – Routing algorithms – Congestion, Control

algorithms – Quality of service – Internetworking – Network layer in the internet. Transport layer: The transport service – Elements of transport protocol – A simple transport protocol - The internet Transport Protocols : UDP – The Internet Transport Protocols : TCP - Performance issues.		
Unit:5	**SESSION LAYER**	**10 hours**
Session layer : Design issues, synchronization - Presentation layer : Design issues, cryptography – Application layer : Design issues, file transfer, E-mail.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Andrew S. Tanenbaum, "Computer Networks", IV Edition, PHI/Pearson Education
2	P. Green – Computer Network Architectures and Protocols, Plenum Press, 1982.
3	Harry Katzan – An Introduction to "Distributed Data Processing", A Petrocelli Book, New York / Princeton.
4	Godbole – Data Communication & Networking, TMH.
Reference Books	
1	Leon Garcia – Communication Networks : Fundamental Concepts & Key Architecture, TMH.
2	Hari & Barani, "Projects in Networking", 2005, SCITECH Publications
3	Kanthi Swarup, P.K. Gupta and Manmohan, (2012), "Operations Research", Sultan Chand and Sons.
4	S.D.Sharma, (2010), "Operations Research", Sultan Chand's Publications (India).
5	Manmohan and Gupta, (2011), "Problems on Operations Research", Prentice Hall of India.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/computer-network-tutorial
2	https://www.geeksforgeeks.org/computer-network-tutorials/
3	https://nptel.ac.in/courses/106/106/106106091/
Course Designed By:	

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	L	M	S	S
CO2	S	S	S	S	M	L	S	M	S	M
CO3	S	S	S	M	S	S	S	S	M	S
CO4	M	M	M	M	S	S	M	S	S	S
CO5	S	S	S	S	S	S	M	M	S	S

*S-Strong; M-Medium; L-Low

Course code		OPERATING SYSTEMS	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basic knowledge about various operating systems (DOS, Windows)	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Enable the students to understand about operating systems, process management, CPU scheduling, memory management and secondary storage management.
2. To enable the students to learn and apply the concepts using LINUX operating system.
3. To enable students to understand and analyse shell programming.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the design issues associated with operating systems	K1,K2
2	Master various process management concepts like scheduling, deadlock management	K1,K2, K3
3	Analyze on memory management	K1,K2, K4
4	Analyze about the disk performance optimization and file systems	K1,K2, K4
5	Analyze on Linux operating system	K1,K2, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12Hours

INTRODUCTION: Definition of OS-Mainframe System-Desktop Systems-Multi processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure-System Components-Services-System Calls-System Programs-System Design and Implementation.

Unit:2	PROCESS MANAGEMENT	12Hours

PROCESS MANAGEMENT: Concepts-Process Scheduling-Operations on Processes-Cooperating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.

Unit:3	PROCESS SYNCHRONIZATION	12Hours

PROCESS SYNCHRONIZATION: Critical Section-Synchronization Hardware Semaphores-Problems of Synchronization-Critical Regions-Monitors-Deadlocks Characterization-Handling Deadlocks-Deadlock Prevention – Avoidance-Detection-Deadlock Recovery.

Unit:4	MEMORY MANAGEMENT	12 hours

MEMORY MANAGEMENT: Storage Hierarchy-Storage Management Strategies Contiguous-

Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition Swapping-Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging Segmentation-Page Replacement Methods-Locality-Working Sets.		
Unit:5	**I/O AND FILE SYSTEMS**	**10Hours**
I/O AND FILE SYSTEMS: Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management **Case Study:** Linux Operating System – Commands, Shell Programming, Report writing		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60Hours**

Text Books	
1	Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2004.
2	Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 1992.
Reference Books	
1	P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall Of India, 2004.
2	H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/os-tutorial
2	https://www.tutorialspoint.com/operating_system/index.htm
3	https://nptel.ac.in/courses/106/106/106106144/
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	M	S	M	M	M	M	S	M	S	S
CO4	S	M	S	S	S	L	M	S	S	S
CO5	S	S	M	M	S	M	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL I : JAVA PROGRAMMING LAB	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		Basic programming knowledge in C and C++	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1.To teach fundamentals of object oriented programming in Java.
2.To familiarize java environment to create, debug and run simple java programs
3.To provide knowledge on JAVA API , SWINGS to create java Applications
4.To introduce JDBC for navigation of records
5.To understand RMI, JAVABEANS & its implementation

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand Object Oriented features using JAVA	K1,K2
2	Apply the concept of Polymorphism and Inheritance	K3,K4
3	Implement Exception Handling Mechanism	K4,K5
4	Develop interactive applications using Servlets and JAVABEANS	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS	75 hours

1. Create an employee package to maintain the information about the employee. Use constructors to initialize the employee number and use overloading method to set the basic pay of the employee. By using this package create a java program.

2. Program to implement polymorphism, inheritance and inner classes.

3. Create a frame with user specific size and position it at user specific position (use command line argument). Then different shapes with different colours (use menus).

4. Java program to handle different mouse events.

5. Create an applet for a calculator application.

6. Java program to maintain the student information in text file.

7. Animate images at different intervals by using multi threading concepts.

8. Program to send a text message to another system and receive the text message from the system (use socket programming).

9. Java program by using JDBC concepts to access a database.

10. Java program to implement RMI.

11. Java program by using to implement the tree viewer.

12. Java bean program to view an image.

13. Java program that prohibit to reading of text files that containing bad words.

Expert lectures, online seminars – webinars

Total Practical hours	**75 hours**

Text Books	
1	Deitel and Deitel, " Java How to Program", Third Edition, PHI/Pearson Education Asia.
2	Keyur shab,"Java 2 programming", Tata McGraw-Hill Pub. Company Ltd.
Reference Books	
1	C.Xavier,"Programming with Java 2",SciTech Publications (India) P. Ltd.
2	Cays S. Horstmann, Gary Cornell, "Core Java2 Volume I – Fundamentals", Pearson Edition, 2001 5. Cays S. Horstmann, Gary Cornell, "Core Java2 Volume II – Fundamentals", Pearson Edition, 2003
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/java-programs
2	https://www.tutorialspoint.com/java/index.htm
3	https://nptel.ac.in/courses/106/105/106105191/

Course Designed By:

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL II : RDBMS WITH ORACLE LAB	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		Basic programming using databases to store and retrieve data	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1.To study the features of commercial RDBMS packages such as Oracle and Developer 2000

2.To give Foundation knowledge in database concepts, technology and practice to groom students into well informed database application developers.

3.To give strong practice in SQL programming through a variety of database problems.

4.To practice host language interface with embedded SQL.

5.Develop database applications using front-end tools and back-end DBMS

6.To create forms and report writer package

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand Entity Relationship model and develop E-R diagrams for some applications	K1,K2
2	Write SQL queries to user specifications	K3,K4
3	Develop triggers, procedures, user defined functions and design accurate and PLSQL programs in Oracle	K4,K5
4	Prepare technical report on the observations of the experiments	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS	75 hours

PRACTICAL II RDBMS LAB

Study the features of commercial RDBMS packages such as Oracle and Developer 2000.

Laboratory exercise should include defining scheme of applications, creation of a database, writing SQL queries to retrieve information from database.

Use of host language interface with embedded SQL.

Use of forms and report writer package.

Some sample applications, which may be programmed, are given below.

- Banking system various schemes
- Online reservation system.
- Personal information.
- Student mark processing system (Internal and External marks).

• Hotel management. • Stock maintenance. • College admission system. (both, UG and PG)	
Expert lectures, online seminars – webinars	
Total Practical hours	**75 hours**

Text Books	
1	Raghu Ramakrishnan, Johannes Gehrke –"Database Management Systems", Third Edition, McGraw-Hill Higher Education.
2	Silberschatry, Korth, Sundarshan, "Database system Concepts", Fourth Edition, Mc Graw-Hill Higher Education
Reference Books	
1	Elmasri, Navathe, "Fundamentals of Database Systems", Third Edition, Pearson Education Asia
2	S.S. Khandare, "Database Management and Oracle Programming", First Edition, 2004, S.Chand and Company Ltd. 5. Nilesh Shah, "Database Systems using Oracle", 2002, Prentice Hall of India. 6. Rajesh Narang, "Database Management Systems", 2004, Prentice Hall of India
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/what-is-rdbms
2	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
3	https://nptel.ac.in/courses/106/105/106105175/
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Second Semester

Course code		DATA MINING AND BIG DATA ANALYTICS	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basic Knowledge about various types of Data and statistical methods for retrieval and analysis .	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To motivate the students as well to enrich their knowledge about the concepts of data manipulation and big data.
2. To enable the students to understand and analyse various datamining applications.
3. To enable the students to understand and apply Big Data to Business problems.
4. To enable the students to analyse business models by high performance deep analytics.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic data mining techniques and algorithms	K1,K2
2	Understand about the Big Data evaluation	K1,K2
3	Analyze on clustering methods	K1,K2, K4
4	Compare and evaluate different data mining techniques like classification and prediction	K4,K5
5	Apply and Analyze Big Data to Business problems	K3,K4, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12Hours

Introduction – Data Mining – Relational Databases – Data Warehouses – Transactional databases – Data Mining functionalities – Classification of Data Mining systems – Major Issues in Data Mining.

Unit:2	DATA PREPROCESSING	12 hours

Data Preprocessing – Data cleaning – Missing value, noising data and inconsistent data – Data integration and Transformation – Data reduction – Data cube aggregation – Dimensionality reduction and data compression – Data mining primitives.

Unit:3	CLASSIFICATION	12 hours

Classification and predictions – Issues regarding classification and prediction – Classifications by decision tree induction – Classification by Back propagation – Other classification methods.

Unit:4	CLUSTER	11 hours

Cluster Analysis – Types of Data in Cluster Analysis – Interval – Scaled variables, Binary variables, Nominal ordinal and ratio - scaled variables – Clustering methods – Partitioning

methods – K-means, k-medoids and CLARANS – Hierarchical methods – Agglomerative and Divisive, BIRCH, CURE – Outlier analysis – Data Mining applications.		
Unit:5	**BIG DATA**	**11 hours**
The Big Deal about Big Data: What is Big Data - Why Is Big data important - Big Data. Applying Big Data to Business problems: A sampling of use cases - Big Data use cases - IT for IT – Customer state. Analytics for Big Data at Rest: The Big Data platform for high performance deep analytics- Appliance simplicity – Hardware Acceleration-Balance, massively parallel architecture - Modular design.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Jinweihan, Micheline Kambler, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi. (For Unit I, II, III and IV).
2	Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, “Harness the Power of Big Data”, The McGraw-Hill Publications, 2013, First Edition. (For Unit V).
Reference Books	
1	Pieter Adriaans, DolfZantinge, "Data Mining", Addison Wesley, 1998. Sam Anohory, Dennis Murrey, "Dataware housing in the real world", Pearson, 2004.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/big_data_analytics/index.htm
2	https://nptel.ac.in/courses/110/106/110106072/
3	https://nptel.ac.in/courses/106/105/106105174/
Suggested online course (optional) : HADOOP Programming	
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	M	M	S	S	S	L	M	S	S
CO3	S	S	S	M	S	M	S	S	M	M
CO4	S	S	S	S	S	S	S	S	S	M
CO5	M	S	M	S	M	M	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		.NET PROGRAMMING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of internet programming.	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to understand and apply the practical aspects of application. development using .Net framework.
2. To enable the students to understand the Common Language Runtime (CLR), .Net framework classes.
3. To enable the students to understand and apply the .NET concepts using C#.
4. To enable the students to understand and apply .NET concepts using ADO.netProgramming

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of .NET Framework Technology	K1,K2
2	Apply error handling techniques in .NET	K2,K3
3	Demonstrates the C# console applications	K3,K4
4	Design and develop the Web applications using C#	K4,K5
5	Design and develop the distributed data driven applications using .NET framework	K3,K4, K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	EVOLUTION OF WEB DEVELOPMENT	12 hours

Evolution of Web Development: HTML Forms-Server Side and Client Side Programming. Developing ASP.Net Applications – Visual Studio: Creating Websites- Designing a Webpage- The anatomy of a Web form – Writing Code. Web Form Fundamentals: The anatomy of an ASP.Net application – Introducing Server Controls – Improving the Currency Converter – A Deeper Look at HTML Control Classes – The Page Class. Web Controls: Steeping up to Web Controls – Web Control Classes – List Controls – Table Controls – Web Control Events and AutoPostBack

Unit:2	STATE MANAGEMENT	12 hours

State Management: The problem of State – View State – Transferring Information between Pages – Cookies – Session State – Session State Configuration. Error Handling, Logging, and Tracing: Common Errors – Exception Handling – Handling Exceptions – Throwing Your Own Exceptions – Logging Exceptions – Error Pages – Page Tracing. Deploying ASP.Net Applications: ASP.Net Applications and the Web Server – Internet Information Services(IIS) – Managing Websites with IIS Manager – Deploying a Simple Site – Deploying with Visual Studio.

Unit:3	C#	10 hours

C# Language: C# Languages Basics – Variables and Data Types – Variable operations – Object based manipulation – Conditional Logic – Loops – Methods. Types, Objects and Namespaces:

Classes – Value types and reference types – Understanding namespaces and assemblies.		
Unit:4	**ENUMERATORS, INTERFACES AND EVENTS**	**12 hours**
C#: Enumerators and Iterators – Exceptions - Serializing objects - Deep serialization-XML based serialization - Multithreading – Interfaces and Structures - Delegates and Events – Indexers and Properties.		
Unit:5	**ADO.NET FUNDAMENTALS**	**12 hours**
ADO.NET Fundamentals: Understanding Data Management – Configure database – SQL Basics - ADO.Net basics – Direct Data Access – Disconnect Data Access. Data Binding: Single-Value data binding		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

	Text Books
1	Matthew MacDonald (2008), Beginning ASP.NET 3.5 in C#, 2/e; A press Berkeley.
2	Jesse Liberty (2003), Programming Visual Basic .NET, 2/e; O'Reilly, Shroff Publishers and Distributors Pvt. Ltd.
3	Bill Evjen, Jason Beres (2009), Visual Basic .Net Bible, Hungry Minds Inc.
	Reference Books
1	Herbert Schildt (2010), Complete Reference C#, Tata McGraw-Hill.
2	Joe Duffy(2010), Professional .Net Framework 2.0l, Wiley India.
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.tutorialspoint.com/asp.net/index.htm
2	https://www.javatpoint.com/net-framework
3	https://www.btechguru.com/training--dot-net--c-sharp-dot-net--framework--microsoft-net-framework-part-1-video-lecture--11280--27--139.html
	Course Designed By:

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	S
CO2	S	M	M	S	S	S	M	M	S	S
CO3	M	S	S	M	S	M	S	S	M	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	M	S	M	M	L	M	S	M

*S-Strong; M-Medium; L-Low

Course code		OPERATIONS RESEARCH	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basic applications of Mathematics and Business Mathematics.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Learn formulation of LPP, mathematical formulation, feasible solution to transport problem, EOQ model.
2. Learn individual replacement, group replacement and the characteristics of queuing theory.
3. apply PERT / CPM for Network Construction.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Firm basis for understanding thelinear programming problems.	K1,K2
2	Toconstruct networks,apply queuing theory andreplacement modelconcepts.	K1,K2, K3
3	Apply the optimality in transportation problem.	K1,K2, K3
4	Analyze oninventory control.	K3,K4
5	Solve a wide range of problems related to network construction through PERT / CPM	K4,K5, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	LINEAR PROGRAMMING	Hours

LINEAR PROGRAMMING : Formulation of LPP – Graphical solutions to LPP –Simplex Method - Big M method – Two – Phase Simplex Method - Duality in Linear Programming: Primal & Dual Problems – Dual Simplex Method.

Unit:2	PROBLEMS	12Hours

THE TRANSPORTATION PROBLEM: Introduction – Mathematical Formulation- Finding Initial Basic Feasible Solutions – Moving towards Optimality – Unbalanced Transportation Problems – Degeneracy.

THE ASSIGNMENT PROBLEM: Introduction – Mathematical formulation - Hungarian Assignment Method – Maximization in Assignment Problem – Unbalanced Assignment Problem – Impossible Assignment.

Unit:3	INVENTORY CONTROL	12Hours

INVENTORY CONTROL : Introduction – Costs involved in inventory - Deterministic models : EOQ models without and with shortage - Buffer stock and Reorder Level – Price Break models – ABC Analysis.

Unit:4	REPLACEMENT MODEL	12 hours

REPLACEMENT MODEL: Introduction – Replacement of items that deteriorates gradually :

value of money does not change with time – value of money changes with time – Replacement of items that fails suddenly : Individual Replacement –Group Replacement.

PERT/CPM: Introduction – Construction of Network - CPM calculations –PERT Calculations.

Unit:5	**QUEUING THEORY**	**10 hours**

QUEUING THEORY: Introduction - Characteristics of queuing system - Problems of single server with finite / infinite population model – Problems of multi server with finite /infinite population model.(No derivation).

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**60 hours**

Text Books

1	Kanti Swarup, P.K. Gupta, Man Mohan, "Operations Research", Sultan Chand & Sons.
2	P.K. Gupta, D.S Hira, "Problems in Operations Research", S.Chand& Company Ltd.
3	Hamdy A. Taha, "Operations Research – An Introduction", Seventh Edition, PHI/Pearson Education.

Reference Books

1	Frederick S. Hillier, Gerald J. Lieberman, "Introduction to Operations Research", Tata McGraw Hill Pub Company Ltd., Seventh Edition.
2	J.K.Sharma, "Operations Research Theory and Applications", Macmillan India Ltd., Second Edition.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/linear_programming/index.asp
2	https://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf
3	https://www.classcentral.com/course/swayam-operations-research-14219

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	S	M	S
CO2	S	S	S	M	S	M	S	S	M	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE PROJECT MANAGEMENT	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of Software .	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to enable the students:

1. To understand basics and importance of Software Engineering.
2. To get a deep insight to software project management concepts.
3. To understand the software project, Analyze project Characteristics, estimate efforts, project evaluation, and selection of process model, software effort estimation, risk management and managing contracts.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Software Project Management	K1,K2
2	Identify the different project contexts and suggest an appropriate management strategy	K1,K2, K3
3	Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule, governance including progress reporting, risk and quality management	K3,K4
4	Analyze a comparison on Product Versus Process Quality Management	K3,K4
5	Perform case studies on cost estimation models like COCOMO	K3,K4, K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction: Software Engineering, Software Myths, Layered Technology, Process Models, Software Project Management - Software Project Versus Other Project – Requirement Specification – Information and Control in Organization – Introduction to step wise Project Planning – Select – Identify Scope and Objectives - Identify Project Infrastructure – Analyze Project Characteristics – Products and Activities – Estimate Effort for each Activity – Identify Activity Risks – Allocate Resources - Review / Publicize Plan – Execute Plan and Lower Levels of Planning.

Unit:2	PROJECT EVALUATION	12 hours

Project Evaluation : Introduction – Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Selection of an Appropriate Project App roach – Choosing Technologies – Choice of Process Models – Structured Methods – Rap id Application Development – Waterfall Model – VProcess Model – Spiral Model – Software Prototyping – Ways of Categorizing Prototypes – Tools – Incremental Delivery – Selection Process Model.

Unit:3	SOFTWARE EFFORT ESTIMATION	12 hours
Software Effort Estimation : Introduction – Problem s with Over and Under Estimates – Basis for Software Estimating – Software Effort Estimation Technique – Albrecht Function Point Analysis – Function Points – Object Points – Procedural Code Oriented Approach – COCOMO – Activity Planning – Project Schedules - Projects and activities – Sequencing and Scheduling Activities – Network Planning Models – Formulating a Network Planning – Adding Time Dimension – Forward Pass – Backward Pas s – Identifying the Critical Path – Activity Float - Shortening Project Duration – Identifying Critical Activities – Precedence Networks.		
Unit:4	**RISK MANAGEMENT**	**11 hours**
Risk Management : Introduction – Nature of Risk Man aging Identification – Analysis – Reducing – Evaluating – Z values – Resource Allocation – Nature of Resources – Requirements – Scheduling – Critical Paths – Counting the Cost – Resource Schedule – Cost Schedule – Scheduling Sequence – Monitoring and Control – Creating the Frame Work - Collecting the Data – Visualizing the Progress – Cost Monitoring – Prioritizing Monitoring – Change Control.		
Unit:5	**SOFTWARE QUALITY**	**11 hours**
Managing Contracts : Introduction – Types of Contract – Stages in Contract Placement – Terms of Contract – Contract Management – Acceptance – Managing People and Organizing Teams – Organizational Behavior Background – Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – Decision Making – Leadership – Organizational Structures – Software Quality – Importance – Practical Measures – Product Versus Process Quality Management – External Standards – Techniques to Help Enhance Software Quality.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1.	Roger .S.Pressman: Software Engineering, Tata McGrawHill , V Edition.
2	Bob Hughes and Mike Cottrell, “Software Project Management”, McGraw Hill, Second Edition.
Reference Books	
3	Walker Royce, “Software Project Management”, Addition Wesley.
4	Derrel Ince, H. Sharp and M. Woodman, “Introduction to Software Project Management and Quality Assurance”, Tata McGraw Hill, 1995.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2	https://www.javatpoint.com/software-project-management
3	https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Designed By:

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	S	S	S	M	S	M	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	M	M	S	S	S	S	S	S	S	S
CO5	M	M	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL III : DATA MINING LAB	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		Basics of Datamining algorithms and various tools available.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression….
2. To understand & write programs using the algorithms
3. To apply statistical interpretations for the solutions
4. Able to use visualizations technique
5. To apply WEKA tool in attribute selection, decision tree, etc…

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To write programs using R for Association rules, Clustering techniques	K1,K2
2	To implement data mining techniques like classification, prediction	K2,K3
3	Able to use different visualizations techniques using R	K4,K5
4	To understand different data mining algorithms to solve real world applications and train data using WEKA tool	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS	60 hours

1. Implement any 3 classification algorithms and compare the results.
2. Implement any 2 clustering algorithms using any open source data mining tool.
3. Implement the algorithm to generate a decision tree for the given data set.
4. Develop an application to extract association mining rules.
5. Develop an application for implementing one of the clustering techniques.
6. Develop an application for implementing Naïve Bayes classifier.
7. Implement Apriori approach.
8. Design a knowledge flow layout to load, apply attribute selection, and normalize the attributes and to store the results in a CSV saver using WEKA tool.
9. Create a decision tree and train the tree using the given dataset as the training data. Report the model obtained after training using WEKA tool.

Total Practical hours	60 hours

Text Books

1	Jinweihan, Micheline Kambler, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi. (For Unit I, II, III and IV).
2	Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, “Harness the Power of Big Data”, The McGraw-Hill Publications, 2013, First Edition. (For Unit V).
Reference Books	
1	Pieter Adriaans, DolfZantinge, "Data Mining", Addison Wesley, 1998. Sam Anohory, Dennis Murrey, "Dataware housing in the real world", Pearson, 2004.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/big_data_analytics/index.htm
2	https://nptel.ac.in/courses/110/106/110106072/
3	https://nptel.ac.in/courses/106/105/106105174/
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL IV : .NET PROGRAMMING LAB (Effective for the candidates admitted from the academic Year 2020- 2021)	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		OOPs, database concepts and Internet Programing to develop Web applications.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1.To Understand & write web applications using ASP.NET
2.To implement OOPS concepts using C#
3.To Develop the Web applications using C#
4.To Design and develop the data base applications using ADO.NET control.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand to create web pages using ASP.NET	K1,K2
2	Capable of developing interactive web applications using ASP.NET	K2,K3
3	Able to write dynamic web applications using C#	K4,K5
4	Must be able develop data base applications using ADO.NET control	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS **60 hours**

ASP.NET PROGRAMS

1. CollegeWebsite
2. Online ExaminationSystem
3. Online Mobile phoneshop
4. Online registrationform

C# PROGRAMS

5. Student Information using inheritance.
6. Sales bill preparation using interface.
7. Insert record using data grid view.
8. Create user login form.

ADO.NET Programming

9. Develop a Windows application with ADO.NET to perform Insert, Delete, Update and Select operations.

10. Build an ADO.NET program which displays the Employee information in the relevant fields from the database which already exists.	
Total Practical hours	**60 hours**

Text Books	
1	Matthew MacDonald (2008), Beginning ASP.NET 3.5 in C#, 2/e; A press Berkeley.
2	Jesse Liberty (2003), Programming Visual Basic .NET, 2/e; O'Reilly, Shroff Publishers and Distributors Pvt. Ltd.
3	Bill Evjen, Jason Beres (2009), Visual Basic .Net Bible, Hungry Minds Inc.
Reference Books	
1	Herbert Schildt (2010), Complete Reference C#, Tata McGraw-Hill.
2	Joe Duffy(2010), Professional .Net Framework 2.0l, Wiley India.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/asp.net/index.htm
2	https://www.javatpoint.com/net-framework
3	https://www.btechguru.com/training--dot-net--c-sharp-dot-net--framework--microsoft-net-framework-part-1-video-lecture--11280--27--139.html
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL V : WEB APPLICATION DEVELOPMENT AND HOSTING (Effective for the candidates admitted from the academic Year 2020-2021)	L	T	P	C
Core/Elective/ Supportive		Core			2	2
Pre-requisite		Basic Programming using HTML Tags	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1.Able to design a web page using HTML tags

2.To enable the students to use Framesets, hyper links and different formatting features of HTML tags

3.Enable the students to use Forms & other controls in a web page

4.To create interactive applications using PHP

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand & implement the basic HTML tags to create static web pages	K1,K2
2	Capable of using hyperlinks, frames , images, tables, ...in a web page	K2,K3
3	Able to write dynamic web applications using HTML forms	K4,K5
4	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS **30 hours**

1. Develop a website for your college using advanced tags of HTML.

2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India.

3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data.

4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.

5. Develop a HTML document to print your Bio-Data in a neat format using several components

6. Develop a Registration Form for an inter-collegiate function and validate using Java Script. 7. Develop and display customer details using XML with XSL transformation and validate the document using DTD or XSD 8. Develop and display student personal details in XML format.	
Total Practical hours	**30 hours**

Text Books	
1	Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.
Reference Books	
1	A.K.Saini and Sumint Tuli, "Mastering XML", First Edition, New Delhi, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/xml/index.htm
2	https://www.tutorialspoint.com/internet_technologies/websites_development.htm
3	https://www.youtube.com/watch?v=PlxWf493en4
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Third Semester

Course code		PHP PROGRAMMING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basic programming knowledge and Internet Programming.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the Introduction to PHP, PHP functions, database handling and in addition AJAX is taught.
2. Enable the students to learn the fundamentals of Open Source software and get experience in PHP and AJAX.
3. Acquire skills to write PHP programs.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of open source softwares	K1,K2
2	Understand the functions and browser handling power of PHP	K1,K2
3	Apply object oriented concepts and file handling concepts of PHP	K2,K3, K6
4	Evaluate database and set sessions, cookies and FTP	K2,K3, K4,K5
5	Develop web pages using PHP	K3,K4, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	OPEN SOURCE SOFTWARE	12 hours

Open Source Softwares: Overview of Free/ Open Source Software: The Open Source Definition - Examples of OSD Compliant Licenses - Examples of Open Source Software Product – The Open Source Software Development Process – A History of Open Source software: The Berkeley Software Distribution – The Free Software Foundation – Linux – Apache – Mozilla – Open Source Software.

PHP: Introduction – Essential PHP – Operators and Flow control: Working with math, assignment, increment and decrement, string, bitwise, execution, comparison and logical operators, Working with loops – Strings and Arrays.

Unit:2	FUNCTIONS AND WEB PAGES	12 hours

PHP Functions and Browser handling power: Creating Functions, passing functions, passing arrays, pass by reference, default arguments, returning data, arrays, lists, references, accessing global data, working with static variables, PHP conditional functions, variable functions, nesting functions – Reading data in web pages: Handling text fields, areas, check boxes, radio buttons, list boxes, password controls, hidden controls, image maps, file uploads, buttons – PHP Browser handling power.

Unit:3	OOPS AND FILES	12 hours
Working with Object oriented programming and File handling: Object oriented programming: creating classes, objects, setting access to properties and methods, using constructors and destructors, inheritance, overriding and overloading methods, auto loading classes – File Handling: open, read, close, parsing files, copy, delete, write and append files.		
Unit:4	**DATABASE, SESSION AND COOKIES**	**12 hours**
Working with databases and setting sessions, cookies and FTP: Databases: creating, accessing, updating, inserting, deleting and sorting databases – Setting sessions, cookies and FTP: setting, reading, and deleting cookies, working, downloading, uploading, deleting, creating and removing directories with FTP.		
Unit:5	**AJAX**	**10 hours**
AJAX and Drawing Images on the server: Ajax: Handling AJAX requests, downloading images using AJAX, downloading javascript with AJAX– Drawing images on the server: creating and displaying images, drawing lines, rectangles, ellipse, arcs, polygons, figures, individual pixels, text, virtual text, working with image files, tiling images, copying images.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Joseph Feller, Brain Fitzgerald, Eric S. Raymond, "Understanding Open Source Software Development", Addison-Wesley Professional, 1st Edition, 2001.
2	"The Complete Reference PHP Covers PHP 5.2, "Steven Holzner, Tata McGraw-Hill Edition 2008.
Reference Books	
1	PHP6 and MySQL6 Bible – Steve Svehring.
2	PHP Programming Solutions – VickramViswani.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/php/index.htm
2	https://www.javatpoint.com/php-tutorial
3	http://www.nptelvideos.com/video.php?id=2138&c=27
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	S	S	M	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	M	S	S	M	M	M	M	S	M	M
CO4	S	S	S	S	S	M	S	S	S	S
CO5	S	M	L	M	S	S	S	M	M	S

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE TESTING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of software testing .	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Provides principles of Software Testing and tools.
2. Enable the students to learn about the principle and tools of Software testing.
3. Improve knowledge in software testingtools.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of software testing	K1,K2
2	Gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects	K2,K3
3	Analyze path testing concept	K3,K4
4	Analyze state testing concept	K3,K4
5	Execute programs and test data in Client-Server Architecture	K3,K4, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	SOFTWARE TESTING	12 hours

Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs.

Unit:2	TESTING FUNDAMENTALS	12 hours

Software testing Fundamentals – Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing.

Unit:3	TRANSACTION FLOW	10 hours

Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips.

Unit:4	LOGIC TESTING	12 hours

Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Specifications – States, State Graphs and transition Testing – State Graphs – Good & bad states – state testing Metrics and Complexity.

Unit:5	**TESTING TYPES**	**12 hours**
Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art of Debugging.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003.
2	Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979.

Reference Books

1	Roger.S.Pressman, Software Engineering – A Practitioner's Approach,McGraw Hill, 5th edition, 2001.
2	Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/software_testing/index.htm
2	https://www.guru99.com/software-testing-introduction-importance.html
3	https://nptel.ac.in/courses/106/105/106105150/

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	M	M	M	S	L	M	S	M
CO2	M	S	S	S	S	S	M	S	S	S
CO3	M	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		NETWORK SECURITY and CRYPTOGRAPHY	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of Networks and its Security	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Deal with principles of encryption algorithms, and conventional and public key cryptography.
2. Enable to know the levels of network security and security tools.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember the basic knowledge on security models	K1,K2
2	Understand the concept of AES and DES cipher	K1,K2
3	Apply on encryption function	K2,K3,K4
4	Analyze about public key cryptography and RSA	K2,K3,K4, K5
5	Analyze on authentication functions in security	K2,K3,K4, K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Service mechanism and attacks – The OSI security architecture – A model for network security – symmetric Cipher model – Substitution techniques – transposition techniques – simplified des – block chipper principles – the strength of des – blockcipher design principles and modes of operation.

Unit:2	ENCRYPTION	12 hours

Triple des-blow fish – RCS Advanced Symmetric Block Ciphers –RC4 stream Cipher confidentially using symmetric encryption – introduction to number theory – public – key cryptography and RSA.

Unit:3	KEY MANAGEMENT	12 hours

Key management – Diffie Hellman key exchange – message authentication and hash function – hash algorithm – digital signature and authentication protocols – digital signature standard.

Unit:4	SECURITY	12 hours

Authentication application – pretty good privacy – S/MIME – IP security – web security considerations –secure socket layer transport layer security –secure electronic transaction.

Unit:5	INTRUDERS AND VIRUS	10 hours

Intruders –intrusion detection – password management –viruses and related threats – virus

countermeasures – fire wall design principles – trusted systems		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total hours	**60 hours**

Text Books	
1	William Stallings, "Cryptography and Network Security Principles and Practices". Fourth Edition, PHI.
2	Atul Kahate, "Cryptography and Network Security",Second Edition, TMH.
Reference Books	
1	Behrouz A.Forouzan, "Cryptography and Network Security", TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105031/
2	http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3	https://www.tutorialspoint.com/cryptography/index.htm
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	L	S	M	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		CLOUD COMPUTING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of cloud and its applications	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Understand the cloud computing architectures, applications and challenges.
2. Know how the data is stored in the cloud and the various services offered by the cloud.
3. Develop the skills in Web Application Development using cloud technologies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic knowledge on virtualization	K1,K2
2	Understand the concept of cloud computing services and its business value	K1,K2
3	Analyze various web based applications for collaborating everyone in cloud computing	K1,K2, K3,K4
4	Assess various industrial platforms for the developments	K2,K3, K4
5	Analyze on cloud mobility and governance	K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction – Essentials – Benefits – Why cloud – Business and IT perspective – cloud and virtualization – cloud service requirements – dynamic cloud infrastructure – cloud computing characteristics – cloud adoption – cloud rudiments. Cloud deployment models: introduction – cloud characteristics – measured service accounting – cloud deployment models – security in a public cloud – public versus private clouds – cloud infrastructure self-service.

Unit:2	SERVICES	12 hours

Cloud as a service: introduction – gamut of cloud solutions – principal technologies- cloud strategy – cloud design and implementation using SOA – conceptual cloud model – cloud service defined. Cloud solutions: introduction – cloud ecosystem – cloud business process management – cloud service management – on premise cloud orchestration and provisioning engine – computing on demand.

Unit:3	VIRTUALIZATION	12 hours

Cloud offerings: Introduction – introduction storage, retrieval archive and protection-cloud analytics – testing under cloud – information security – virtual desktop infrastructure-storage cloud. Cloud Management: Introduction – resiliency – provisioning – asset management-cloud governance – high availability and disaster recovery – charging models – usage reporting, and metering. Cloud Virtualization Technology: Introduction – virtualization demand – virtualization benefits – server virtualization – virtualization for x86 architecture – hypervisor management

software – virtual infrastructure requirements.		
Unit:4	**CLOUD INFRASTRUCTURE**	**12 hours**
Cloud Infrastructure: Introduction – storage virtualization – storage area networks-network-attached storage – cloud server virtualization – networking essential to the cloud. Cloud and SOA: Introduction – SOA Journey to Infrastructure – SOA and the cloud – SOA Defined – SOA and infrastructure as a service – SOA based cloud infrastructure steps – SOA Business and IT services.		
Unit:5	**CLOUD MOBILITY**	**10 hours**
Cloud Mobility: Introduction – the business problem – mobile enterprise application platforms – mobile application architecture overview. Cloud Governance: Introduction – service level agreement and compliance – data privacy and protection risks – enterprise governance – risk management – third party management – information management.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Dr. Kumar Saurabh "Cloud Computing-Unleashing Next Gen Infrastructure to Application", 3rd Edition, Wiley India Pvt Ltd, 2014.
2	RajkumarBuyya, James Broberg, AndrzejGoscinski , "Cloud computing principles and paradigms", Wiley India, 2014.

Reference Books

1	Michael Miller, "Cloud computing web based application that change the way you work & collaborate online", Pearson Education, 2013.
2	Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business"

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL VI : PHP PROGRAMMING LAB	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		Basic knowledge on HTML, MySQL, CSS and Java Script.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

- Understand the features like basic functions and features in PHP.
- Be able to know the implementation of File handling, OOPs concepts, cookies in PHP
- Able to write PHP programs for File manipulation
- Able to write a Data base application in PHP

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand to write programs in PHP for OOPS concepts	K1,K2
2	Capable of developing interactive web applications using PHP	K2,K3
3	Able to write PHP programs for File handling	K3,K4
4	Must be able develop data base applications using PHP	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS **75 hours**

1. Write a PHP Program for Stringhandling.

2. Write a PHP Program for associative array.

3. Write a PHP Program to use various Functions of PHP.

4. Write a PHP Program to read form data.

5.Write a PHP Program to implement Overloading and overriding.

6. Write a PHP Program to implement Inheritance.

7. Write a PHP Program for File handling.

8. Develop PHP Program to Create a Database and to Insert , Delete and List the records.

9. Write a PHP Program to implement cookies.

10. Write a PHP Program for Drawing images on a webpage.

	Total Practical hours	**75 hours**
Text Books		
1	Joseph Feller, Brain Fitzgerald, Eric S. Raymond, "Understanding Open Source Software Development", Addison-Wesley Professional, 1st Edition, 2001.	
2	"The Complete Reference PHP Covers PHP 5.2, "Steven Holzner, Tata McGraw-Hill Edition 2008.	
Reference Books		
1	PHP6 and MySQL6 Bible – Steve Svehring.	
2	PHP Programming Solutions – VickramViswani.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.tutorialspoint.com/php/index.htm	
2	https://www.javatpoint.com/php-tutorial	
3	http://www.nptelvideos.com/video.php?id=2138&c=27	
Course Designed By:		

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL VI : SOFTWARE TESTING LAB	L	T	P	C
Core/Elective/ Supportive		Core			5	3
Pre-requisite		Basics of various software testing and testing tools	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1.This course focuses on the Testing phase of SDLC
2.This course enables the students to learn about Software Testing & its Types
3.It also enable the students to write Test Cases, about different testing tools and its applications
4.It gives a clear picture about the role of Testing phase & its importance in SDLC.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of Software Testing, & its tools	K1,K2
2	Able to understand different testing phases & to execute it	K2,K3
3	Must be able to evaluate the results with respect to the specifications	K3,K4
4	Application of different tools, according to the testing process.	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS	**75 hours**

Various S/W Testing Can Be Done Related To the Methods Given Below Using Any of the S/W Testing Tools

1. Design Phase testing
2. Program Phase Testing.
3. Debugging
4. Evaluation of test results
5. Installation phase testing & Acceptance testing

Total Practical hours	**75 hours**

Text Books

1	Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003.
2	Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979.

Reference Books

1	Roger.S.Pressman, Software Engineering – A Practitioner's Approach,McGraw Hill, 5th edition, 2001.

2	Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/software_testing/index.htm
2	https://www.guru99.com/software-testing-introduction-importance.html
3	https://nptel.ac.in/courses/106/105/106105150/
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

PRACTICAL VII- MINI PROJECT (GUIDELINES FOR MINI PROJECT)

- The aim of the Mini Project is to lay a foundation for the Main Project.
- Each student should carry out individually one Mini Project Work and it may be a case study using the software packages that they have learnt or may be an implementation of a concept in a paper prescribed on a journal.
- It should be compulsorily done in the college only under the supervision of the staff concerned.
- University Exam will be conducted as like a practical exam with one Internal and one External Examiner, which carries 50 marks for project evaluation and 25 marks for viva examination. Remuneration for the examiners is equivalent as that of practical examination.

Elective Courses

Course code		ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of Artificial Intelligence and its applications	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Enrich the knowledge about the concepts of Artificial Intelligence.
2. Know the concepts of AI problems and techniques.
3. Learn about Structures & Expert System.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Demonstrate AI problems and techniques	K1,K2
2	Know the various searching techniques, constraint satisfaction problems and example problems	K1,K2
3	Apply and analyze basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K2,K3, K4
4	Analyze knowledge Structures & Expert System	K3,K4
5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction: AI Problems – Al techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

Unit:2	SEARCH TECHNIQUES	12 hours

Heuristic Search Techniques: Generate and Test – Hill Climbing – Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.

Unit:3	PREDICATE LOGIC	12 hours

Using Predicate Logic: Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge.

Unit:4	REASONING	12 hours

Statistical Reasoning: Probability and Bayes Theorem- Certainty Factors and Rule- Based systems Bayesian Networks - Dempster - Shafer Theory-Fuzzy logic . Knowledge representation: Syntactic - Semantic Spectrum of Representation-Logic and Slot-and Filter Structures - Other Representational Techniques – Planning – Understanding.		
Unit:5	**EXPERT SYSTEM**	**10 hours**
Learning – Common sense – Perception and Action – Expert System.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers company Pvt. Ltd, Second Edition, 1991.

Reference Books

1	George F Luger, "Artificial Intelligence", 4th Edition, Pearson Education Publ., 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.javatpoint.com/artificial-intelligence-tutorial
2	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm
3	https://nptel.ac.in/courses/106/105/106105077/

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		MOBILE COMPUTING	L	T	P	C
Core/Elective/ Supportive		Core	4			4
Pre-requisite		Basics of mobile communication	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the overview of Mobile computing, Applications and Architectures.
2. Describe the futuristic computing challenges.
3. Enable the students to learn the concept of mobile computing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the need and requirements of mobile communication	K1,K2
2	Focus on mobile computing applications and techniques	K2,K3
3	Demonstrate satellite communication in mobile computing	K2,K3, K4
4	Analyze about wireless local loop architecture	K3,K4
5	Analyze various mobile communication technologies	K3,K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication – Requirements of Mobile Communication – History of Mobile Communication.

Unit:2	MOBILE COMMUNICATION	12 hours

Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management – Frequency Management – Cordless Mobile Communication Systems.

Unit:3	MOBILE COMPUTING	12 hours

Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication.

Unit:4	INTERNET	12 hours

Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.

Unit:5	COMMUNICATION SYSTEM	10 hours
WCDMA Technology and Fibre Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	T.G. Palanivelu, R. Nakkeeran, "Wireless and Mobile Communication", PHI Limited, 2009.
2	Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2007.
Reference Books	
1	Asoke K Talukder,HasanAhmed,RoopaYavagal, "Mobile Computing",TMH, 2010.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/mobile_computing/index.htm
2	https://www.javatpoint.com/mobile-computing
3	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	L	L	M	S	M	M	M	M
CO2	S	S	S	M	M	S	M	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		DISTRIBUTED COMPUTING	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of distributed networks, databases and processing.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the introduction to fully distributed processing systems, communication line loading and client/server network model.
2. Enable the students to learn the concepts of distributed computing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand distributed processing and network systems	K1,K2
2	Learn factors, resources and responsibilities of distributed systems.	K1,K2
3	Analyze distributed database and decision trees.	K2,K3, K4
4	Acquire knowledge about network models	K2,K3, K4
5	Design distributed database and project techniques.	K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	DISTRIBUTED SYSTEMS	10 hours

Distributed Systems: Fully Distributed Processing Systems – Networks and Interconnection Structures – Designing a Distributed Processing System.

Unit:2	DISTRIBUTED DATA	12 hours

Distributed Systems: Pros and Cons of Distributed Processing – Distributed Databases – The Challenge of Distributed Data – Loading Factors – Managing the Distributed Resources – Division of Responsibilities.

Unit:3	DESIGN	12 hours

Design Considerations: Communication Line Loading – Line Loading Calculations – Partitioning and Allocation – Data Flow Systems – Dimension Analysis – Network Database Design Considerations – Ration Analysis – Database Decision Trees – Synchronization of Network Databases.

Unit:4	CLIENT/SERVER NETWORK	12 hours

Client/Server Network Model: Concept – File Server – Printer Server – an e-mail Server.

Unit:5	DISTRIBUTED DATABASES	12 hours
Distributed Databases: An overview – Distributed Databases – Principles of Distributed Databases – Levels of Transparency – Distributed Database Design – The R* Project Technique Problems of Heterogeneous Distributed Databases.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	John A. Sharp, "An Introduction to Distributed and Parallel Processing", Blackwell Scientific Publications, 1987.
2	Uyless D. Black,"Data Communications & Distributed Networks".
Reference Books	
1	Joel M. Crichllow, "Introduction to Distributed & Parallel Computing".
2	StefansCeri, GinseppePelagatti, "Distributed Databases Principles and systems", McGraw Hill Book Co., New York, 1985.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://www.cs.iit.edu/~ren/cs447/lectures/dsIntro-2.ppt
2	https://www.youtube.com/watch?v=YS-QvfCZWvc
3	https://www.btechguru.com/courses--nptel--computer-science-and-engineering--distributed-computing-systems-video-lecture--cse--CS1001020W.html
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	S	S	S	S	M
CO2	S	M	M	S	S	S	M	S	M	L
CO3	S	S	S	M	S	S	S	M	S	M
CO4	M	M	S	S	S	M	S	S	S	S
CO5	M	L	S	M	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code		EMBEDDED SYSTEMS	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of micro controllers	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the introduction to embedded systems, Devices and Buses for Device Networks, Program modeling concepts, Inter – process communication & Synchronization of processes, Tasks and threads
2. Enable the students learn the embedded systems concepts and fundamentals.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand embedded systems concepts	K1,K2
2	Understand RTOS concepts	K1,K2
3	Identify the devices and buses used in embedded networking	K2,K3, K4
4	Analyze on software development process life cycle and its models	K2,K3, K4
5	Analyze and design various real time embedded systems using RTOS	K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction to Embedded Systems: Embedded System – Processor in the system – Other hardware units – software embedded into a system – Exemplary Embedded systems – On chip and in VLSI Circuit. Processor and Memory selection for Embedded systems.

Unit:2	NETWORKS	12 hours

Devices and Buses for Device Networks: I/O devices – Timer and counting Devices. Device Drivers and Interrupts Servicing Mechanism: Device drivers – Parallel Port device drivers in system – Serial Port device in a system – Device drivers for internal programmable timing devices – Interrupt servicing mechanism – context and the periods for context-switching, deadline and interrupt latency.

Unit:3	PROGRAMMING MODELS	12 hours

Program modeling concepts in single & Multiprocessor systems software- Development Process: Modeling Processes for Software analysis before software Implementation – Programming models for event controlled or response time constrained real time programs – Modeling for microprocessor systems. Software Engineering Practices in the Embedded Software Development Process: Software algorithm complexity – Software Development process life cycle and its models – Software analysis – Software design – Software implementation – Software Testing, Validating and Debugging – Real time programming issues during the software

development process – Software project management – Software maintenance – UML.

Unit:4	REAL TIME OPERATING SYSTEMS	11 hours

Inter – process communication & Synchronization of processes, Tasks and threads: Multiple processes in an application – Problem of sharing data by multiple tasks and routines – Inter Process communication. REAL TIME OPERATING SYSTEM:- Real time and Embedded systems operating systems – Interrupt routines in RTOS environment – RTOS Task scheduling models, Interrupt latency and Response times of the Tasks as performance Metrices – performance Metric in scheduling models for periodic, sporadic and Aperiodic Tasks – IEEE standard POSIX 1003.1b functions for Standardization of RTOS and Inter-task communication functions – List of Basic actions in a preemptive scheduler and Expected times taken at a processor – Filters – point strategy for synchronization between the processes, ISRs, OS functions and tasks and for Resource management – Embedded Linux Internals.

Unit:5	EMBEDDED SYSTEM	11 hours

Hardware – Software co-design in an embedded System: Embedded System Project Management – Embedded system design and co-design issues in system development processes – Design cycle in the development phase for an Embedded system – Uses of Target system, or its Emulator and In-circuit Emulator – Use of software tools for development of an embedded system – Use of scopes and logic analysis for system hardware tests – Issues in Embedded system design

Case Study: An Embedded System for an Adaptive cruise control system in a car, embedded system for a smart card.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	60 hours

Text Books

1	Raj Kamal, “Embedded Systems – Architecture, programming and design”, Tata McGraw – Hill, 2003.
2	David E. Simon, “An Embedded Software primer” Pearson Education Asia, 2003.

Reference Books

1	Kenneth J Ayala, “The 8051 Microcontroller and Architecture programming and application”, Second Edition, PenramInternational.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.nptel.ac.in/noc20_cs14/preview
2	https://www.javatpoint.com/embedded-system-tutorial
3	https://www.tutorialspoint.com/embedded_systems/index.htm

Course Designed By:

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	L	L	S	M	S	S	M	M	S
CO2	M	M	S	S	M	S	M	S	S	S
CO3	M	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		WEB SERVICES	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of distributed computing	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL , UDDI
2. Get overview of Distributed Computing, XML, and its technologies
3. Update with QoS and its features
4. Develop Standards and future of Web Services

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand web services and its related technologies	K1,K2
2	Understand XML concepts	K1,K2
3	Analyze on SOAP and UDDI model	K1,K2,K4
4	Demonstrate the road map for the standards and future of web services	K2,K3,K4
5	Analyze QoS enabled applications in web services	K1,K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12 hours

Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms.

Unit:2	XML FUNDAMENTALS	12 hours

XML Fundamentals – XML documents - XML Namespaces- XML Schema –Processing XML.

Unit:3	SOAP MODEL	12 hours

SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure-interfacedefinitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registrySpecification- Core data structures-Accessing UDDI

Unit:4	TECHNOLOGIES AND STANDARDS	12 hours

Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management-workflows and workflow management systems Security: Basics-data handling and forwarding-data storage-errors-Web services security issues.

Unit:5	QUALITY OF SERVICE	10 hours
Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide", Prentice Hall, Nov 2003.
2	Keith Ballinger, "NET Web services: Architecture and Implementation with .Net", Pearson Education, First Education Feb 2003.
3	Ramesh Nagappan, Developing Java Web Services: Architecting and developing secure Web Services Using Java", John Wiley and Sons, first Edition Feb 2003.

Reference Books

1	Eric A Marks and Mark J Werrell, "Executive Guide to Web services", John Wiley and sons, March 2003.
2	Anne Thomas Manes, "Web Services: A managers Guide" Addison Wesley, June 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/webservices/index.htm
2	https://www.javatpoint.com/web-services-tutorial
3	https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	M	M	M	S
CO2	S	S	S	M	M	S	M	S	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		MIDDLEWARE TECHNOLOGIES	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of client server model and middlewares	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the overview of middleware technologies which plays important role in today's technologies such as RPS, CORBA and web services.
2. enable the students to learn the concept of middleware technologies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the motivation of using middleware	K1,K2
2	Understand how middleware facilitates the development of distributed applications in heterogeneous environments	K1,K2
3	Apply CORBA concepts	K2,K3
4	Analyze web services as most often used middleware technique	K2,K3, K4
5	Make judgment in choosing a suitable middleware for application problems	K2,K3, K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	INTRODUCTION	12Hours

INTRODUCTION: Emergence of Middleware – Objects, Web Services – Middleware Elements – Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction-Oriented Middleware – MOM – RPC.

Unit:2	MIDDLEWARE	12 hours

OBJECT ORIENTED MIDDLEWARE: OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI – COM+.

Unit:3	CORBA	10 hours

CORBA: Naming – Trading – Life Cycle – Persistence – Security – CORBA.

Unit:4	WEB SERVICES	12 hours

WEB SERVICES : Introduction – XML Web Services standards – Creating Web Services – Extending Web Services – Messaging Protocol – Describing – Discovering – Securing.

Unit:5	TYPES OF MIDDLEWARE	12 hours

OTHER TYPES OF MIDDLEWARE : Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	60 hours

Text Books	
1	Chris Britton and Peter Eye, "IT Architecture and Middleware", Pearson Education, 2nd Edition, 2004.
2	Wolfgang Emmerich, "Engineering Distributed Objects", John Wiley, 2000.
3	Keith Ballinger, ".NET Web Services – Architecture and Implementation", Pearson Education, 2003.
Reference Books	
1	Qusay H. Mahmoud, "Middleware for Communications", John Wiley and Sons, 2004.
2	Gerald Brose, Andreas Vogel, Keith Duddy, "JavaTM Programming with CORBATM: Advanced Techniques for Building Distributed Applications", Wiley, 3rd edition, January, 2004.
3	Michah Lerner, "Middleware Networks: Concept, Design and Deployment of Internet Infrastructure", Kluwer Academic Publishers, 2000.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/laravel/laravel_middleware.htm
2	https://www.btechguru.com/training--programming--j2ee--web-services--web-services-middleware-video-lecture--12140--24--154.html
3	https://www.coursera.org/lecture/web-app/video-1-what-is-middleware-FUnIX
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	S	S	M	S
CO2	S	M	S	S	S	S	M	S	S	M
CO3	S	M	M	S	M	M	L	M	S	M
CO4	S	S	S	S	S	S	S	S	M	S
CO5	M	S	M	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of various forms of information and accessing methods.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the introduction to retrieval of information from the web, various applications and query structures.
2. Describe multimedia information retrieval process.
3. Enable the students to learn the basics of search operation on the web and its applications.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts and techniques in Information Retrieval	K1,K2
2	Analyze on querying languages used for IR	K3,K4
3	Identify the common text compression algorithms and their role in the efficient building and storage of inverted indices	K3,K4
4	Analyze on the various methods being followed to retrieve the contents from the web like text, image and multimedia contents	K3,K4
5	Acquire the necessary experience to design, and implement real applications us ing Information Retrieval system	K3,K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	12 hours

INTRODUCTION : Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation –Word Sense Disambiguation.

Unit:2	QUERY	12 hours

QUERYING: Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages.

Unit:3	TEXT OPERATIONS AND USER INTERFACE	12 hours

TEXT OPERATIONS AND USER INTERFACE : Document Preprocessing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points –Query Specification - Context – User relevance Judgment – Interface for Search.

Unit:4	MULTIMEDIA	12 hours

MULTIMEDIA INFORMATION RETRIEVAL : Data Models – Query Languages – Spatial

Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction.		
Unit:5	**APPLICATIONS**	**10 hours**
APPLICATIONS : Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", Pearson Education Asia, 2005.
2	G.G. Chowdhury, "Introduction to Modern Information Retrieval", Neal-Schuman Publishers; 2nd edition, 2003.
3	Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, 2000.
Reference Books	
1	David A. Grossman, Ophir Frieder, " Information Retrieval: Algorithms, and Heuristics", Academic Press, 2000
2	Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press, 2000.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://csenotescorner.blogspot.com/2018/02/information-retrieval-techniques.html
2	https://www.youtube.com/playlist?list=PL0ZVw5-GryEkGAQT7lX7oIHqyDPeUyOMQ
3	https://cse.iitkgp.ac.in/~pawang/courses/IR16/lec1.pdf
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	M	S	S	S	S	S	M	S
CO2	S	S	M	S	S	S	M	S	S	M
CO3	S	M	S	M	M	S	S	M	M	S
CO4	M	M	S	S	M	M	S	M	S	S
CO5	S	M	S	M	L	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code		INTERNET OF THINGS	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of Sensors and its applications	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.
2. Enable students to learn the Architecture of IoT and IoT Technologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about IoT, its Architecture and its Applications	K1,K2
2	Understand basic electronics used in IoT & its role	K1,K2
3	Develop applications with C using Arduino IDE	K3,K4
4	Analyze about sensors and actuators	K2,K3, K4
5	Design IoT in real time applications using today's internet & wireless technologies	K3,K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	10 hours

Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT

Unit:2	BASIC ELECTRONICS FOR IoT	12 hours

Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

Unit:3	ARDUINO	12 hours

Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

Unit:4	SENSORS AND ACTUATORS	12 hours

Sensors and Actuators: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.

Unit:5	SENSOR IN INTERNET	12 hours
Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 2014. ISBN: 978-0996025515
2	Boris Adryan, DominikObermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.
Reference Books	
1	Michael Margolis, "Arduino Cookbook", O"Reilly, 2011
2	Marco Schwartz, "Internet of Things with ESP8266", Packt Publishing, 2016.
3	DhivyaBala, "ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit", 2018.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2	https://www.javatpoint.com/iot-internet-of-things
3	https://www.tutorialspoint.com/internet_of_things/index.htm
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		PYTHON PROGRAMMING	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of statistical programming.	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Python Programming	K1,K2
2	Understand File operations, Classes and Objects	K1,K2
3	Acquire Object Oriented Skills in Python	K1,K2, K3
4	Develop web applications using Python	K1,K2, K5
5	Develop Client Server Networking applications	K3,K4, K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	10 hours

Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets– Comparison.

Unit:2	CODE STRUCTURES	12 hours

Code Structures: if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Unit:3	MODULES, PACKAGES AND CLASSES	12 hours

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit:4	DATA TYPES AND WEB	12 hours

Data Types: Text Strings – Binary Data. **Storing and Retrieving Data:** File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.

Web: Web Clients – Web Servers – Web Services and Automation		
Unit:5	**SYSTEMS AND NETWORKS**	**12 hours**
Systems: Files –Directories – Programs and Processes – Calendars and Clocks. **Concurrency:** Queues – Processes – Threads – Green Threads and gevent – twisted – Redis. **Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2	Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.
Reference Books	
1	David M. Beazley,“Python Essential Reference”, Developer’s Library, Fourth Edition,2009.
2	SheetalTaneja,Naveen Kumar, ”Python Programming-A Modular Approach”,PearsonPublications.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M
CO5	S	S	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		DIGITAL IMAGE PROCESSING	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of Image Processing and applications	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Learn basic image processing techniques for solving real problems.
2. Gain knowledge in image transformation and Image enhancement techniques.
3. Learn Image compression and Segmentation procedures.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of Digital Image Processing	K1,K2
2	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	K1,K2
3	Apply, Design and Implement and get solutions for digital image processing problems	K3,K4
4	Apply the concepts of filtering and segmentation for digital image retrieval	K3,K4
5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	K3,K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	12 hours

Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

Unit:2	IMAGE ENHANCEMENT	12 hours

Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

Unit:3	IMAGE RESTORATION	12 hours

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

Unit:4	IMAGE COMPRESSION	10 hours
Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.		
Unit:5	**IMAGE SEGMENTATION**	**12 hours**
Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**hours**

Text Books	
1	Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Second Edition, PHI/Pearson Education.
2	B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.
Reference Books	
1	Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/117/105/117105135/
2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	M	S	M	M	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		NEURAL NETWORKS	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of Neurons and Network	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the introduction to the basic neuron, Kohenen self- organizing network, hop field networks, associative memory, fuzzy.
2. Learn the pattern classification in Neural Networks.
3. Gain knowledge on the fuzzy relation and fuzzylogic.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about soft computing techniques and their applications	K1,K2
2	Understand the pattern classification in Neural Networks	K1,K2
3	Analyze various neural network architectures	K1,K2, K3,K4
4	Analyze fuzzy relation and fuzzy logic & its applications	K3,K4
5	Apply and analyze fuzzy logic in real time applications	K3,K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	PATTERN CLASSIFICATION	12 hours

Pattern classification - Learning and Generalization - Structure of neural networks - ADA line, Delta rule - input output value - perceptions - Linear separability - Back propagation - XOR Function - Introduction to Boolean neural networks.

Unit:2	NETWORKS	10 hours

Hopfield Networks - Energy - The Hamming Network - RAM -Boltzmann machine - Instar, outstar network - ART - Kohonen's Network Recognition.

Unit:3	FUZZY RELATION	12Hours

Fuzzy relation - Member function - Fuzzy matrices - Fuzzy entropy - Fuzzy operation - Fuzzy composition.

Unit:4	FUZZY VARIABLES	12Hours

Fuzzy variables - Linguistic variables - Measure of fuzziness - Transition Matrix - Concept of Defuzzication and Applications

Unit:5	CASE STUDY	12Hours

CASE STUDY: Application of Neural Networks in character recognition, drug discovery, speech recognition; Application of Fuzzy logic concepts in Fuzzy controller design and Fuzzy querying

in Relational databasemodel.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60Hours**

Text Books	
1	P.D.Wasserman, "Neural computing and practice", Van Nostran Reinhold, New York, 1991.
2	LiminFu,"NeuralNetworkin ComputerIntelligence",McGrawHill, International editions, 1994.
Reference Books	
1	B Kosko, "Neural Network and Fuzzy systems", Prentice Hall,1996.
2	Klir& Yuan, "Fuzzy sets and Fuzzy logic", Theory and Applications, Prentice Hall of India, 1996.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/artificial-neural-network
2	https://www.tutorialspoint.com/artificial_neural_network/index.htm
3	https://nptel.ac.in/courses/117/105/117105084/
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	S	S	S	M	S	M	M	M	S
CO2	M	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		ADVANCEMENTS IN INDUSTRY 4.0	L	T	P	C
Core/Elective/ Supportive		Elective	4			4
Pre-requisite		Basics of AI, Image Processing and Security	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Present the concepts and application of Machine learning, RPA, Cyber Security, Virtual Reality and Augmented Reality in various domains.
2. Learn current trends in IT industry.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the drivers and enablers of Industry 4.0	K1,K2
2	Learn about Cyber Security and Cyber-Systems from the industrial systems perspective	K1,K2
3	Analyze on purpose of Robotic Process Automation	K2,K3, K4
4	Analyze on Virtual Reality-Based Enhance Manufacturing Sustainability in Industry 4.0	K2,K3, K4
5	Analyze on Augmented Reality-Based Enhance Manufacturing Sustainability in Industry 4.0	K2,K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	MACHINE LEARNING	12Hours

Machine Learning - Introduction – Definition – Types of Machine Learning –Supervised, Unsupervised, Reinforcement Learning – Algorithms for Machine Learning – Problems solved by Machine Learning - Tools for Machine Learning - Applications areas of Machine Learning

Unit:2	ROBOTIC PROCESS	12Hours

Robotic Process Automation (RPA): Introduction to RPA – Need for automation – Programming constructs in RPA – Robots and Softbots – RPA architecture and process methodologies - Industries best suited for RPA - Risks & Challenges with RPA

Unit:3	CYBER SECURITY	12Hours

Cyber Security: Cyber Crime and Information Security – Classification of Cyber Crimes - Types of Cyber Attacks - Cyber crime and Indian IT Act 2000 – Security Methods.

Unit:4	VRTUAL REALITY	11Hours

Virtual Reality: Definition – Types of Head Mounted Displays – Tools for Virtual Reality – Applications of VR in Education, Industries - Difference between VR and AR.

Unit:5	AUGMENTED REALITY	11Hours

Augmented Reality: Definition - Tools for Augmented Reality –Hololens - Advantages and

Challenges of AR - Applications of AR in Education, Industries - Mixed Reality.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2020.

Reference Books

1	Anand Nayyar "A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development (Advances in Science, Technology & Innovation), Springer; 1st ed. 2020

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/uipath/uipath_robotic_process_automation_introduction.htm
2	https://www.javatpoint.com/rpa
3	https://onlinecourses.nptel.ac.in/noc19_me74/preview

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	S	M	S
CO2	S	S	M	L	M	S	S	M	S	M
CO3	M	M	S	M	S	M	S	M	S	S
CO4	S	S	S	S	S	S	S	S	M	M
CO5	S	S	S	M	S	S	M	S	M	S

*S-Strong; M-Medium; L-Low

Annexure

Master of Computer Applications

Syllabus

(With effect from 2021 -2022)

Program Code :

DEPARTMENT OF COMPUTER SCIENCE

Bharathiar University
(A State University, Accredited with "A" Grade by NAAC and
13th Rank among Indian Universities by MHRD-NIRF)
Coimbatore 641 046, INDIA

BHARATHIAR UNIVERSITY, COIMBATORE 641046

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

MISSION

To impart Knowledge and Skill that develop Technical, Social, Economical, and Cultural values by providing a good Platform to Perform, acquiring Basic Practical Knowledge of various Fundamental Theoretical concepts and apply them successfully to meet the industrial needs globally with an attitude of Self upliftment and Society.

Bridge Course

Bharathiar University , Coimbatore – 46

Bridge Course for MCA

(For students admitted from 2021-2022 onwards)

Total Hours : 60 hours (Use PPT to enhance and Speed up the Teaching Learning Process and PPT can be used for Future References)

Goal:

The objective of bridge course is to provide the fundamental concepts and Practical knowledge about Computer Science and its Applications for students admitted from Non – Computer streams [with Mathematics at UG level or +2.]

SubCode	Subject Name	Theory Hrs	Practical Hrs
01	Basics of Digital Computer	07	--
02	Data Structures and its applications Using C		
	2.1. Data Structure &Applications	------ 06	--
	2.2. C Programming	------ 07	10
03	Basics OOPS concepts using C++	07	10
04	Basics of Computer Graphics and Multi media	07	6
	Total	**34**	**26**

Sub Code 01 Basics of Digital Computer (7 Hours)

Number System: Binary numbers, 4 – bit representation from (1 to 16) – Binary to Decimal, Decimal to Binary , Octal, Hexadecimal Conversions. Gray code and ASCII code-Addition, Subtraction (2's complement) Logic Gates , Truth table , Half Adder, Full Adder, BCD Adder.

Boolean Algebra – Boolean Expression Simplification -Encoder, decoder, multiplexer, demultiplexer-Flip- Flops : RS ,J-K , D ,T, Master Slave, Registers , counters -Memory: Hierarchy, Types, Associative memory, match logic

Sub Code 02 Data structure and its applications Using C

2.1. Data Structureand its applications (6 Hours)

Arrays – single and multi dimension - STACK and its applications like - Expression Evaluation,Programming constructs - check for parity – Open / Close bracket; Begin / End; Subroutine calls / Returns; Nested loops etc. Linked lists , sorting lists , circularly linked lists. QUEUE and its applications like Process Scheduling, Priority Queue, Circular Queue. TREE and application of tree- FILES Importance of FILE data structure, FILE Operations , Types of files.

2.2. C Programming (7 Hours)

History and the importance of C as System programming and application programming -Variables, datatypes, operators and built- in functions - Input / Output statements, Control strings, escape sequences - Control structures -IF then else, Elseif Ladder, Switch case statements Loops – For loop, while, do while - Arrays, Structurers, Union, Pointers and Files.

C programming with Data Structures Lab **(10 Hours)**

(Lab session for C emphasized with data structure implementation.)

1.Write a C program to sort the given list of numbers in ascending order and find greatest among the list of numbers..

2. Write a C program to convert INFIX notation to POSTFIX using Stack

3.Write a C program to implement QUEUE operations accepting the choice for INSERTION, DELETION and EXIT

4. Write a C program to find the result of a student (PASS / FAIL) for 5 subjects in a class 0f 60 students using structure variable.

5. Write a C Program to implement file operation.

Related Programs may be added.

Sub Code : 03 Basic OOPS concepts Using C++ **(10 Hours)**

Class, Object, encapsulation – inheritance - polymorphism – accesss specifiers – scope – Variables, datatypes, - input/ output statements - control structures - branching and looping, control structures functions in C++-Member function, friend function, constructor, destructor, overloading.

OOPS with C++ Lab **(10 Hours)**

1. Write a C++ program to implement friend function
2. Write a C++ program to implement Inheritance
3. Write a C++ program to implement polymorphism with constructor and destructor
4. Write a C++ program to implement operator overloading
5. Write a C++ program to implement function overloading .

Related Programs may be added.

Sub code 04 Basic concepts of Graphics and Multimedia **(7 Hours)**

Output Primitives - Attributes of output Primitives - 2D Transformations - Text – Audio – Video

Basics of Graphics and Multimedia Lab **(6 Hours)**

1. Write a program to implement 2D Transformation
2. Write a program to Draw Line
3. Write a program to move an object with sound effect
4. Create an object and animate using Photoshop
5. Create a web page using Photoshop.

Related Programs may be added.