MASTER OF COMPUTER APPLICATION (MCA)

PROGRAMME GUIDE

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INTRODUCTION

If not the real world, the classes of MCA are simulated as real world, making the learning close to reality. Wide range of emerging specialization areas are on offer.

PROGRAMME OUTCOME

Programme outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the programme: -

1. **Analysis & design of complex problems:** Ability to apply knowledge of computer science concepts, principles & techniques to solve various computing problems.
2. **Coding skills:** Apply and solve problems using computer programming and simulation.
3. **Communication:** Communicate effectively problem findings, and to be able to assimilate, write and present effective design documents to give and receive clear instructions.
4. **Societal Impact:** Acquire and apply advanced knowledge of concepts and participate in sustainable development.
5. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
6. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of upcoming information technology changes.
7. **Investigation:** To know and able to experiment, analyze and interpret the data.
8. **Use of computing tools:** An ability to use current techniques, skills, and tools necessary for modern Information Computing Technology and communication support services.
9. **Professionalism:** Ability to Manage time well, demonstrate an appropriate level of preparedness and maintain a high standard for personal and professional demeanor, accepting responsibility and accountability for words and actions.
10. **Economics and project management:** Demonstrate knowledge and understanding of the software project management principles to manage projects in multidisciplinary environments.

PROGRAMME SPECIFIC OUTCOMES

PSOs are statements that describe what the graduates of a specific engineering program should be able to do:

1. **PSO1:** Understand and comprehend advanced level of programming, data structures, databases, networking, mobile computing, information security and data analysis.
2. **PSO2:** Demonstrate competence in using computer science concepts and computational tools for simulation and digital transformation.
3. **PSO3:** Ability to effectively apply the information technology concepts to analyze, design and develop cost effective solutions to the societal problems.
4. **PSO4:** Provide user friendly and need based mobile, web or cloud-based solutions to the society.

SALIENT FEATURES

- **Industrial Visits:** Encourage students to have maximum industrial exposure through visits for problem identification and emerging technologies.
- **Industry ready:** Makes student industry ready.
- **Holistic Development:** Participation in technical events, sports and cultural activities help in the holistic development of students.
- **Projects:** Project driven courses are designed to enhance technical and presentation skills.
- **Industry Immersion:** Training, projects and guest lecturers collaborated with industries help to learn from real life situations.
- **Professional Enhancement:** In addition to core curriculum, course offers subjects like communication, analytical and soft skills to enhance personality and employability.
- **Software Skills:** Curriculum is equipped with 21st century digital technologies for game designing, web designing and Android/iPhone Application Development.
- **Contemporary Curriculum:** Instill knowledge in the major areas of computing such as Programming, Databases, Web Development and Mobile Phone App Development.

PROGRAMME CODE: **DE1624**

DURATION OF THE PROGRAMME:

Minimum Duration 2 years

Maximum Duration 4 years

MEDIUM OF INSTRUCTION / EXAMINATION:

Medium of instruction and Examination shall be English.

PROGRAMME STRUCTURE					
Term	**Core Courses (CR I, CR II, CR III) CR I+II – (8+4) 12 x 4 Credits CR III 2x 4 Credits**	**Discipline Specific Electives (DSE) 4 x 4 Credits**	**Skill Enhancement Courses (SEC) 4 x 4 Credits**	**Generic Electives (GE) 4 x 4 Credits**	**Credits**
I	Discipline Specific Core- I Discipline Specific Core- II Discipline Specific Core- III Discipline Specific Core- IV Discipline Specific Core- V		**SEC- I**		**24**
II	Discipline Specific Core- VI Discipline Specific Core-VII Discipline Specific Core- VIII Discipline Specific Core- IX Discipline Specific Core- X Discipline Specific Core- XI		**SEC- II**		**28**
III	Discipline Specific Core- XII **CRIII –** Seminar on Summer Training	**DSE- I DSE- II**	**SEC-III**	**GE-I GE- II (**Management, Marketing, Finance, Research)	**28**
IV	**CR III-**Project Work	**DSE- III DSE-IV**	**SEC-IV**	**GE-III GE- IV (**Management, Marketing, Finance, Research)	**24**
Total	**56 Credits**	**16 Credits**	**16 Credits**	**16 Credits**	**104**

MASTER OF COMPUTER APPLICATIONS PROGRAMME SCHEME (DE1624)					
COURSECODE	**COURSETITLE**	**Cr.**	**CA**	**ETE (Th.)**	**ETE (Pr.)**
TERM1					
DECAP437	SOFTWARE ENGINEERING PRACTICES	4	30	70	0
DECAP444	OBJECT ORIENTED PROGRAMMING USING C++	4	30	40	30
DECAP446	DATA WAREHOUSING AND DATA MINING	4	30	70	0
DECAP448	LINUX AND SHELL SCRIPTING	4	30	40	30
DECAP453	DATA COMMUNICATION AND NETWORKING	4	30	70	0
SEC-I	SKILL ENHANCEMENT COURSE I	4	-	-	-
DECAP010	PROGRAMMING IN C	S/U			
DECAP011	DATABASE MANAGEMENT SYSTEM	S/U			
Note: ECAP010 and ECAP011 are Bridge Courses. These courses are applicable for the students who completed their graduation in non-computer background (i.e., B.A., B.Com., B.Sc.)					
TERM2					
DECAP615	PROGRAMMING IN JAVA	4	30	40	30
DECAP770	ADVANCED DATA STRUCTURES	4	30	40	30
DECAP456	INTRODUCTION TO BIG DATA	4	30	40	30
DECAP470	CLOUD COMPUTING	4	30	70	0
DEMTH403	MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE	4	30	70	0
DECAP472	WEB TECHNOLOGIES	4	30	40	30
SEC-II	SKILL ENHANCEMENT COURSE II	4	-	-	-
TERM3					
DECAP776	PROGRAMMING IN PYTHON	4	30	40	30
SEC-III	SKILL ENHANCEMENT COURSE III	4	-	-	-
DSE-I	DISCIPLINE SPECIFIC ELECTIVE I	4	-	-	-
DSE-II	DISCIPLINE SPECIFIC ELECTIVE II	4	-	-	-
GE-I	GENERIC ELECTIVE I	4	-	-	-
GE-II	GENERIC ELECTIVE II	4	-	-	-
DECAP735	SEMINAR ON SUMMER TRAINING	4	30	0	70
TERM4					
DSEC-IV	SKILL ENHANCEMENT COURSE IV	4	-	-	-
DSE-III	DISCIPLINE SPECIFIC ELECTIVE III	4	-	-	-
DSE-IV	DISCIPLINE SPECIFIC ELECTIVE IV	4	-	-	-
GE-III	GENERIC ELECTIVE III	4	-	-	-
GE-IV	GENERIC ELECTIVE IV	4	-	-	-
DECAP788	PROJECT WORK	4	30	0	70
TOTAL CREDITS		**104**			

DISCIPLINE SPECIFIC ELECTIVE (DSE) BASKET 1								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective**	**Term**
1	DECAP790	PROBABILITY AND STATISTICS	4	30	40	30	Data Science	3
2	DECAP774	STYLING AND SCRIPTING FOR WEB DEVELOPMENT	4	30	40	30	Web Development	3

DISCIPLINE SPECIFIC ELECTIVE (DSE) BASKET 2								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective**	**Term**
1	DECAP792	DATA SCIENCE TOOL BOX	4	30	40	30	Data Science	3
2	DECAP777	WEB DEVELOPMENT USING PHP	4	30	40	30	Web Development	3

DISCIPLINE SPECIFIC ELECTIVE (DSE) BASKET 3								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective**	**Term**
1	DECAP794	ADVANCE DATA VISUALIZATION	4	30	40	30	Data Science	4
2	DECAP784	RESPONSIVE WEB DESIGN	4	30	40	30	Web Development	4

DISCIPLINE SPECIFIC ELECTIVE (DSE) BASKET 4								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective**	**Term**
1	DECAP737	MACHINE LEARNING	4	30	40	30	Data Science	4
2	DECAP785	WEB PERFORMANCE OPTIMIZATION	4	30	40	30	Web Development	4

SKILL ENHANCEMENT COURSE (SEC) BASKET							
Course Code	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective Area**	**Term**
DEPEA515	ANALYTICAL SKILLS-I	4	30	70	0	PROFESSIONAL ENHANCEMENT	1
DEPEA516	ANALYTICAL SKILLS-II	4	30	70	0	PROFESSIONAL ENHANCEMENT	2
DECAP538	ALGORITHM DESIGN AND ANALYSIS	4	30	40	30	COMPUTER APPLICATION	3
DECAP951	SOFTWARE PROJECT MANAGEMENT	4	30	70	0	COMPUTER APPLICATION	4

GENERIC ELECTIVE (GE) BASKET 1							
Course Code	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective Area**	**Term**
DEMGN581	ORGANIZATIONAL BEHAVIOUR AND HUMAN RESOURCE DYNAMICS	4	30	70	0	MANAGEMENT	3
DEMKT503	MARKETING MANAGEMENT	4	30	70	0	MARKETING	3
DEFIN542	CORPORATE FINANCE	4	30	70	0	FINANCE	3
DEGEN530	FUNDAMENTALS OF RESEARCH	4	30	70	0	RESEARCH	3

GENERIC ELECTIVE (GE) BASKET 2								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective Area**	**Term**
1	DEMKT503	MARKETING MANAGEMENT	4	30	70	0	MANAGEMENT	3
2	DEMKT509	CONSUMER BEHAVIOUR	4	30	70	0	MARKETING	3
3	DEFIN548	INTERNATIONAL FINANCIAL MANAGEMENT	4	30	70	0	FINANCE	3
4	DEGEN531	RESEARCH METHODS AND DESIGN	4	30	70	0	RESEARCH	3

GENERIC ELECTIVE (GE) BASKET 3								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective Area**	**Term**
1	DEFIN542	CORPORATE FINANCE	4	30	70	0	MANAGEMENT	4
2	DEMKT505	DIGITAL AND SOCIAL MEDIA MARKETING	4	30	70	0	MARKETING	4
3	DEFIN508	INTERNATIONAL BANKING AND FOREX MANAGEMENT	4	30	70	0	FINANCE	4
4	DECAP797	RESEARCH PROJECT –I	4	30	70	0	RESEARCH	4

GENERIC ELECTIVE (GE) BASKET 4								
S. No	**Course Code**	**Course Title**	**Credit**	**CA**	**ETE**	**ETP**	**Elective Area**	**Term**
1	DEOPR639	OPERATIONS MANAGEMENT AND RESEARCH	4	30	70	0	MANAGEMENT	4
2	DEMKT517	CUSTOMER RELATIONSHIP MANAGEMENT	4	30	70	0	MARKETING	4
3	DEFIN576	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	4	30	70	0	FINANCE	4
4	DECAP798	RESEARCH PROJECT -II	4	30	70	0	RESEARCH	4

Note:

1. Students can adopt only one area from discipline specific elective basket that will be applicable for the whole program.
2. Students can adopt only one area from generic elective basket that will be applicable for the whole program.

Course code	DECAP437	Course Title	SOFTWARE ENGINEERING PRACTICES

WEIGHTAGES	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Apply theoretical foundation of software engineering in practical software development

CO2: Analyze the need of software maintenance activities

CO3: Discuss the software life cycle models

CO4: Apply software engineering practices to create complex software designs

CO5: Identify the importance of the software development process

Unit No.	Content
Unit 1	**Introduction to software engineering**: Define software engineering, software process, software engineering practices.
Unit 2	**Software process models**: Software development life cycle (SDLC), classical software development life cycle model, prototyping model, V model, incremental Model, introduction to agile method of software development.
Unit 3	**Requirement engineering**: Requirement engineering, requirement eliciting / gathering, negotiating requirement, validating requirement, requirement analysis, stakeholder analysis.
Unit 4	**Requirement specification**: Software requirement specification document, characteristics of a good SRS, functional and non-functional requirement.
Unit 5	**Design**: Design process, design concepts, coupling, cohesion, data flow diagram (DFD), flow chart, architectural design, component-based design, object-oriented design, class-based components, use case diagram, class diagram, activity diagram.
Unit 6	**User interface design**: Golden rules, interface design models, interface design process, interface design activities.
Unit 7	**Standards**: Good coding practices, coding standards, code reusability, documentation, documentation standards.
Unit 8	**Software testing**: Test design, test planning, test case definition, test case template.
Unit 9	**Testing strategies**: Black box testing, white box testing, sanity testing, smoke testing.
Unit 10	**Testing levels**: Unit testing, integration testing, system testing, acceptance testing, regression testing.
Unit 11	**Bugs**: Bug/defect definition, bugs life cycle, bug tracking, bug tracking tool (bugzilla overview).
Unit 12	**Software maintenance**: Software maintenance, software supportability, reengineering, business process reengineering, software reengineering, restructuring, economics of reengineering.
Unit 13	**Product metrics**: Measure, metrics and indicators, measurement principles, function-based metrics, metrics for specification quality.
Unit 14	**Software process improvement**: Approaches to SPI, maturity models, SPI process.

READINGS:

1. FUNDAMENTALS OF SOFTWARE ENGINEERING by RAJIB MALL, PHI LEARNING
2. AN INTEGRATED APPROACH TO SOFTWARE ENGINEERING by PANKAJ JALOTE, NAROSA PUBLISHING HOUSE

Course code	DECAP444	Course Title	OBJECT-ORIENTED PROGRAMMING USING C++

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the concepts of Object-oriented programming

CO2: Distinguish between the procedure-oriented and object-oriented programming languages

CO3: Apply the concept of file handling and exception handling mechanisms

CO4: Develop applications using the concepts of Object-oriented programming

CO5: Validate the code formulation by passing various test cases

Unit No.	Contents
Unit 1	**Principles of OOPs and basics of C++:** Basic Concepts of Object-Oriented Programming, Object Oriented Languages, Benefits of OOP's Specifying Class, Access specifies, Defining member functions, Nesting of member functions, Private member functions, Arrays within class.
Unit 2	**Constructors and Destructors:** Constructors, Parameterized constructors, Copy Constructor and Dynamic Constructor, Multiple Constructor in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Destructors.
Unit 3	**Functions and Compile Time Polymorphism:** Call by Value & Call by Reference, Objects as function arguments, Inline Functions, Making outside function inline, Friend functions, Static Data Members & Functions, Function Overloading.
Unit 4	**Inheritance:** Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance, Hybrid Inheritance.
Unit 5	**Operator Overloading:** Rules for operator overloading, overloading unary operators, overloading binary operators, overloading binary operators using Friend Function.
Unit 6	**Type Conversion:** Type conversions: Basic to Class Type, Class to Basic Type, One Class to Another Class Type.
Unit 7	**Run-time Polymorphism:** Virtual Base Classes, Abstract Classes, Pointer to Object, This Pointer, Pointer to Derived Class.
Unit 8	**Virtual Functions:** Virtual Function, Pure Virtual Function, Early Vs. Late Binding.
Unit 9	**Working with Streams and Files:** C++ Streams, C++ Stream Classes, Classes for File Stream Operation, Opening & Closing Files, Detection of End of File.
Unit 10	**More on Files:** More about Open(): File modes, File pointer & manipulator, Sequential Input & output Operation, Updating a File: Random Access, Command Line Arguments.
Unit 11	**Generic Programming with Templates:** Need of Template, Class Template, Function Template, Overloading of Function Template.
Unit 12	**More on Templates:** Recursion with Template Function, Class Template and Inheritance, Difference between Templates and Macros.
Unit 13	**Exception Handling:** Principles of Exception Handling, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.
Unit 14	**More on Exception Handling:** Re-throwing Exceptions, Exceptions in Constructors and Destructors, Controlling Uncaught Exceptions.

LABORATORY WORK:

IMPLEMENTATION OF C++ PROGRAMMING CONCEPTS (CLASSES AND OBJECTS, CONSTRUCTOR AND DESTRUCTORS, FUNCTION OVERLOADING AND OPERATOR OVERLOADING, INHERITANCE, WORKING WITHFILES, TEMPLATES AND EXCEPTION HANDLING).

READINGS:

1. OBJECT ORIENTED PROGRAMMING WITH ANSI & TRUBO C++ by ASHOK N. KAMTHANE, PERASON EDUCATION
2. OBJECT ORIENTED PROGRAMMING IN C++ by ROBERT LAFORE, GALGOTIA PUBLICATIONS
3. THE C++ PROGRAMMING LANGUAGE by BJARNE STROUSTRUP, PEARSON

Course code	DECAP446	Course Title	DATA WAREHOUSING AND DATA MINING

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the various concepts of data warehousing like metadata, data mart, summary table, fact data and dimension data.

CO2: Sail along with the various approaches in data mining.

CO3: Familiarize with the various data warehousing and data mining tools.

CO4: Observe the various methods to extract knowledge using data mining techniques.

CO5: Evaluate current trends in data mining such as web mining, spatial-temporal mining.

CO6: Apply different data mining methodologies with information systems.

CO7: Research of database systems and able to improve the decision-making process.

Unit No.	Contents
Unit 1	**Data Warehousing and Online Analytical Processing**: Basic concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation.
Unit 2	**Introduction to data mining:** Basic concepts of data mining, Different types of data repositories, Data mining functionalities, Concept of interesting patterns, Data mining tasks, Current trends, Major issues and ethics in data mining.
Unit 3	**Data Warehousing Architecture:** Operational Data and Data store, Load Manager, Warehouse Manager, Query Manager, Detailed Data, Lightly and highly summarized Data, Archive/Backup Data, Meta-Data, architecture model, 2-tier, 3-tier and 4-tier data warehouse, End user Access tools.
Unit 4	**Installation and development environment overview:** Downloading Rapid miner and WEKA tool from source websites, Installing Rapid miner and WEKA tool on your windows computer.
Unit 5	**Introduction to mining tools:** Introduction to Rapid miner, Introduction to WEKA tool, features of tools, Comparison between Rapid Miner and WEKA, Overview of interface.
Unit 6	**Extracting Data Sets:** Importing data into Rapid miner using different formats of files, Storing and retrieving data using rapid miner, Graphical representation of data in rapid miner, Hands on practice problems on data import / export.
Unit 7	**Data Preprocessing:** Data cleaning, Data integration and transformation, Data reduction, Discretization and concept hierarchy generation.
Unit 8	**Data Pre-processing using rapid miner:** Identification and removal of duplicates, Apply operations for handling Meta data like rename or attribute role definition, Identify and remove the missing values in the data set, Apriori method for finding frequent item set WEKA / Rapid miner tool, Apply data mining pre-processing techniques and methods to large data sets, Hands on practice problems on data pre-processing.
Unit 9	**Association and Correlation Analysis:** Basic concepts of frequent pattern and association rule, frequent item set generation with Apriori algorithm and FP Growth algorithm, Rule generation, Applications of Association rules.

Unit 10	**Clustering Algorithms and Cluster Analysis:** Measures of similarity, K means partitioning method, k medoids method, CLARANS method, Agglomerative and divisive clustering hierarchical method, BIRCH method, Density based methods - Subspace clustering, Graph-based clustering - MST clustering, Cluster evaluation, Outlier detection and analysis.
Unit 11	**Classification:** Introduction to classification, Introduction to Classification methods, Basic concepts of binary classification, Bayes theorem and Naive Bayes classifier, Association based classification, Rule based classifiers, Nearest neighbor classifiers, Decision Trees, Random Forest, Perceptron's, Multi-category classification, Model over fitting, Cross validation.
Unit 12	**Prediction and Classification using WEKA Tool:** Applying model for prediction, Bayesian Classification on new imported data, Bayesian Classification on existed dummy data set, Decision Tree classification on both new and dummy data sets, Practice problems on classification methods, Applications of classification for web mining.
Unit 13	**Clustering methods using WEKA Tool:** Introduction to clustering, Introduction to Clustering algorithms, differentiate clustering and classification, K-means clustering, Hierarchical clustering algorithm.
Unit 14	**Applications of Data Warehousing and Data Mining:** Case studies of Data Warehousing in financial data analysis and retail industries, Case studies of Data Warehousing in Indian Railway reservation system and other industrial use, Case study on forecasting weather reports.

READINGS:

1. DATA MINING: CONCEPTS AND TECHNIQUES by JAWEI HAN, MICHELINE KAMBER AND JIAN PE, MORGAN KAUFMANN
2. DATA WAREHOUSING, DATA MINING AND OLAP by ALEX BERSON AND STEPHEN J. SMITH, MC-GRAW HILL
3. BUILDING THE DATA WAREHOUSE by INMON W. H, WILEY

Course code	DECAP448	Course Title	LINUX AND SHELL SCRIPTING

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes

CO1: Learn about LINUX environment and basic LINUX administration tasks.

CO2: Demonstrate comprehensive introduction to shell scripting/programming in LINUX.

CO3: Explain various basic LINUX commands and C system programming and debugging techniques in LINUX environment.

CO4: Analyze the usage of LINUX utilities, organize directory structures and develop useful shell scripts.

CO5: Interpret and configure different LINUX servers like samba, ftp, apache and nfs.

Unit No.	Contents
Unit- 1	**Getting started with LINUX:** The History of UNIX and GNU–LINUX, What Is So Good About LINUX? Overview of LINUX, Additional Features of LINUX.
Unit- 2	**Installation Guide:** Booting LINUX Installation Program, Partitioning Hard Drives, setting up Swap Space, Choosing Partitions to Format Booting with LILO, Multi-boot with Other Operating Systems, Logging-In from a Terminal or Terminal Emulator, More About Logging-In, Run levels.
Unit- 3	**Connecting to Internet:** Network interfacing tool, Connecting to LAN, DNS (Static and Dynamic connection).
Unit- 4	**Installing software:** RPM management tool, Querying RPM packages, Package installation in TAR format, Adding & removing packages.
Unit- 5	**Utilities:** Basic Utilities, Working with Files, Pipe, Four More Utilities, Compressing and Archiving Files, Locating Commands.
Unit- 6	**File Systems:** Obtaining User and System Information, Communicating with Other Users, Directory Files and Ordinary Files, Pathnames, Working with Directories, Access Permissions, Access Control Lists, Links.
Unit- 7	**The Shell and popular editors:** The Command Line, Standard Input and Standard Output, running a Command in the Background, Filename Generation/Pathname Expansion, Built ins, Using VIM to Create and Edit a File, Introduction to vim Features, Command Mode, Input Mode, Emacs versus Vim, Getting Started with Emacs, Basic Editing Commands
Unit- 8	**The Bourne Again Shell and TC Shell:** Shell Basics, Parameters and Variables, Special Characters, Processes, Re-executing and Editing Commands, Aliases, Functions, controlling bash, Entering and Leaving the TC Shell, Features Common to the Bourne Again and TC Shells
Unit- 9	**Programming the Bourne Again Shell:** Control Structures, File Descriptors, Parameters and Variables, Built-in Commands, Expressions
Unit- 10	**LINUX System Administration:** System Administrator and Superuser, Rescue Mode, SELINUX, System Operation, System Administration Utilities, Setting Up a Server, Important Files and Directories, File Types, Filesystems, Configuring User and Group Accounts, Backing Up Files, Scheduling Task, System Reports, Parted.
Unit- 11	**Web Server Configuration:** Apache Web Server, Installing Apache, Configuring Web server, Starting Apache, Setting up first web page.

Unit- 12	**File Server Configuration:** FTP protocol, Starting FTP server, Using FTP server, Using FTP client to test anonymous read access, Testing FTP server.
Unit- 13	**Samba Servers:** Overview of SAMBA server, Installing SAMBA server, SAMBA configuration with SWAT and starting SWAT service, Starting and stopping the SAMBA server, Adding SAMBA user, Creating and configuring SAMBA share.
Unit- 14	**Network File System:** NFS overview, Planning an NFS installation, Configuring an NFSserver, Configuring an NFS client, Using automount services, Examining NFS security.

READINGS:

1. DATA COMMUNICATION AND NETWORKING by B.A. FOROUZAN, MCGRAW HILL EDUCATION
2. DATA AND COMPUTER COMMUNICATIONS by WILLIAM STALLINGS, PEARSON

Course code	DECAP453	Course Title	DATA COMMUNICATION AND NETWORKING

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Recognize different networking devices and their functionalities

CO2: Understand the importance of data communication

CO3: Utilize the role of protocols in networking

CO4: Analyse the services and features of the various layers of network

Unit No.	Contents
Unit 1	**Introduction to data communication and computer networks:** data communication system - components and characteristics, protocol – its component and functions, definition, characteristics, applications and classification of computer networks – PAN, LAN, MAN, WAN, inter-networks, network topologies.
Unit 2	**Data and signals:** Analog and digital data, Analog and digital signals, transmission impairments, performance metrics, transmission modes - simplex, half duplex and full duplex.
Unit 3	**Digital and Analog Transmission:** digital transmission, line coding, modulation, PCM, DM, ASK, FSK, PSK, amplitude, frequency and phase modulation.
Unit 4	**Network models:** layered architecture, benefits of layered architecture, OSI reference model, TCP/IP protocol suite, functions of layers in OSI and TCP/IPmodels, addressing in OSI and TCP/IP models.
Unit 5	**Physical layer:** services of physical layer, transmission medium – wired and wireless, switching – message switching, circuit switching, datagram packet switching, virtual circuit packet switching, networking devices - modem, repeater, network interface card, connectors, transceiver, hub - active, passive and intelligent, bridge - local, remote, wireless, switches, routers - static and dynamic, gateways
Unit 6	**Data link layer - error and flow control:** introduction, types of errors, one and two-dimensional parity method, hamming code, cyclic redundancy check (CRC), framing- character stuffing, bit stuffing, introduction to flow and error control, protocols for noiseless and noisy channels - simplest protocol, stop-and-wait protocol; stop-and-wait ARQ, go-back-n ARQ, selective repeat ARQ.
Unit 7	**Data link layer - medium access control protocols:** High level Data Link Control Protocol (HDLC), Point-to-Point Protocol (PPP), random access - pure ALOHA and slotted ALOHA, persistent and non-persistent CSMA, CSMA/CD, CSMA/CA; controlled access.
Unit 8	**Network layer - logical addressing:** IPV4 addressing, classful addressing, classless addressing, sub netting, network address translation, classless inter-domain routing, IPV6 addressing, internet control messaging protocol (ICMP), address resolution protocol (ARP), reverse address resolution protocol (RARP).
Unit 9	**Network layer – routing:** routing characteristics, routing algorithms, comparison of routing algorithms, broadcast and multicast routing: broadcast routing, multicast routing, routing in adhoc networks, routing protocols: distance vector, link state, path vector.

Unit 10	**Transport layer - protocols:** services of transport layer, multiplexing and demultiplexing, connection oriented and connectionless services, connection establishment, connection release, port addressing, connectionless transport using UDP, connection-oriented transport using TCP – handshaking
Unit 11	**Transport layer - congestion control and QoS:** general principles of congestion control, congestion avoidance and prevention policies; quality of service - types of traffic, traffic shaping, leaky bucket algorithm, token bucket algorithm.
Unit 12	**Application layer – services and protocols:** remote login (TELNET), file transfer protocol (FTP), domain name system (DNS), e-mail - simple mail transfer protocol (SMTP), post office protocol (POP), internet message access protocol (IMAP).
Unit 13	**Internet and WWW:** internet basics, hypertext transfer protocol (http), world wide web (www), securing e-mail, security in internet – IPsec, VPN, overview of digital signature and digital certificates technology.
Unit 14	**Network Security:** network security issues, goals of network security, approaches to network security, cryptography, principles of cryptography, encryption and decryption, public / private key encryption, firewalls, types of firewall technology - network level and application level, IP packets filter screening routers, limitations of firewalls.

READINGS:

1. DATA COMMUNICATION AND NETWORKING BY B.A. FOROUZAN, MCGRAW HILL EDUCATION
2. DATA AND COMPUTER COMMUNICATIONS BY WILLIAM STALLINGS, PEARSON
3. MS-EXCEL - WORKING WITH WORKSHEET, FORMULAS & FUNCTIONS, INSERTING

Course code	DECAP010	Course Title	PROGRAMMING IN C

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the basic concepts of programming like data types, control structures, functions and arrays

CO2: Perceive problem solving through C programming

CO3: Build sequential steps and procedures to solve a given problem

CO4: Demonstrate the use of pointers and dynamic memory allocation

CO5: Implement the knowledge and insights to create solutions

Unit No.	Contents
Unit 1	**Introduction:** Introduction to programming language, machine language, Assembly Languages and High Level Languages, Program Development in C, The C character set, Identifiers and keywords
Unit 2	**Data Types**: Data types, Constants and Variables
Unit 3	**Input/ Output in C:** Unformatted and formatted I/O functions- print(), scan(), puts (), gets(), get char(), put char(),
Unit 4	**Operators**: Expressions, Arithmetic operators, Unary, Relational, logical, Assignment and Conditional Operator, Bitwise operators
Unit 5	**Decision making statements**: Designing Structured Programs in C covering Top Down Design and Stepwise refinement, Type Conversion and Type Modifiers, If and If else, Switch Case
Unit 6	**Loop Statements:** While and do-while, For Statement, Break and Continue statements, goto statement
Unit 7	**Functions:** Function Definition and Prototypes, Scope Rules - Local and global scope, passing arguments by value and passing arguments by reference, Recursion, Library Functions,
Unit 8	**Storage Classes:** Storage Classes in C and their usage
Unit 9	**Arrays:** Declaring arrays in C, Defining and processing 1D and 2D arrays, Defining and processing of multidimensional arrays, passing arrays to functions, Array applications - Sorting and searching, Character arrays, Return statement
Unit 10	**Pointers:** Pointer data type, Pointer declaration, Initialization, accessing values using pointers, Pointer expressions and Arithmetic, Operations on Pointers, Pointers and arrays, Pointers and functions, Array of Pointers,
Unit 11	**Strings:** Defining and Initializing string, Reading and writing a string, Processing of string, String Library Functions, Pointers and strings
Unit 12	**Dynamic Memory Management:** Dynamic Memory Management functions (malloc, calloc, ealloc and free),
Unit 13	**Structures and Union**: -Declaration, definition and initialization and accessing, Structures in functions, Structures and Pointers, Self-referential structures, Nested Structures and Unions
Unit 14	**File Structures:** Categories of files, Opening and closing files, Text and binary files, Reading and writing in files, additional Features of C - creating header files, pre-processor directives and macros, appending in files

LABORATORY WORK:

Implementation of C Programming Concepts (Operators, Data types, Control Statements, Functions, Arrays, Strings, Structures, Union, Pointers, File Handling)

READINGS:

1. Programming in ANSI C by E. Balagurusamy, Tata McGraw Hill, Publishing Company Limited, New Delhi, India
2. Programming with C by Gottfried, McGraw Hill Education
3. Programming with ANSI & Turbo C by Ashok N. Kamthane, Pearson Education

Course code	DECAP011	Course Title	DATABASE MANAGEMENT SYSTEMS

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Analyze the relational database model to understand the Logical and Physical aspects of the DBMS architecture.

CO2: Apply refined queries to fetch information from large datasets.

CO3: Understand the normalization theory and apply such knowledge to normalization of a database.

CO4: Apply and relate the concept of transaction, concurrency control and recovery in database.

CO5: Describe the principles of storage structure and recovery management.

CO6: Discuss distributed databases and be familiar with cloud databases.

Unit No.	Contents
Unit 1	**Introduction to fundamentals of DBMS:** Database applications, Purpose of database systems, Components of DBMS, DBMS Architecture, Different Data Models, Data Independence, Various types of constraints.
Unit 2	**Database design and ER model:** Overview of Design process, Entity relationship model, constraints, ER Diagrams, ER Design issues, Weak entity sets, extended ER features
Unit 3	**Relational Databases:** Relational Model, Structure of Relational databases, fundamental, additional and extended relational algebra operations, Views, DDL statements in SQL, DML statements in SQL, JOINS
Unit 4	**SQL (DDL):** Implementation of Data Definition Language, data types, schema definition,Basic structure of SQL Queries - CREATE, ALTER, DROP, RENAME, TRUNCATE.
Unit 5	**SQL (DML):** DML commands - SELECT, INSERT, DELETE and UPDATE operations, implementation of constraints, implementation of joins, Nested sub queries, Complex queries, Views, Joined relations.
Unit 6	**Relational Languages**: Tuple Relational calculus, Domain relational calculus, Query by Example, Data log, Set Operations – UNION, INTERSECT, EXCEPT, Aggregate Functions, NULL values.
Unit 7	**Relational Database Design:** Features, Atomic Domains and first normal form, Functional dependency theory decomposition using functional dependencies, decomposition using Multi-valued dependencies, more normal forms, database design process.
Unit 8	**Transaction Management:** Concept of Transaction, Transaction State, Implementation of atomicity and durability, concurrent execution, Serializability, Recoverability, Implementation of Isolation, testing for Serializability.
Unit 9	**Concurrency Control:** Lock based protocols, Timestamp based protocols, Validation based protocols, Deadlock handling, Insert and Delete operations, Weak levels of consistency.
Unit 10	**SQL (DCL/TCL):** implementation of GRANT, REVOKE, ROLLBACK, COMMIT, SAVEPOINT, implementation of aggregate functions, implementation of inbuilt character functions, implementation of inbuilt numeric functions, implementation of inbuilt date & time functions
Unit 11	**Recovery system:** Failure classification, storage structure, recovery and atomicity, log - based recovery, recovery with concurrent transactions, buffer management, failure with loss of non-volatile storage.

Unit 12	**Distributed Databases:** Distributed Databases, Data Fragmentation, Replication and Allocation Techniques, Semi Join, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions
Unit 13	**Cloud-Based Databases:** From collaborative to the Cloud – A short history, Introduction to Client – Server Computing, Peer-to-Peer Computing, Distributed Computing, Grid Computing, Collaborative Computing, Cloud Computing. Functioning of Cloud Computing, Differences between Distributed computing and Cloud computing.
Unit 14	**Introduction to PL/SQL**: introduction to PL/SQL blocks, conditional statements, loops, cursors and triggers.

LABORATORY WORK:

SQL (DDL): Implementation of Data Definition Language, data types, schema definition, Basic structure of SQL Queries- CREATE, ALTER, DROP, RENAME, TRUNCATE.

SQL (DML): DML commands - SELECT, INSERT, DELETE and UPDATE operations, implementation of constraints, implementation of joins, Nested sub queries, Complex queries, Views, Joined relations.

SQL (DCL/TCL): implementation of GRANT, REVOKE, ROLLBACK, COMMIT

READINGS:

1. H.F. KORTH & A. SILBERSCHATZ, DATABASE SYSTEM CONCEPTS, TATA MC-GRAW HILL, NEW DELHI, YEAR 2006
2. IVAN BAYROSS, SQL, PL/SQL THE PROGRAMMING LANGUAGE OF ORACLE, BPB PUBLICATION.
3. ELMASRI & NAVATHE, FUNDAMENTALS OF DATABASE SYSTEMS, ADDISON & WEISELY, NEW DELHI.
4. C. J. DATE, DATABASE SYSTEMS, PRENTICE HALL OF INDIA, NEW DELHI.
5. P. BHATIA & G. SINGH, SIMPLIFIED APPROACH TO DBMS, KALYANI PUBLISHERS.
6. MARTIN GRUBER, UNDERSTANDING SQL, BPB PUBLICATION, NEW DELHI.
7. VAL OCCARDI, RELATIONAL DATABASE: THEORY & PRACTICE, BPB PUBLICATION, NEW DELHI.

Course code	DECAP615	Course Title	PROGRAMMING IN JAVA

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Learn the structure and model of the Java programming language

CO2: Understand the accessibility of fields and methods of an object through String and String Builder classes

CO3: Develop applications in Java programming language to solve problems

CO4: Evaluate user requirements for software functionality and assess its implementation in java

CO5: Implement Lambda functions.

CO6: Demonstrate object serialization with file handling and exception handling to overcome run-time errors

Unit No.	Contents
Unit 1	**Introduction:** Introduction to basic java concepts, JDK, JRE, JVM, wrapper classes, inner and nested classes
Unit 2	**Arrays and Strings:** working with arrays and strings, String, String Buffer and String Builder classes, access specifies, inheritance
Unit3	**Collection Framework:** Array List class, List Iterator interface, Linked list class, Tree Setclass, Priority Queue class
Unit 4	**More on Collection Framework:** Comparable and Comparator, Properties class, Lambda expressions
Unit 5	**Multithreading:** implementing multithreading, life cycle of a thread, thread communication
Unit 6	**More on Multithreading**: suspending, resuming, deadlock and stopping threads
Unit 7	**Synchronization:** thread synchronization, handling exceptions during multithreading.
Unit 8	**Swings:** JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class.
Unit 9	**More on Swings:** JColorChooser class, JProgressBar class, JSlider class
Unit 10	**Layouts**: layout manager, Border Layout, Grid Layout, Flow Layout, Box Layout, Card Layout
Unit 11	**Managing data using JDBC**: introduction to JDBC, Connectivity with database, CRUD operations, Connection interface
Unit 12	**More on JDBC:** Statement interface, Result Set interface, Prepared Statement, Result Set Meta Data and Database Metadata.
Unit 13	**Network Programming:** Java network terminology, socket classes, server socket classes
Unit 14	**More on Network Programming**: URL class, URL connection class, Datagram Socketclass, Java socket programming

Laboratory Work:

Implementation of JAVA Programming Concepts (Classes and objects, constructor, function overloading, inheritance, working with files, exception handling and multithreading, JDBC, network programming)

READINGS:

1. JAVA: The Complete Reference By Herbert Schildt, Mcgraw Hill Education
2. Intro to Java Programming (Comprehensive Version) by Y. Daniel Liang, Pearson Publication
3. Programming with JAVA by E. Balagurusamy, Mc Graw Hill publication

Course code	DECAP770	Course Title	ADVANCED DATA STRUCTURES

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Perceive advanced data structures and perform operations on them

CO2: Understand abstract data types and algorithmic complexity

CO3: Apply suitable data structure for solving problems

CO4: Implement hashing and collision resolution techniques

CO5: Evaluate the performance of various algorithms

Unit No.	Contents
Unit 1	**Introduction:** need of data structures and algorithms, time and space complexity of algorithms, asymptotic notations, average and worst-case analysis,
Unit 2	**Arrays vs linked lists**: operations on arrays and linked lists.
Unit 3	**Stacks:** implementation of stacks, applications of stacks: quick sort, parenthesis checker, arithmetic expression conversion and evaluation, tower of Hanoi problem, role of stack in recursion,
Unit 4	**Queues**: implementation of queues, priority queue, applications of queues
Unit 5	**Search trees:** binary search trees: searching, insertion and deletion operations
Unit 6	**Tree data structure 1**: Avl trees: balancing operations, b-trees: properties and operations,
Unit 7	**Tree data structure 2:** red-black trees. splay trees: properties and operations, 2-3 trees: properties and operations
Unit 8	**Heaps:** introduction to heaps, min heap, max heap, operations on heap, applications of heap: priority queue implementation
Unit 9	**More on heaps**: heap sort, binomial heaps, Fibonacci heaps
Unit 10	**Graphs:** type of graphs, adjacency matrix and linked adjacency chains, connected components and spanning trees
Unit 11	**More on Graphs:** breadth first search, depth first search, network flow problems, warshall's algorithm for shortest path, topological sort
Unit 12	**Hashing techniques:** linear list representation, hash table representation, hash functions
Unit 13	**collision resolution:** separate chaining, open addressing-linear probing, quadratic probing
Unit 14	**More on hashing:** double hashing, rehashing

LABORATORY WORK

Arrays vs linked lists: operations on arrays and linked lists.

Stacks: implementation of stacks, applications of stacks: quick sort, parenthesis checker, arithmetic expression conversion and evaluation, tower of Hanoi problem, role of stack in recursion,

Queues: implementation of queues, priority queue, applications of queues

Search trees: binary search trees: searching, insertion and deletion operations

Tree data structure 1: Avl trees: balancing operations, b-trees: properties and operations,
Tree data structure 2: red-black trees. splay trees: properties and operations, 2-3 trees: properties and operations.

READINGS:

1. DATA STRUCTURES AND ALGORITHMS IN C++ by ADAM DROZDEK, THOMSON EDUCATIONAL PUBLISHING
2. DATA STRUCTURES AND ALGORITHM ANALYSIS IN C by MARK ALLEN WEISS, ADDISON-WESLEY
3. DATA STRUCTURES AND ALGORITHMS by AHO, HOPCRAFT, ULLMAN, PEARSON
4. INTRODUCTION TO ALGORITHMS by CORMEN, THOMAS H., LEISERSON, CHARLES E., RIVEST, RONALD L., STEIN, CLIFFORD, PHI Learning Pvt Ltd

Course code	DECAP456	Course Title	INTRODUCTION TO BIG DATA

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Analyze the need and importance of fundamental concepts and principles of Big Data

CO2: Apply internal functioning of different modules of Big Data and Hadoop

CO3: Evaluate the big data ecosystem and appreciate its key components

Unit No.	Contents
Unit- 1	**Introduction to Big Data:** Big Data and its importance, The V's of Big Data, Challenges and Applications of Big Data, Tools used in Big Data Scenario.
Unit- 2	**Foundations for Big Data:** Distributed file system, scalable computing over internet, programming models for big data.
Unit- 3	**Data Models:** Data model vs. data format, data stream, understanding data lakes, exploring streaming sensor data.
Unit- 4	**NOSQL Data Management:** Introduction to NoSQL, aggregate data models, aggregates key-value and document data models relationships, graph databases, schema less databases, materialized views, distribution models, sharding, version, Map reduce partitioning and combining, composing map-reduce calculations.
Unit- 5	**Introduction to Hadoop:** Understand what Hadoop is, learning about other open source software related to Hadoop, understand how Big Data solutions can work on the Cloud, Hadoop - Big Data Overview, Hadoop - Big Data Solutions.
Unit- 6	**Hadoop Administration:** Hadoop - Environment Setup, Hadoop - HDFS Overview, Starting HDFS, Hadoop - Command Reference.
Unit- 7	**Hadoop Architecture:** Understand the main Hadoop components, learn how HDFS works, List data access patterns for which HDFS is designed, describe how data isstored in an HDFS cluster.
Unit- 8	**Hadoop Master Slave Architecture:** Hadoop – Map Reduce, Hadoop – Streaming, Hadoop – Multi Node Cluster, Creating User Account, Configuring Key Based Login, Installing Hadoop and Configuring Hadoop on Master Server.
Unit- 9	**Hadoop Node Commands:** Configuring Master Node, Configuring Slave Node, Format Name Node on Hadoop Master, Starting Hadoop Services, Adding a New Data Node in the Hadoop Cluster, Adding User and SSH Access.
Unit- 10	**Map Reduce Applications:** Map Reduce workflows – unit tests with MR Unit – test data and local tests, anatomy of Map Reduce job run, classic Map-reduce, YARN failures in classic Map-reduce and YARN job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats.

Unit- 11	**Hadoop Ecosystem:** Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and Zookeeper, IBM Info Sphere Big Insights and Streams.
Unit- 12	**Predictive Analytics:** Simple linear regression - Multiple linear regression- Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and applications
Unit- 13	**Data Analytics with R:** Machine Learning, Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Big Data Analytics with Big R**.**
Unit- 14	**Big data management using SPLUNK:** data integration process, Big Data Management and Processing using Datameer, Installing Splunk Enterprise on Windows, Installing Splunk Enterprise on LINUX, Exploring Splunk Queries**.**

READINGS:

1. BIG DATA by ANIL MAHESHWARI, MC GRAW HILL
2. UNDERSTANDING BIG DATA: ANALYTICS FOR ENTERPRISE CLASS HADOOP AND STREAMING DATA byGEORGE LAPIS, CHRIS EATON, TOM DEUTSCH, PAUL ZIKOPOULOS, DIRK DEROOS, MC GRAW HILL.
3. BIG DATA AND ANALYTICS by SEEMA ACHARYA, SUBHASHINI CHELLAPPAN, WILEY

Course Code	DECAP470	Course Title	CLOUD COMPUTING

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Apply the fundamental concepts in data centers to understand the tradeoffs in power,efficiency and cost.

CO2: Identify resource management fundamentals i.e. resource abstraction, sharing andsandboxing and outline their role in managing infrastructure in cloud computing.

CO3: Analyze various cloud programming models and apply them to solve problems on thecloud.

Unit No.	Content
Unit-1	**Cloud computing introduction**: cloud computing fundamentals, history of cloudcomputing, cloud components, usage scenarios and applications
Unit-2	**Cloud computing architecture and models:** why cloud computing matters,issues in cloud, cloud architecture, cloud storage, NIST cloud computing reference model, cloud cube model.
Unit-3	**Cloud services**: types of cloud services, service providers, software as a service, platform as a service, infrastructure as a service, database as a service, monitoring as a service, communication as services.
Unit-4	**Introduction to big data:** big data, hadoop framework, introduction to mapreduce, phases of mapreduce,
Unit-5	**File system in cloud:** google file system, architecture of google file system, operations of google file system, hadoop distributed file system, architecture of hdfs, operations of hdfs, comparison of gfs and hdfs.
Unit-6	**Collaborating using google cloud:** create word documents in collaboration, collaborating on spreadsheets, collaborating using google forms, storing and sharing files.
Unit-7	**Collaborating on event management:** collaborating on calendars, schedules and task management, creation of to-do lists, Collaborating on Contact Management.
Unit-8	**Collaborating on Project Management:** Project Management, project management tools, management of project using a cloud-based project-management tool.
Unit-9	**Collaborating on Databases:** understanding databases, working of databases,working of online databases, exploring web-based databases, evaluating online databases.
Unit-10	**Collaborate using web-based communication:** web-based communication tools, web mail services, instant messaging tools, web conferencing tools, social networks and groupware, blogs and wikis.
Unit-11	**Virtualization concepts:** need for virtualization, types of virtualizations, features of virtualization, working of virtualization in cloud, pros and cons of virtualization.
Unit-12	**Virtual machine:** virtual machine properties, interpretation and binary translation, hypervisors, types of hypervisors, HLL VM: Xen, KVM, VMware, virtual box, hyper-V.
Unit-13	**Security and standards in Cloud:** security in clouds, security challenges, the open cloud consortium, the distributed management task force, standards for application developers, standards for messaging, standards for security

Unit-14	**Application of cloud computing**: end user access to cloud computing, application of cloud service in various areas of life, mobile internet devices and the cloud

Text Books:

1. CLOUD COMPUTING: "A PRACTICAL APPROACH by ANTOHY T VELTE, MC GRAW HILL

References:

1. CLOUD COMPUTING FOR DUMMIES by BLOOR R., KANFMAN M., HALPER F. JUDITH HURWITZ,WILEY
2. CLOUD COMPUTING: IMPLEMENTATION, MANAGEMENT

Course code	DEMTH403	Course Title	MATHEMATICAL FOUNDATION FOR COMPUTERSCIENCE

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Recall formal logical arguments of propositional logic.

CO2: Perceive problem solving through the basics of combinatorics.

CO3: Compare the basic discrete structures and algorithms.

CO4: Apply the concepts of trees to find the shortest path.

CO5: Infer properties of graphs and be able to relate these to practical examples.

CO6: Formulate and prove theorems about trees, connectivity, colouring and planar graphs.

Unit No.	Contents
Unit- 1	Introduction, conjunction, disjunction & negation, propositions and truth table,Tautologies and contradictions, equivalence of formulas, duality law.
Unit- 2	Predicates, the statement function, variables and quantifiers, predicate formulas, Methods of proof (Inference Theory).
Unit- 3	Partially Ordered Sets, External elements of POSET, HASSE Diagrams of POSETS, Well-Ordered Sets, Lattices, Bounded Lattices, Distributive Lattices,
Unit- 4	Introduction to Boolean algebra, Basic Definitions, Duality, Basic Theorems, Boolean Algebras as Lattices
Unit- 5	Introduction, Basic Counting Principles, Mathematical Functions, Permutations
Unit- 6	Combinations, the Pigeonhole Principle
Unit- 7	Terminology and special types of graphs, graph isomorphism
Unit- 8	Paths, cycles and connectivity
Unit- 9	Euler and Hamilton path and graphs
Unit- 10	shortest path problems, planner graphs
Unit- 11	graph coloring, chromatic number of graphs
Unit- 12	tree and its properties, rooted tree
Unit- 13	spanning and minimum spanning tree, binary search tree
Unit- 14	infix, prefix, and post-fix notation, pre-order traversal, in-order traversal, and post-order traversal

READINGS:

1. DISCRETE MATHEMATICS AND ITS APPLICATIONS by KENNETH H ROSEN., M.G. Hills
2. DISCRETE MATHEMATICS (SCHAUM'S OUTLINES) (SIE) by SEYMOUR LIPSCHUTZ, MARC LIPSON, VARSHA H. PATIL, MCGRAW HILL EDUCATION

Course code	DECAP472	Course Title	WEB TECHNOLOGIES

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Understand the website layout creation using HTML language.

CO2: Apply the website planning, management and maintenance techniques

CO3: Apply dynamic website creation using JavaScript and Query

CO4: Illustrate logic implementation on a web page

CO5: Understand how to manage versatile data on a web page

Unit No.	Contents
Unit- 1	**Overview of HTML:** structure of HTML page, working with tags and attributes, working with list and inline elements, implementing tables and forms
Unit- 2	**DHTML with CSS**: concepts of selectors, formatting tags with css, responsive layout designing using css flexbox
Unit- 3	**Introduction to Bootstrap**: introduction to bootstrap, associating bootstrap with mobile web interfaces
Unit- 4	**Using the framework**: starter template, bootstrap theme, bootstrap - grids, bootstrap - jumbotron, bootstrap - narrow jumbotron
Unit- 5	**Navbars in action**: bootstrap - navbar, bootstrap - static top navbar, bootstrap - fixed navbar
Unit- 6	**Custom components**: bootstrap - cover, carousel, blog, dashboard, sign-in page, justified nav, sticky footer, sticky footer with navbar
Unit- 7	**Introduction to ReactJS**: reactjs architecture, reactjs and web development
Unit- 8	**Pure React concepts**: setting up webpage using react and react dom, constructing elements with data, concept of dom rendering, working with factories in react
Unit- 9	**Using React with JSX**: defining react elements using jsx, concept of transpiling and babel, working with recipes and webpack
Unit- 10	**State management and component tree in ReactJS**: validating properties with react, managing data using state in react, using component tree to manage state
Unit- 11	**Working with React router and server:** web page management by incorporating react router, data driven web applications and router parameters, react based server rendering, react based server communication
Unit- 12	**Components in detail:** stateful vs stateless components, creating class-based components, more about set State() method, Passing props to class-based components, passing functionas props
Unit- 13	**Styling components:** Introduction to CSS modules, creating mobile responsive components
Unit- 14	**Functional programming with Javascript:** programming constructs in javascript, introduction to es6 class, components of es6 class

LABORATORY WORK:

1. Program to implement basic concepts of HTML.
2. Program to implement CSS3.
3. Program to implement the box model and positioning properties in CSS3.
4. Program to implement basics of bootstrap.
5. Program to implement the basics of JavaScript.
6. Program to implement Objects in JavaScript.
7. Program to implement Arrays in JavaScript.
8. Program to implement Functions in JavaScript.
9. Program to build web applications in JavaScript.
10. Program to implement the concept of Dynamic views in JavaScript.

READINGS:

1. HTML & CSS: The Complete Reference, By Thomas A. Powell, Mc Graw Hill

Course code	DECAP776	Course Title	PROGRAMMING IN PYTHON

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Understand the basic structure and features of Python programming

CO2: Interpret object-oriented programming concepts such as encapsulation, inheritance and polymorphism as implemented in Python

CO3: Apply pandas and NumPy for data analysis

CO4: Implement machine learning algorithms

CO5: Analyze real-life situation specific problems and perceive solutions

CO6: Build exploratory data analysis and visualizations

Unit No.	Contents
Unit- 1	**Python basics:** introduction, data types and operators, control statements, functions
Unit- 2	**Python data structures:** strings, lists, sets, tuples and dictionaries
Unit- 3	**OOP concepts:** OOP features, encapsulation, inheritance
Unit- 4	**More on OOP concepts:** function overloading, operator overloading and method overriding,
Unit- 5	**Exception handling**: catching exceptions, catching multiple exceptions, raising exceptions, custom exception
Unit- 6	**Introduction to NumPy**: arrays vs lists, array creation routines, arrays from existing data, indexing and slicing
Unit- 7	**Operations on NumPy arrays**: array manipulation, broadcasting, binary operators
Unit- 8	**NumPy functions**: mathematical functions, statistical functions, sort, search and counting functions
Unit- 9	**Handling data with pandas**: introduction to pandas, series, data frame, sorting, working with csv files, operations using data frame
Unit- 10	**Data cleanup:** investigation, matching and formatting
Unit- 11	**Data visualization:** introduction to matplotlib, line plot, multiple subplots in one figure, bar chart, histogram, box and whisker plot, scatter plot, pie charts
Unit- 12	**Data visualization:** introduction to seaborne, seaborne Vs matplotlib, data **visualization** using seaborne
Unit- 13	**Machine learning:** introduction, types of machine learning
Unit- 14	**Machine learning algorithms:** linear regression, k-nearest neighbors, decision trees, random forests, k-means clustering

LABORATORY WORK:

Implementation of Python programming concepts (control statements, functions, strings, lists, sets, tuples, dictionaries, OOP concepts, exception handling, NumPy arrays and functions, pandas, data visualization, machine learning algorithms)

READINGS:

1. Programming and Problem Solving with Python by Ashok Kamthane, Amit Ashok kamthane, McGraw Hill 2nd Edition
2. Hands-On Data Analysis with NumPy and Pandas by Curtis Mille, Kindle Edition
3. Python for Data Analysis by Wes McKinney, O'Reilly Media
4. Machine Learning for Absolute Beginners by Oliver Theobald, Kindle Edition

Course Code	DECAP790	Course Title	PROBABILITY AND STATISTICS

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Experiment to carry out simple data investigations for categorical variables. They interpret and compare data displays. Students conduct chance experiments, list possible outcomes and recognize variations in results.

CO2: Measure a random variable that describe randomness or an uncertainty in certain realisticsituation

CO3: Employ the different types of data and choose an appropriate way to display them.

CO4: Identify and compare techniques for collecting data from primary and secondary sources and identify questions and issues involving different data types

Unit No.	Content
Unit-1	**Introduction to probability:** Elements of Set Theory, Sample Space and Probability Measure, Statistical Independence, Conditional Probability, Counting Sample Points, Mutually and pair wise independent events, multiplication theorem of probability for independent events, Baye's theorem.
Unit-2	**Introduction to statistics and data analysis:** Statistical Inference, Samples, Populations and Experimental Design, Measures of Location: The Sample Mean and Median, Measures of Variability, Discrete and Continuous Data, Statistical Modeling, Scientific Inspection, and Graphical Diagnostics, Graphical Methods and Data Description, General Types of Statistical Studies.
Unit-3	**Mathematical expectations:** Definition, expected value of random variable, expected value of function of a random variable, properties of expectations, Various measures of Central Tendency, Dispersion, skewness and Kurtosis for continuous probability distribution, continuous distribution function, Variance, Properties of variance, covariance.
Unit-4	**Moments:** Chebyshev Inequality, Moments of Two or More Random Variables, Moments of Sums of Random Variables, Moment Generating Function, Properties of moment generating function, cumulants, Raw and central moments.
Unit-5	**Relation between moments:** raw moments & central moments, Effect of change of origin and scale on moments, Pearsonian coefficients Measures of skewness, kurtosis.
Unit-6	**Correlation, regression and analysis of variance:** Pearson's Correlation coefficient, Spearman's Rank correlation coefficient, Regression Concepts, Regression lines, Multiple correlation and regression, Analysis of Variance - One-way classification and two-way classification.
Unit-7	**Standard distribution:** Binomial, Poisson, Negative Binomial Distribution, Normal Distribution and their properties
Unit-8	**Statistical quality control:** Introduction, Process control, control charts for variables – X and R, X and S charts control, charts for attributes: p chart, np chart, c chart and their applications in process control
Unit-9	**Index numbers:** Learn about the need of index numbers, explain the different methods of constructing index numbers, evaluate the tests for judging the soundness of an index number.

Unit-10	**Time series:** Explain about time series, describe components of time series and define measurement of variations of time series.
Unit-11	**Sampling theory:** Sampling Theory, Random Samples and random Numbers, Sampling with and without replacement, sampling distributions, sampling distribution of means, sampling distribution of properties, sampling distribution of differences and sum, standard errors, software demonstration of elementary sampling Theory.
Unit-12	**Hypothesis testing:** Definition of hypothesis, interpret statistical procedure of hypothesis testing, use application of hypothesis testing in several business contexts.
Unit-13	**Tests of significance:** Based On t, F and Z Distributions: Student's (t) distribution, definition, properties, critical value of t, Application of t-distribution, Test for single mean, t-test for difference of mean, Fischer Z - transformation, F-statistic, critical value of F distribution, application.
Unit-14	**Statistical tools and techniques:** Bayesian Concepts, Bayesian Inferences, Bayes Estimates Using Decision Theory Framework, Statistical Tools: Excel, R-Studio and SPSS.

READINGS:

1. FUNDAMENTALS OF MATHEMATICAL STATISTICS by S.C. GUPTA AND V. K. KAPOOR, SULTAN CHAND & SONS (P) LTD.
2. PROBABILITY & STATISTICS FOR ENGINEERS & SCIENTISTS by RONALD E. WALPOLE ,PEARSON

Course Code	DECAP774	Course Title	STYLING AND SCRIPTING FOR WEB DEVELOPMENT

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes: Through this course students should be able to

- Describe concepts of HTML and HTML5
- Discuss scripting capabilities of JavaScript with advanced CSS and HTML5 elements to makefull-fledged web application
- Develop capabilities of web page designing by adding dynamic and attractive elements
- Differentiate between HTML CSS and JavaScript

Unit No.	Content
Unit-1	**Introduction of HTML:** HTML introduction, HTML editors, HTML basics, elements, attributes, headings, paragraphs, formatting, links, head
Unit-2	**HTML Forms and Frames:** Images, tables, lists, blocks, layouts, forms, Iframes,
Unit-3	**HTML Colors and XHTML:** Color, color names, color values, entities, URL encode, quick list, XHTML
Unit-4	**Introduction of HTML5:** new elements in HTML5, canvas, SVG, drag / drop, geo-location, video, audio, input types, form elements, form attributes.
Unit-5	**Advanced HTML5:** Semantic, web-storage, app cache, web workers, SSE
Unit-6	**Introduction of CSS, box model and advanced CSS:** basic, home, introduction,syntax, id & class, backgrounds, text, fonts, links, lists, tables box model, border, outline, margin, padding
Unit-7	**Advanced CSS:** Grouping and nesting, dimension, display, positioning, floating, align, pseudo-class, pseudo-element,
Unit-8	**Images and Media types in Advanced CSS:** Navigation bar, image gallery, imageopacity, image sprites, media types
Unit-9	**Introduction of JavaScript, basic elements and JavaScript objects:** what is JavaScript, understanding events, external JavaScript comment, variable, globalvariable, data types, operators, if statement, switch, loop: for and while,
Unit-10	**Functions and Arrays in Java Script:** Introduction to functions, types of functions JavaScript objects, JavaScript array
Unit-11	**Java Script Events and Validations: -** Introduction to events, types of events, javascript validations, validation types and expressions.
Unit-12	**JavaScript:** Browser object model: Browser objects, Window object, Document object, get Element By Id, get Elements By Name, get Elements By Tag Name, innerHTML property, inner Text property
Unit-13	**JavaScript**: validation and Menu-Builder: form validation, email validation Menu-Builder. Bootstrap
Unit-14	**Bootstrap:** Introduction to Bootstrap and Bootstrap Components

PRACTICALS:

1. Basic concepts of HTML such as elements, formatting, images, tables, links etc.
2. HTML5 components such as canvas, form, drag / drop etc.
3. The CSS concepts in id and class, backgrounds, lists, tables, fonts etc.
4. CSS box Model including Box Model, Border, Outline, Margin, Padding and few concepts of advanced CSS
5. Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attribute Selectors, Introduction, Borders, Backgrounds, Gradients, Text Effects, Fonts
6. The basic concepts of JavaScript
7. The Objects and Browser Object Model components in JavaScript such as array, browser, window, document etc.
8. Validation of forms and validation of emails
9. The menu bars and bootstraps in JavaScript

Text Books:

TML & CSS: THE COMPLETE REFERENCE by THOMAS A. POWELL, Tata McGraw Hill, India

References:

WEB ENABLE COMMERCIAL APPLICATION DEVELOPMENT USING HTML, DHTML, JAVASCRIPT, PERL, CGI by IVAN BAYROSS, Tata McGraw Hill, India.

Course Code	DECAP792	Course Title	DATA SCIENCE TOOL BOX

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Observe the various methods to extract knowledge using data mining techniques

CO2: Evaluate current trends in data mining such as web mining, spatial-temporal mining.

CO3: Apply different data mining methodologies with information systems.

CO4: Analyze research of database systems and able to improve the decision-making process

CO5: Understand Big Data Concepts

CO6: Define Need of Big Data Analytics in Real World

CO7: Develop Interest in The Area of Hadoop Cluster Mechanism

CO8: Apply the Big Data Learning in Research

Unit No.	Content
Unit-1	**Data Science Fundamentals:** What is Data Science? What is Data? The Data Science Process, Need of Data Science, Global requirement of Data Scientist.
Unit-2	**Using Data Science Tool R and RStudio:** Installing R, Installing R Studio, RStudio Tour, R Packages, Projects in R
Unit-3	**Version Control and GitHub:** Version Control, Github and Git, Linking Github and R Studio, Projects under Version Control
Unit-4	**Introduction to Python:** Variables and expressions, conditional execution (loops, branching, and try/except), functions, Python data structures (strings, lists, dictionaries, and tuples), and manipulating files
Unit-5	**Python as Data Visualization:** Introduction to Data Visualization, introduction to Matplotlib, Basic Plotting with Matplotlib, importing Dataset, Line Plot, Area Plots, Histograms Bar Charts, Waffle Charts, Word Clouds
Unit-6	**Introduction to Rapid Miner:** Downloading and Installation of Rapid Miner, Introduction to different modules of Rapid miner interface, working with different sample data in Rapid miner, Working with different sample process in Rapid miner
Unit-7	**Introduction to operators in RapidMiner:** Introduction to various operators in RapidMiner, working with different data processing operators, Using various filters. Statistical. Analysis of sample data.
Unit-8	**Introduction to Big Data:** Understanding big data concepts and terminology datasets data analysis data analytics descriptive analytics, diagnostic analytics, predictive analytics, prescriptive analytics business intelligence (BI) ,key performance indicators (KPI) big data characteristics volume, velocity ,variety veracity value different types of data :structured data ,unstructured data ,semi- structured data ,metadata case study background history identifying data characteristics volume velocity variety veracity.
Unit-9	**Business Motivations and Drivers for Big Data Adoption:** Business Motivations and Drivers for Big Data Adoption: marketplace dynamics business architecture business process management information and communications technology data analytics and data science

	digitization affordable technology and commodity hardware social media hyper-connected communities and devices cloud computing internet of everything (IoE) case study example
Unit-10	**Introduction to WEKA mining tools:** Introduction to WEKA tool, importing data into Rapid miner using different formats of files, Storing and retrieving data using rapid miner.
Unit-11	**Data Import and Export in Rapid Miner:** Graphical representation of data in rapid miner, Hands on practice problems on data import/export. Identification and removal of duplicates, apply operations for handling meta data like rename or attribute role definition, Identify and remove the missing values in the data set
Unit-12	**Data Pre-processing using rapid miner:** Apriori method for finding frequent itemset WEKA/Rapid miner tool Apply data mining pre-processing techniques and methods to large data sets, Hands on practice problems on data pre-processing
Unit-13	**Introduction to classification:** Introduction to Classification methods, applying model for prediction, Bayesian Classification on new imported data, Bayesian Classification on existed dummy data set, Decision Tree classification on both new and dummy data sets
Unit-14	**Introduction to clustering:** Introduction to Clustering algorithms, differentiate clustering and classification, K-means clustering, Hierarchical clustering algorithm

READINGS:

1. INTERNATIONAL BANKING BY P. SUBRAMANIAN, MACMILLAN
2. INTERNATIONAL BANKING OPERATIONS by B. Y. OLKAR, A. K. TRIVEDI, A. K.PATWARDHAN, A. R. PAWSE, MACMILLAN

Course Code	DECAP777	Course Title	WEB DEVELOPMENT USING PHP

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Develop dynamic web pages using php

CO2: Apply database concepts for effectively manage data using server site script

CO3: Apply the different aspects of server site and client site scripts

CO4: Apply the parsing technique to read data from other sources

Unit No.	Content
Unit-1	**Introduction with Language Basics**: brief introduction to php, lexical structures in php, data types and variables in php.
Unit-2	Control flow and loops in php, embedding php in web pages.
Unit-3	Global and Super global variables in php.
Unit-4	Functions in PHP: understanding built in functions of php, defining and calling user defined functions in php, managing parameters in user defined functions, user defined functions with return values.
Unit-5	variable functions and anonymous functions in php.
Unit-6	Arrays in PHP: different types of arrays supported by php, storing data in arrays, array functions in php, traversing arrays, converting between arrays and variables, sorting arrays in php.
Unit-7	Working with Databases in PHP: using php to access database, performing database operations using mysqli.
Unit-8	Advanced database techniques and database validation techniques.
Unit-9	Working with Graphics in PHP: embedding an image in web page using php, creating and drawing images.
Unit-10	Working with Graphics in PHP: images with text, scaling images, color handling of images using php.
Unit-11	Working with PDF in PHP: pdf extensions available in php, pdf documents and pages, putting text in pdf pages using php.
Unit-12	Working with PDF in PHP: inserting images and graphics in pdf with php, navigation in pdf pages using php.
Unit-13	Working with XML in PHP: Generating xml in php, parsing xml with simple xml, parsing xml with xslt.
Unit-14	File Upload and File Permissions: Files access and uploads using php, file permissions in php.

PRACTICALS:

1. Basics of PHP programming language such as data types, operators.
2. Control flow statements like if-else,for loop, while loop, do while loop and switch statements.
3. super globals.
4. Implementing functions in php, built in functions, user defined functions, parameters, return values.
5. variable functions and anonymous functions.
6. Implementation of array in php, types of arrays, storing data, array functions, traversing arrays, converting between arrays and variables, sorting arrays.
7. Databases Connectivity, accessing database, database operations.
8. Advanced database techniques.
9. Implementing graphics and pdf in php, embedding images, creating and drawing images.
10. Images with text, scaling images, color handling, pdf extensions, pdf documents and pages, putting text in pdf pages.
11. Inserting images and graphics in pdf, navigation in pdf pages.
12. Implementing XML and file upload, generating xml, parsing xml with simple xml, parsing xml with xslt.
13. Files access and uploads, file permissions

Text Books:

1. PROGRAMMING PHP by RASMUS LERDORF, KEVIN TATROE, O'REILLY

READINGS:

1. WEB TECHNOLOGIES BLACK BOOK by KOGENT LEARNING SOLUTIONS INC, DREAMTECH PRES

Course Code	DECAP794	Course Title	ADVANCE DATA VISUALISATION

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes

CO1: Discuss the terminology used in Tableau Prep.
CO2: Identify how Tableau Prep approaches data sampling.
CO3: Construct and understand data prep flows that address common scenarios encountered in data preparation, as applied to common data use cases.
CO4: Review the quality of the data and perform exploratory analysis.
CO5: Manage and Connect Data Source.

Unit No.	Content
Unit-1	**Introduction to Data Visualization**: Acquiring and Visualizing Data, Simultaneous acquisition and visualization, Applications of Data Visualization, Keys factors of Data Visualization. Reading Data from Standard text files (.txt, .csv, XML), Displaying JSON content.
Unit-2	**Making charts interactive and animated**: Data joins, updates and exits, interactive buttons, updating charts, adding transactions, using keys, wrapping the update phase in a function, adding a Play button to the page, Making the Play button go, Allow the user to interrupt the play, sequence.
Unit-3	**Managing, organizing and enhancing data:** Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization
Unit-4	**Creation of Hierarchies:** Create hierarchies to drill down into data, creating groups for data, Creating and Using Sets Create data filters, create calculated fields, Combine data sources using data blending, Creating & using Parameters, Bringing in More data with Joins
Unit-5	**Chart types and their usage in tableau:** Defining data and their different visualization ways, Building various charts, Visualizing data using Bar Chart, Lines Charts, Scatter plots, Heat maps, Histograms, Maps, Dual Axis, Charts, Pie Charts.
Unit-6	**Visualization data with advanced analytics:** Polygon Maps, Bump Charts, Control charts, Funnel charts, Pareto charts, Waterfall charts, Usage and filtration of data with charts, Visualizing categorical data, Visualizing time series data, Visualizing multiple variables, Visualizing geospatial data, Map box integrations, Web Mapping Services, Background Images
Unit-7	**Interactive dashboards and story points in tableau:** Creating a dashboard, Designing dashboard, Add motions, Adding interactivity with actions, Dashboard layout and formatting, Add extra detail to visualization using Marks Shelf, Add Size, Shape, Labels, Details, Tool tips in visualization, Sharing and collaborating dashboards.
Unit-8	**Story Points** and how to create them, Designing effective slide presentations to showcase data story, Publish online business dashboards with Tableau, Exporting Pdfs, Sharing Dashboard Securely
Unit-9	**Introduction:** Installation of TABLEAU, Tableau Interface, Data Types, Tableau features **Tableau Data Sources:** Connecting data with tableau, Joining data sources, Combine data sources using data blending, Creating and Using Sets Create data filters, Creating & using Parameters, Bringing in More data with Joins

Unit-10	**Managing, organizing and enhancing data in tableau:** Splitting data, Pivoting & Transforming data, Blue & green pills Filters, Blue & green pills effect on dates, Cleaning data by Bulk Re-aliasing, Setting data defaults, Create hierarchies to drill down into data, Creating groups for data, Create calculated fields
Unit-11	**Sharing your Work**: Tableau data source, Tableau data extract, Tableau workbook, Tableau packaged workbook.
Unit-12	**Mathematical and visual analytics in tableau**: Aggregate calculations, Date calculations, Logic calculations, Number calculations, Sting calculations, Type calculations, LOD Expressions, Add reference lines and trend lines
Unit-13	**Interactive dashboards and story points in tableau**: Creating a dashboard, Designing dashboard, Add motions, Adding interactivity with actions, Dashboard layout and formatting, Add extra detail to visualization using Marks Shelf, Add Size, Shape, Labels
Unit-14	**Publishing work:** Sharing and collaborating dashboards, Story Points and how to create them, Designing effective slide presentations to showcase data story, Publish online business dashboards with Tableau, Exporting Pdfs, Sharing Dashboard Securely

READINGS:

1. DESIGNING DATA VISUALIZATIONS: REPRESENTING INFORMATIONAL RELATIONSHIPS by JULIE STEELE, NOAH ILIINSKY, KINDLE EDITION
2. MASTERING PYTHON DATA VISUALIZATION PAPERBACK by KIRTHI RAMAN, PACKT PUBLISHING

Course Code	DECAP784	Course Title	RESPONSIVE WEB DESIGN

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes

CO1: Understand the need of responsive web design

CO2: Employ the HTML5 elements

CO3: Connect CSS to various HTML5 elements

CO4: Weigh media query structure in stylesheets

CO5: Construct responsively for various devices to improve the performance

Unit No.	Content
Unit-1	**Getting started with responsive web design:** understanding the RWD, pros / cons RWD, percentage-based layout for fluid Width CSS,
Unit-2	**Getting started with responsive web design:** start with a pixel width layout and convert to percent, use and work with equation width= the target/context formula
Unit-3	**HTML5 structure for website:** overview of html structure, CSS resets and html5, html for container
Unit-4	**HTML5 structure for website:** header, navigation, html for four column content area, html for two column footer
Unit-5	**Using CSS:** writing CSS for navigation bar and logo, building CSS for navigation and its element, formatting header
Unit-6	**Using CSS:** formatting header and images in columns, formatting footer
Unit-7	**Creating responsive websites with media query and images:** media query structure, using media queries in stylesheet links
Unit-8	**Creating responsive websites with media query and images**: media breakpoints, design ranges, using media queries, optimizing images, responsive images, image file formats
Unit-9	**Adding media queries to fluid layout:** build a media query for 600 px width, make the navigation bar fill the width of the device, centre and shrink the logo, adjust the text alignment of the header
Unit-10	**Adding media queries to fluid layout:** adjust the footer content to fill the width, hide the paragraph content in the four columns, adjust the navigation content to make it more visible on a small device
Unit-11	**Working responsively:** mobile and beyond: content before layout, responsive design tools, user experience
Unit-12	**Working responsively:** mobile and beyond: device-agnostic design, focusing on mobile first
Unit-13	**Creating responsive websites to improve performance:** performance as design, web pages loading and rendering, measuring performance
Unit-14	**Creating responsive websites to improve performance**: cleaning up your code, minimizing http requests, conditionally loading content, reflows and repaints

Text Books:

1. LEARNING RESPONSIVE WEB DESIGN: A BEGINNER'S GUIDE by PETERSON C, O'REILLY

READINGS:

1. RESPONSIVE WEB DESIGN BY EXAMPLE by FRAHAAN HUSSAIN, PACKT PUBLISHING

Course Code	DECAP737	Course Title	MACHINE LEARNING

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course outcomes:

CO1: Apply python libraries for data analysis and machine learning model development.

CO2: Evaluate important features from a given dataset.

CO3: Apply machine learning models for real world problems.

CO4: Evaluate the performances of different machine learning models.

Unit No.	Contents
Unit- 1	**Introduction to Machine Learning:** History of Machine Learning, Basic definitions, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Issues in machine learning, Different Applications of Machine learning.
Unit- 2	**Python Basics:** Introduction to Python, Jupiter Notebook, Python packages for data Science.
Unit- 3	**Data Pre-processing:** Introduction to Data Analysis, Importing and Exporting Data in python, Data wrangling, Exploratory Data Analysis.
Unit- 4	**Pre-processing Implementation in python**
Unit- 5	**Regression:** Simple Linear Regression, Multiple Linear Regression, Non-Linear Regression, A mathematical formulation of Regression models, Model Evaluation in Regression Models.
Unit- 6	**Regression Implementation:** Implementation and performance analysis of Linear Regression, Multi Regression, Non-Linear Regression
Unit- 7	**Classification**: Classification Problems, Decision Boundaries, K-Nearest Neighbours, Decision Trees, Building Decision Tree, Training and Visualizing a Decision Tree.
Unit- 8	**Classification Algorithms:** Logistic Regression, Support Vector Machine, Margin, Kernel function and Kernel SVM.
Unit- 9	**Classification Implementation:** Implementation and performance analysis of KNN, SVM and Logistic Regression
Unit- 10	**Clustering:** Introduction, K-Means Algorithm, A mathematical formulation of the K-Means algorithm, Hierarchal Clustering.
Unit- 11	**Ensemble methods:** Bagging, random forests, boosting.
Unit- 12	**Clustering Implementation:** Implementation and performance analysis of k-Means and Hierarchal Clustering, Implement and compare any two ensemble-based machine learning approaches on different datasets.
Unit- 13	**Neural network:** Biological Structure of a Neuron, Perceptron, multilayer networks and back propagation, introduction to deep neural Networks, Evaluation Metrics of machine learning models.
Unit- 14	**Neural network Implementation:** Design of an Artificial Neural Network for given dataset, Implement and compare the performances of any three-machine learning based classification models on different datasets

LABORATORY WORK:

Implementation of machine learning concepts (Data Analysis, Importing and Exporting Data in python, Data wrangling, Exploratory Data Analysis, Simple Linear Regression, Multiple Linear Regression, Non-Linear Regression, K-Nearest Neighbours, Decision Trees, Logistic Regression, Support Vector Machine, Margin, Kernel function and Kernel SVM, K-Means Algorithm, Bagging, random forests, boosting)

READINGS:

1. Applied Machine Learning by Madan Gopal (2018), McGraw Hill Education, India
2. Machine Learning by Tom Mitchell (2017), McGraw Hill Education, India
3. Principles of Soft Computing by S. N. Sivanandam and S. N. Deepa (2018), Wiley, India

Course Code	DECAP785	Course Title	WEB PERFORMANCE OPTIMIZATION

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course outcomes:

CO1: Understand how to increase web performance.

CO2: Analyse websites for higher conversions.

CO3: Evaluate the performance of web resources.

CO4: Construct websites for better user engagement and user retention.

Unit No.	Content
Unit-1	**Introduction to Web Performance Optimization:** inside http, support for virtual hosting, caching, rendering, persistent Vs. keep-alive connections, parallel downloading
Unit-2	**Utilizing Client-Side Caching:** types of caching, controlling caching, dealing with intermediate caches, caching http responses, dns caching and prefetching
Unit-3	**Content Compression:** compression methods, transfer encoding, compressing PHP-generated pages, compressing other resources
Unit-4	**Reducing Size with Minification:** javascript minification, css minification, html magnification
Unit-5	**Jscript, DOM and Ajax:** javascript, jscript and ecmascript, the document object model, getting the most from javascript, ajax
Unit-6	**Optimizing PHP:** extensions and compiling, opcode caching, compiling PHP, sessions, profiling with xhprof
Unit-7	**Working with Web Servers:** apache, looking beyond apache, multiserver setups with nginx and apache, load balancers
Unit-8	**Tuning MySQL:** looking inside mysql, understanding the storage engines, tuning mysql, tuning myisam
Unit-9	**Tuning Innodb :** tuning innodb, working with the query cache, optimizing sql
Unit-10	**MySQL in the Network:** using replication, partitioning, sharding, complementing mysql, alternatives to mysql Utilizing
Unit-11	**NoSQL Solutions:** nosql flavors, memcache, mongodb, other nosql technologies
Unit-12	**Optimizing Web Graphics:** various image formats, optimizing images
Unit-13	**Optimizing CSS:** css sprites, css performance
Unit-14	**Working with SSL:** ssl caching, ssl termination and endpoints, sending intermediate certificates, determining key sizes, selecting cipher suites, investing in hardware acceleration, the future of ssl

Text Books

1. HIGH PERFORMANCE WEB SITES by STEVE SOUDERS, O'REILLY

References:

1. WEB PERFORMANCE DAYBOOK by STOYAN STEFANOV, O'REILLY

Course Code	DEPEA515	Course Title	ANALYTICAL SKILLS-I

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course Outcomes:

CO1: Observe the basic concepts of reasoning and quantitative aptitude

CO2: Apply the learned concepts to solve the company specific reasoning and quantitative aptitude tests

CO3: Analyze the problem and use logic to interpret and handle different situations

CO4: Understand the concepts to solve the problems in given time

CO5: Reproduce the concepts and use it to solve the applications

CO6: Evaluate the knowledge by cracking online tests

Unit No.	Content
Unit-1	**Number system**: classification of numbers, rules of divisibility, multiplication and squaring of numbers, HCF & LCM of numbers, cyclicity of unit digit, remainder theorem
Unit-2	**Average:** average of numbers, arithmetic mean, weighted average
Unit-3	**Mathematical operations** : BODMAS rule, calculation based problem, conversion of symbols into signs
Unit-4	**Percentage** : commodity price increase/decrease, comparison based questions, population based examples, successive percent changes, budget based problems
Unit-5	**Profit and loss** : cost price, selling price, profit and loss, calculation of profit/loss percent, false weight, discount, successive discount, marked price
Unit-6	**Direction sense test** : understanding of directions, different types of practice problems
Unit-7	**Blood relation** : cracking jumbled up descriptions, relation puzzle, coded relations
Unit-8	**Number, ranking and time sequence** : number test, ranking test, time sequence test
Unit-9	**Ratio and proportion** : ratio and its types, proportion and its types, direct and indirect variations, partnership
Unit-10	**Allegation or mixture** : concept and rules of allegation, problem based on mixing of liquids/items
Unit-11	**Problem on ages and numbers**: problems on ages, problem on numbers
Unit-12	**Permutation and combination**: factorial, difference between permutation & combinations, circular permutation, arrangement and selection-based problems, distribution and division **Probability**: experiment, sample space, event, probability of occurrence of an event, bayes theorem, odds of an event, selection-based problems, binomial distribution
Unit-13	**Logical Venn diagram and set theory**: Venn diagram based problems, concept of set theory **Syllogism**: all, some and none relations, related statements with Venn diagram
Unit-14	**Data interpretation**: basics of data interpretation, average and percentage, tabulation, bar graphs, pie charts, line graphs

READINGS:

1. QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS by DR. R S AGGARWAL, S Chand Publishing
2. A MODERN APPROACH TO VERBAL & NON-VERBAL REASONING by DR. R S AGGARWAL, S Chand Publishing
3. MAGICAL BOOK ON QUICKER MATHS by M TYRA, BANKING SERVICE CHRONICLE
4. ANALYTICAL REASONING by M.K. PANDEY, BANKING SERVICE CHRONICLE

Course Code	DEPEA516	Course Title	ANALYTICAL SKILLS-II

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course outcomes:

CO1: Apply logical reasoning to understand, interpret and handle different situations.
CO2: Solve efficiently the company specific logical reasoning tests.
CO3: Apply logical reasoning to prioritize and manage time.
CO4: Decide to build the logic.
CO5: Examine the problem and handle it.
CO6: Apply the logics.

Unit No.	Content
Unit 1	**Time and Work:** chain rule, computation of work done together, men,women, children-based problems, wages-based work problems, alternate day work
Unit 2	**Pipes and Cisterns:** inlet-outlet, part of tank filled, time-based problems, alternate work
Unit 3	**Time and Distance:** concept of time speed and distance, conversion ofUnits, average speed concept, different types of problems
Unit 4	**Problem on trains:** relative speed concept, faster and slower train Boats and streams and races: downstream and upstream, linear and circular track
Unit 5	**Sequence and series completion**: series completion, analogy, classification, arithmetic and geometric progression
Unit 6	**Alphabet test and logical sequence of words:** alphabetical order ofwords, letter-word problems, rule detection, alphabetical quibble, word formation by unscrambling letters, word formation using Letters of agiven word, alpha-numeric sequence puzzle, logical sequence of words
Unit 7	**Coding-Decoding:** letter coding, number/symbol coding, substitution, matrix coding, mixed letter coding, mixed number coding
Unit 8	**Simple interest:** basics of principal, rate and time, rate computation,time computation, amount computation
Unit 9	**Compound interest:** concept of simple and compound interest,questions based on relation between compound and simple interest
Unit 10	**Calendar:** calculating odd days, basic concept of calendar, finding theexact day
Unit 11	**Clocks:** concept of clock, angle computation, facts Insert the missing character: set of figures, set of arrangements, set of matrix
Unit 12	**Data sufficiency:** check sufficiency of data to answer the given questions, Coding inequalities: basic operations, rules of inequalities, coded relations
Unit 13	**Puzzle test:** seating/placing arrangements, comparison type questions, sequential order of things, family-based problems
Unit 14	**Non-Verbal Reasoning:** series of figures, analogy of figures, classification of figures

READINGS:

1. QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS by DR. R S AGGARWAL, SChand Publishing
2. A MODERN APPROACH TO VERBAL & NON-VERBAL REASONING by DR. R S AGGARWAL, S Chand Publishing
3. MAGICAL BOOK ON QUICKER MATHS by M TYRA, BANKING SERVICE CHRONICLE
4. ANALYTICAL REASONING by M.K. PANDEY, BANKING SERVICE CHRONICLE

Course Code	DECAP538	Course Title	ALGORITHM DESIGN AND ANALYSIS

WEIGHTAGE		
CA	ETE(Th.)	ETE (Pr.)
30	40	30

Course outcomes:

CO1: Differentiate between a range of authentic academic texts

CO2: Observe actively to lectures, presentations and interviews to understand key information

CO3: Construct a variety of essays and other assignments

CO4: Appraise academic grammar

CO5: Apply academic English and vocabulary in professional life

Unit No.	Content
Unit-1	**Introduction:** elementary data structures, basic computational models, analysis of algorithms: best case, average case and worst-case behaviour, asymptotic notations: big O notation, recursion, recurrence relations to analyse recursive algorithms
Unit-2	**Divide and conquer:** general method, binary search, merge sort, quick sort, and arithmetic with large integers.
Unit-3	**Greedy method**: General Method, Knapsack problem, Minimal Spanning Trees - Prim's and Kruskal's algorithm, single source shortest paths
Unit-4	**Dynamic programming**: general method, chained matrix multiplication, optimal storage on tapes
Unit-5	**More on Dynamic programming**: all-pairs shortest paths, optimal binary search trees
Unit-6	**Backtracking:** general method, the 8-queens problem, graph coloring, Hamiltonian cycles
Unit-7	**Branch and bound:** general method, 0/1 knapsack problem, travelling salesperson
Unit-8	**Pattern matching:** design of algorithms for pattern matching problems: brute force, knuth-morris-pratt, boyer moore algorithms
Unit-9	Huffman coding and data compression problems
Unit-10	**Lower bound theory**: comparison tree, oracles and adversary arguments
Unit-11	**More on lower bound theory**: lower bounds through reductions
Unit-12	**Approximation:** approximation basics, task scheduling, bin packing
Unit-13	**Intractable problems**: basic concepts, non-deterministic algorithms, NP completeness
Unit-14	**More on intractable problems**: examples of NP-hard and NP-complete problems, cook's theorem, problem reduction

LABORATORY WORK:

Implementation of algorithm design and analysis concepts (Divide and conquer, greedy method, dynamic programming, back tracking, branch and bound, pattern matching, lower bound theory, intractable problems)

READINGS:

1. Fundamentals of computer algorithms by E. Horowitz and S. Sahani, Galgotia publications
2. Design and analysis of algorithms by Himanshu B. Dave, Pearson
3. Design & analysis of algorithms by R.C.T. Lee, Mcgraw Hill Education
4. Design and analysis of computer algorithms by John E. Hopcroft, Addison-Wesley

Course Code	DECAP951	Course Title	SOFTWARE PROJECT MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course outcomes:

CO1: Apply python libraries for data analysis and machine learning model development

CO2: Evaluate important features from a given dataset

CO3: Apply machine learning models for real world problems

CO4: Evaluate the performances of different machine learning models

Unit No.	Contents
Unit- 1	**Introduction to Software Project Management**: what is project? software project vs. other types, activities by software project mgt. plans, methods and methodologies, problems with software projects
Unit- 2	**Step Wise Project Planning**: project scope, objectives, infrastructure, characteristics, effort estimation, risk identification.
Unit- 3	**Program Management & Project Evaluation**: meaning, managing allocation of resources, creating program, individual projects, technical assessment, cost benefit analysis & risk evaluation
Unit- 4	**Project Approach:** intro, technical plan, choice of process models: waterfall, v-process, spiral, Prototyping, incremental delivery
Unit- 5	**Effort Estimation:** meaning, problems with estimation, basis, estimation techniques, Albrecht function point analysis, functions mark ii, COCOMO Model
Unit- 6	**Activity Planning:** objectives, project schedule, network planning model, time dimension, identifying critical path
Unit- 7	**Risk Management:** categories of risk, identification. assessment, schedule risk, applying pert technique
Unit- 8	**Resource Allocation:** identifying resource requirements, scheduling resources, publishing the resource schedule & cost schedule, scheduling sequence
Unit- 9	**Monitoring & Control:** creating frameworks, data collection, visualizing progress, cost monitoring, change control
Unit- 10	**Software Quality:** introduction, defining software quality, ISO9126, software measures, product vs. process quality management, external standards
Unit- 11	**Small Projects:** introduction, problems with student projects, content of project plan
Unit- 12	**Software configuration management: SCM,** managing contracts, types of contracts, stages in contract placement, contract management and acceptance
Unit- 13	**People Management**: understanding behavior, organizational behavior, selecting the right person for the job, selecting the right person for the job
Unit- 14	**Organization and team structures**: decision making, leadership, organizational structures, stress health and safety, ISO and CMMI models, overview of project management tools

LABORATORY WORK:

1. Creating an activity schedule for a project.
2. Setting up resources.
3. Assigning resources to tasks.
4. Create a baseline.
5. Track plan by specific date.
6. Track plan as % complete.
7. Viewing critical path in a project.
8. Resolve resource over allocation.
9. Leveling over allocated resources.
10. Checking plan's cost.

READINGS:

1. SOFTWARE PROJECT MANAGEMENT by BOB HUGHES, MIKE COTTERELL, RAJIB MALL, MCGRAW HILL
2. SOFTWARE PROJECT MANAGEMENT IN PRACTICES by PANKAJ JALOTE, PEARSON
3. SOFTWARE PROJECT MANAGEMENT: A UNIFIED FRAMEWORK by WALKER ROYCE, PEARSON

Course Code	DEMGN581	Course Title	ORGANISATIONAL BEHAVIOUR AND HUMAN RESOURCE DYNAMICS

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Enumerate the concept of management practices and organizational behavior

CO2: Develop and sharpen acumen of how different management thoughts can be used to improve organization functioning

CO3: Analyze the importance of management practices and important organizational behavior dimensions at different levels of organization

CO4: Appraise the dynamics of industrial relations and to manage them as per statutory regulations

CO5: Apply human resource management functions to handle emerging issues

Unit No.	Content
Unit-1	**Organizational behavior:** relationship between management and organization behavior, model of OB and contributing disciplines to the OB field **Foundations of individual behavior:** values, attitude and job satisfaction, theories of learning and behavior modification
Unit-2	**Personality:** theories of personality and its assessment, transactional analysis and attribution theory of perception **Emotions:** emotional intelligence and affective events theory of emotion **Motivation:** early and contemporary theories of motivation
Unit-3	**Group dynamics:** group dynamics and its significance, types of groups, formation and stages of group development, group performance factors **Team development:** team formation, its types and difference between group and team
Unit-4	**Organizational conflict and negotiations:** conflict sources, types and levels of conflict, traditional and modern approaches to conflict, resolution of conflict through negotiation **Stress:** sources and consequences of stress, stress management techniques
Unit-5	**Introduction:** External and Internal Forces of environment affecting HRM, Objectives and functions of HRM. **Human Resource Planning:** HRP process, Barriers and Prerequisites for Successful HRP.
Unit-6	**Job Analysis:** Methods of Collecting Job Data, Potential Problems with Job Analysis, Job Design and its approaches, Process of Job Analysis
Unit-7	**Recruitment & Selection:** Meaning, Recruitment process, Recruitment Methods, Challenges in India and Selection Process
Unit-8	**Talent Management:** talent management, talent retention, talent acquisition and sources of talent acquisition **Orientation, induction and placement:** process of orientation, induction and placement programme, Evaluation of Orientation Programme
Unit-9	**Training and Development:** employee training, difference in training and development, methods of training, methods of management development, people capability maturity model
Unit-10	**Career planning and management:** career management, process of career planning, challenges in career planning

Unit-11	**Performance management system:** performance management, performance planning, performance appraisal, potential appraisal, feedback and counselling
Unit-12	**Compensation management:** types and theories of compensation, concept of wages, factors influencing compensation management, incentives and fringe benefits, employee engagement and retention.
Unit-13	**Managing industrial relations:** major actors and their roles in IR, factors influencing IR, approaches to IR, grievance handling procedure
Unit-14	**Industrial Disputes:** industrial disputes, methods of settlement of industrial disputes, trade unions and their challenges in India

READINGS:

1. Organizational Behaviour By Stephen P. Robbins. Timothy A. Judge. Neharika Vohra, Pearson
2. Management by Management By Stephen P. Robbins. Mary Coulter. Neharika Vohra, Pearson
3. Human Resource Management By Dessler, G. And Varkkey, B, Pearson

Course Code	DEMKT503	Course Title	MARKETING MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Analyze and respond to environmental and competitive changes, their impact on marketing planning, strategies and practices

CO2: Apply the conceptual frameworks, theory and techniques to various marketing contexts

CO3: Prepare marketing and sales plan appropriate to the needs of customers and contexts

CO4: Determine strategies for developing new products and services that are consistent with evolving market needs

Unit No.	Content
Unit-1	**Introduction:** market and marketing, definition, nature and scope of marketing, exchange process, functions of marketing, core marketing concepts
Unit-2	**Marketing orientations:** evolution of modern marketing concept, holistic marketing concepts, new marketing orientations selling vs. marketing
Unit-3	**Marketing mix:** 7 P's & 7 C's of Marketing, 4 A's of Marketing, customer quality, value and satisfaction, Michael E. Porters chain analysis model
Unit-4	**Marketing environment**: Significance of scanning marketing environment; Analysis of macro environment of marketing – economic, demographic, socio-cultural, technological, political legal and ecological; Impact of micro and macro environment on marketing decisions
Unit-5	**Consumer behaviour:** buyer behaviour, different consumer roles, need for studying buyer behaviour, different buying motives, consumer buying decision process and influences, consumer vs. business buying behaviour, industrial buying process
Unit-6	**Segmentation decisions**: market segmentation, characteristics of a segment, bases for segmenting a consumer market, levels of market segmentation, factors influencing selection of market segments
Unit-7	**Targeting and positioning:** Benefits of market segmentation; Criteria for effective market segmentation; Target market selection and strategies; Positioning – concept, bases and process
Unit-8	**Product decisions:** concept and classification, layers of products, major product decisions, product-mix, new product development stages, packaging and labelling, product life cycle (PLC) – concept and appropriate strategies adopted at different stages
Unit-9	**Pricing decisions:** pricing – objectives, price sensitivity, factors affecting price of a product, pricing methods and strategies, ethical issues in product and pricing decisions
Unit-10	**Distribution planning:** channels of distribution – concept and importance, different types of distribution middlemen and their functions, selection, motivation and performance appraisal of distribution middlemen
Unit-11	**Distribution decisions:** decisions involved in setting up the channel, channel management strategies, distribution logistics – concept, importance and major logistics decisions, channel integration and systems, ethical issues in distribution decisions

Unit-12	**Distribution decisions:** retailing and wholesaling, types of retail formats, retail theories, retailing strategies, non-Store retailing, wholesaling – nature and importance, types of wholesalers, developments in retailing and wholesaling in Indian perspective
Unit-13	**Promotion decisions:** role of promotion in marketing, promotion mix, integrated marketing communication, concept, communication process and promotion, determining promotion mix, factors influencing promotion mix, developing promotion campaigns, sales promotion, direct marketing, public relations, digital and social media
Unit-14	**Trends in marketing:** service Marketing, e-marketing, green marketing, customer relationship management, rural marketing, other emerging trends, ethical issues in marketing

READINGS:

1. Kotler, P. & Keller, K. L. (2017). Marketing Management. Pearson
2. McCarthy, E. J., Cannon, J. & Perreault, W. (2014). Basic Marketing. McGraw-Hill Education
3. Etzel, M. J., Walker, B. J., Staton, W. J., & Pandit, A. (2010).Marketing Concepts and Cases. Tata McGraw Hill

Course Code	DEFIN542	Course Title	CORPORATE FINANCE

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understanding finance function with respect to its evolution and growth

CO2: Understanding the concept of Time Value of Money and interpreting the results based on calculations.

CO3: Analyzing financing needs of the businesses and designing an optimum capital structure

CO4: Understanding the retention and distribution of profits and impact on business valuation

Unit No.	Content
Unit-1	**Financial Management:** An Overview**,** evolution of finance, the basic goal: creating shareholder value, agency issues, business ethics and social responsibility
Unit-2	**Sources of Finance**: Long term and Short-term sources of finance- Ordinary shares, Preferences shares, redeemable irredeemable debentures, Debt vs. Equity.
Unit-3	**Money Market Instruments:** Treasury Bills, Commercial Papers, Certificate of Deposits, Treasury Management and Treasury Operations in corporate. External Commercial Borrowings, Financing for MSMEs
Unit-4	**Time Value of Money concept:** Compounding and discounting, Future value and Present value, Annuities, Effective interest rates
Unit-5	**Investment Decisions**: Capital Budgeting Decisions, Rationale of Capital Budgeting, Non-Discounting Capital Budgeting Techniques - Payback period, Profitability Index, Accounting Rate of Return
Unit-6	**Investment Decisions**: Discounting Techniques of Capital Budgeting - NPV, IRR, Discounting Payback Period Method, Estimation of Cash Flows, NPV v/s IRR, Risk analysis in Capital Budgeting - Sensitivity Analysis, Certainty Equivalent Approach
Unit-7	**Cost of Capital:** Meaning and Concept, Cost of Debt, Cost of Equity, Cost of Retained Earnings, Calculation of WACC, International Dimensions in Cost of Capital
Unit-8	**Financing Decisions**: Capital Structure, Theories and Value of the firm - Net Income Approach, Net Operating Income Approach, Traditional Approach, Modigliani Miller Model, Determining the optimal Capital Structure, Checklist for Capital Structure Decisions, Costs of Bankruptcy and Financial Distress.
Unit-9	**EBIT-EPS Analysis:** Concept of Leverage, Types of Leverage: Operating Leverage, Financial Leverage, Combined Leverage.
Unit-10	**Dividend Decisions:** Factors determining Dividend Policy, Theories of Dividend Gordon Model, Walter Model, MM Hypothesis
Unit-11	**Forms of Dividend:** Cash Dividend, Bonus Shares, Stock Split, Stock Repurchase, Dividend Policies in practice.
Unit-12	**Working Capital Management:** Working Capital Policies, Risk-Return trade-off, Cash management, Receivables management

Unit-13	**Corporate Governance:** Value-based Corporate culture, Disclosures, transparency and accountability, Corporate Governance and Human Resource Management, Evaluation of performance of board of directors, Succession planning, Public sector undertakings and corporate governance, Insider trading, Lessons from corporate failure
Unit-14	**Economic outlook and Business Valuation:** Impact of changing business environment on corporate valuation, climate change and corporate valuation, Business sustainability and corporate valuation, Role of environmental, social, and governance (ESG) factors in corporate valuation

READINGS:

1. FUNDAMENTALS OF CORPORATE FINANCE by JONATHAN BERK, PETER De MARZO & JARRED HARDFORD, PEARSON
2. CORPORATE FINANCE by STEPHEN A. ROSS, RANDOLPH W. WESTERFIELD & JEFFREY JAFFE, McGRAW HILL

Course Code	DEGEN530	Course Title	FUNDAMENTAL OF RESEARCH

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Develop research aptitude and get in-depth understanding of various methods of research.

CO2: Identify the appropriate research problem and conduct research in an effective way.

CO3: Understand indexing systems of various journals.

CO4: Apply ethics of research in writing research paper and dissertation thesis.

CO5: Understand basics of intellectual property rights.

Unit No.	Contents
Unit- 1	Basics of research, meaning of research, objectives of research, motivations in research, types of Research
Unit- 2	Research approaches, significance of research, research process, criteria of good research, concept of theory: deductive and inductive theory
Unit- 3	Literature survey and research gap identification, problem identification as per industrial and societal needs, potential and thrust areas, difference between scientific literature and advocacy literature
Unit- 4	Hypothesis, qualities of a good hypothesis, null hypothesis and alternative hypothesis, use of databases, search engines and research gateways, framing of timeline/Gantt chart
Unit- 5	Types and classification of journals, journal indexing, role of indexing in defining the quality of journal
Unit- 6	Journal citation indices, h-index, h5-index, h5-median, g index, i-10 index, almetrics, JIF, JIF percentile, cite score, SJR, SNIP and Eigen factor
Unit- 7	Research paper review process, citation, self-citation, funding agencies, Manupatra, academic social networks, Google scholar, academia research gate etc
Unit- 8	Objectivity and subjectivity in research, integrity, carefulness, openness, respect for intellectual property, confidentiality, social responsibility, competence, legality and informed consent
Unit- 9	Definition of Plagiarism, use of turn tin / ithenticate software, role of referencing / bibliography in handling plagiarism, penalties and consequences, University Grants Commission's (UGC) policy for curbing plagiarism
Unit- 10	Research writing including research paper, research proposal, review writing, thesis writing, Microsoft word (grammar checking, formatting of documents, incorporating references), reference styles
Unit- 11	Poster preparation, coherence of the ideas, use of theory, Microsoft power point (creation of posters, slides for seminar/talk)
Unit- 12	Introduction to intellectual property rights concept and theories kinds of intellectual property rights, introduction to patents, patent act 1970 – amendments of 1999, 2000, 2002 and 2005
Unit- 13	Copyright and neighboring rights concept and principles, historical development of the concept of trademark and trademark law-National and International
Unit- 14	International regime relating to IPR TRIPS and other Treaties (WIPO, WTO, GATTS)

READINGS:

1. RESEARCH DESIGN QUALITATIVE, QUANTITATIVE, AND MIXED METHODS APPROACHES by JOHN W. CRESWELL, SAGE PUBLICATIONS

Course Code	DEMKT509	Course Title	CONSUMER BEHAVIOR

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the implications of consumer behavior concepts & theories for businesses and wider society.

CO2: Discern how individuals and groups influence consumer behavior, and how marketers utilize this knowledge to help achieve organizational objectives.

CO3: Analyze the dynamic interplay of internal and external factors influencing consumer behavior and accordingly develop a marketing strategy.

CO4: Articulate practical and comprehensive managerial understanding of consumer behavior.

CO5: Develop the understanding of marketing regulation, consumer protection act and contemporary issues in consumer behavior.

Unit	Content
Unit- 1	**Consumer Behavior and Marketing strategy**: consumer behaviour, market strategy and applications of consumer behavior.
Unit- 2	**Market Analysis and Consumer Decisions:** market analysis components, segmentation strategy and consumer decisions and consumer behavior models.
Unit- 3	**Culture and Group influence**: cultural and group influence on consumer behavior, concept of culture, cross cultural marketing strategy, the household life cycle and marketing strategy.
Unit- 4	**Groups, Reference Group and Diffusion of Innovation**: groups, types of groups, reference group influence on consumption process & marketing strategies and diffusion of innovation.
Unit- 5	Perception: perception, exposure, attention and interpretation, perception and marketing strategy.
Unit- 6	**Learning and Personality:** memory's role in learning, learning theories, brand image and product positioning, brand equity and brand leverage motivation, personality and emotion.
Unit- 7	**Motivation and Emotion**: motivation theory and marketing strategy use of personality in marketing practice, emotions and marketing strategy.
Unit- 8	**Attitude and Market Segmentation**: attitude, influencing attitude, attitude components and change strategies, market segmentation and product development strategies based on attitudes.
Unit- 9	**Self-Concept and Consumer Decisions**: nature of lifestyle, the VALS system consumer decision process and types of consumer decisions.
Unit- 10	**Consumer Decision Making Process** : process of problem recognition and uncontrollable determinants of problem recognition, marketing strategy and problem recognition, information, alternative evaluation and selection, types and sources of information, consumer decision making and evaluation criteria.
Unit- 11	**Decision Rules and Attributes of consumers:** decision rules for attitude based choices, attributes affecting retail outlet selection, consumer characteristics and outlet choice, in-store and online influence on brand choice and evaluation criteria.

Unit- 12	**Post purchase Processes and Dissonance**: post purchase processes, post purchase dissonance, product use and non-use, disposition.
Unit- 13	**Purchase Evaluation and Customer Satisfaction**: purchase evaluation, customer satisfaction, dissatisfaction responses, repeat purchase and customer commitment.
Unit- 14	**Consumer Behavior and Marketing Regulation**: regulation and marketing to children, regulation and marketing to adults, consumer protection act and contemporary issues in consumer behavior.

READINGS:

1. CONSUMER BEHAVIOR- BUILDING MARKETING STARTEGY by DEL I HAWKINS, DAVID L MOTHERSBAUGH, & AMIT MOOKERJEE, MCGRAW HILL EDUCATION
2. CONSUMER BEHAVIOR by KUMAR, S. R. , SCHIFFMAN, L.G. , WISENBLIT J., PEARSON
3. CONSUMER BEHAVIOR by RAJNEESH KRISHNA, OXFORD UNIVERSITY PRESS.
4. SCHIFFMAN, L. G., &KANUK, L. L. CONSUMER BEHAVIOR. NEW DELHI, PRENTICE HALL.

Course Code	DEFIN548	Course Title	INTERNATIONAL FINANCIAL MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the critical financial issues of international firms and international investors in present scenario.

CO2: Analyze the framework of exchange rates and foreign exchange exposures and forces affecting exchange rates.

CO3: Evaluate the international capital structure and international capital budgeting mechanism of multinational corporations.

CO4: Analyze the different modes of raising finance in international market and significance of international finance in MNCs.

Unit No.	Content
Unit-1	**Introduction to International Financial management:** Domestic vs. international finance, International financial market integration, currency crisis, and global recession and risk spill over
Unit-2	Balance of Payments - Structure - Contents of Current, Capital, and Reserve Accounts –Linkages and Impact on Exchange Rates, Capital Markets, & Economy - Understanding BOP structure of a country for Investment and Raising Finance
Unit-3	**Foreign Exchange Markets and Exchange Rate Mathematics**: Nature, Functions, Transactions, Participants, Forex Markets in India, Forex dealing, Foreign exchange regimes, Foreign exchange rate determination, factors affecting foreign exchange
Unit-4	**Forecasting Foreign Exchange Rate:** Exchange Rate Forecasting– Purchasing Power Parity, Covered and Uncovered Interest Rate Parity – International Fisher's Effect - Forward Rate Parity–Influence of these parity relationships on Exchange Rates
Unit-5	**Foreign Exchange Spot and Derivative Market**: Spot and Forward Contracts- Cash and Spot Forex Trading, Forward Contracts- Long and Short Forward contract, Foreign Exchange Futures Contract- Contract specification trading at National Stock Exchange of India
Unit-6	**Management of Foreign Exchange Risk:** Foreign Exchange Exposure: Risk, Measurement and Management: Global Firms Foreign exchange exposure - Transaction, economic and translation exposures, potential currency exposure impact on global firms and investor performance
Unit-7	**International Capital Markets** - Sources of International Finance - Debt and Equity Markets – International Equity Diversification, Short-term Vs Long-term Finance – Export Import Finance
Unit-8	**Capital Structure of the Multinational Firm:** International Capital Structure – Parent Vs Subsidiary Norms, Global Capital Structure – Factors affecting the choice of markets and structure. International Cost of Capital – Calculation – Cost of Foreign Debt, Cost of Foreign Equity, Use of International CAPM
Unit-9	**Capital Budgeting of the Multinational Firm:** International Capital Budgeting – Key Issues – Unique Cash flows – Adjusted Present Value Approach. Foreign Direct Investment – Motives – Determinants – International Portfolio Diversification.

Unit-10	**Working Capital Management of the Multinational Firm:** International Working Capital Management – International Cash Management – Decentralized Centralized Cash Management – Bilateral Vs Multilateral Netting – Central Cash Pool
Unit-11	**Option Contracts** American and European Currency Options, call and Put option, Option and risk management strategies. Introduction to currency swap, Foreign exchange risk management strategies through Forward contracts, future contracts, money market hedges, and options contracts.
Unit-12	**Managing Foreign Operations**: ADRs; benefits and costs of ADR holdings for investors; benefits and costs of ADR issuance for corporations, External Commercial Borrowing and International refinancing, issues and challenges before multinational subsidiaries
Unit-13	**Multinational Cash management**: Centralized perspective of Cash Flow Analysis, Techniques to Optimize Cash Flow- Leading and Lagging, Netting, Matching.
Unit-14	**Country Risk Analysis-** Nature of Country Risk Assessment, Techniques to assess Country Risk, Raters of Country Risk, Multinational Capital Budgeting: Problems and issues in Foreign Investment Analysis, Techniques of Multinational Capital Budgeting- NPV, IRR, APV

READINGS:

1. Shapiro, A.C. (2013). Multinational Financial Management. (10thed.). John, Inc.
2. Buckley, A. (2009). Multinational Finance. (5thed.). Pearson Education.
3. Levi, M.D. (2018). International Finance. (6th ed.). Routledge Publications
4. Madura, J. (2018). International Financial Management. (13thed.). Cengage Learning India Pvt Ltd.

Course Code	DEGEN531	Course Title	RESEARCH METHODS AND DESIGN

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the basic functions of MS-Excel

CO2: Discuss the fundamentals of statistics used in research and development

CO3: Identify research techniques and their use in research

CO4: Classify statistical methods in context of descriptive and inferential statistics

CO5: Understand the various sampling and probability distribution

CO6: Formulate and test hypothesis based on the nature of the research problem

Unit No.	Content
Unit-1	Basic introduction to sheets/workbook-cell, row, columns, basic operations, use of all excel options and add-ins.
Unit-2	Tabulation and graphical Presentation: Discrete data, continuous data and frequency distributions.
Unit-3	Graphs and their presentation, diagrammatic and graphical representation of data: bar diagram, pie-chart, line chart, histogram, frequency polygon and Ogive curves.
Unit-4	Introduction to types of data-Qualitative, Quantitative, Ordinal
Unit-5	Measures of Central Tendency: Arithmetic Mean, Average Median and its importance, Characteristics of an ideal average
Unit-6	Measures of Concept of Central Tendency- Mean, Median, Mode Correlation and Regression Analysis
Unit-7	Linear Bivariate Regression, Correlation - Concept, Important
Unit-8	Methods - Scatter Diagram, Karl Pearson Coefficient of Correlation, Spearman's Rank Correlation.
Unit-9	Sampling and sampling Distribution: introduction to sampling, types of sampling: random and non-random sampling,
Unit-10	Design of Experiments, introduction to sampling distributions
Unit-11	Probability: Definition and its concept, Addition Theorem, Multiplicative Theorem
Unit-12	Probability Distribution: Concept of probability distribution, Binomial Distribution, Normal Distribution
Unit-13	Estimation: introduction, basic concept of point estimation and interval estimation, Hypothesis, Null and Alternate Hypothesis, Types of errors - Type I and Type II, Hypothesis Testing and Concept of confidence interval: Introduction,
Unit-14	Importance and Types of Hypothesis, Hypothesis testing: t test, z test, chi-square, test of independence and goodness of fit(chi-square), one-way Analysis of Variance (ANOVA one way).

READINGS:

1. BUSINESS STATISTICS by J K SHARMA, VIKAS PUBLISHING HOUSE
2. RESEARCH METHODOLOGY: METHODS AND TECHNIQUES by C.R. KOTHARI AND GAURAV GARG, NEW AGE INTERNATIONAL
3. FUNDAMENTALS OF MATHEMATICAL STATISTICS by S C GUPTA, SULTAN CHAND & SONS (P) LTD.
4. STATISTICAL METHODS by S P GUPTA, S CHAND PUBLISHING

Course Code	DEMKT505	Course Title	DIGITAL AND SOCIAL MEDIA MARKETING

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Define social media marketing goal setting necessary to achieve successful online campaigns.

CO2: Describe the stages of the social media marketing strategy development process.

CO3: Develop effective social media marketing strategies for various types of industries.

CO4: Devise an integrated social media marketing strategy using a variety of services, tools and platforms to accomplish marketing objectives.

CO5: Analyze the progress in achieving social media goals with a variety of powerful measurement tools, services, and metrics.

Unit No.	Contents
Unit- 1	**Evolution of digital marketing**- the digital consumer & communities online and digital marketing landscape
Unit- 2	**Search Engine Marketing**- Pay Per Click (PPC) and online advertising, search engine optimization and search engine marketing
Unit- 3	**Social media and consumer engagement**: Social feedback cycle, social web and engagement, operations and marketing connection
Unit- 4	**Customer engagement** -affiliate marketing & strategic partnerships-Email Marketing-Content strategies.
Unit- 5	**New role of the customer**: social interactions, customer relationships, outreach and influencer relations.
Unit- 6	**Social listening:** importance of social analytics, know your influencers, web analytics, and business analytics
Unit- 7	**Mobile Marketing:** integrating digital and social and media strategies.
Unit- 8	**Social technology and business decisions:** creation of social business, understanding the conversations, social CRM and decision support.
Unit- 9	**Social CRM:** social CRM and business design and build a social CRM program.
Unit- 10	**Engagement on the social web:** engagement as a customer activity, engagement as a business activity and extend engagement.
Unit- 11	**Social objects:** meaning of social object, build on existing social objects, create new social objects and use of social objects in business.
Unit- 12	**Social graph:** role of social graph, social graphs spread information, use of social graphs in the business and measure the social graphs
Unit- 13	**Social applications:** importance of social applications, social applications drive engagement and planning a social application.
Unit- 14	**Social business ecosystem:** social profiles, social applications, using brand outposts and communities, social ecosystem**.**

READINGS:

1. SOCIAL MEDIA MARKETING by DAVE EVANS AND JAKE MCKEEE, WILEY
2. SOCIAL MEDIA MARKETING: A STRATEGIC APPROACH by MELISSA S. BARKER, DONALD I.BARKER, NICHOLAS F. BORMANN, DEBRA ZAHAY, MARY LOU ROBERTS, CENGAGE LEARNING
3. ADVANCED SOCIAL MEDIA MARKETING: HOW TO LEAD, LAUNCH, AND MANAGE A SUCCESSFUL SOCIAL MEDIA PROGRAM by TOM FUNK, APRESS

Course Code	DEFIN508	Course Title	INTERNATIONAL BANKING AND FOREX MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Understand the dimensions of international banking

CO2: Establish legal and regulatory issues in international banking institutions

CO3: Demonstrate foreign exchange market operations

CO4: Discover the functions of different bodies in Foreign exchange management

CO5: Analyze various management issues in international finance

Unit No.	Content
Unit-1	**International banking:** global trends and developments in international banking, international financial centers, offshore banking units, profitability of international banking operations
Unit-2	**Offshore banking & offshore currency trading;** Factors contributing to the growth of international banking & Eurocurrency trading, regulatory asymmetry
Unit-3	**International finance:** fundamental principles of lending to MNCs, documentation and monitoring
Unit-4	**International credit appraisal:** International credit policy agencies and global capital markets, raising resources, project and infrastructure finance, financing of mergers and acquisitions
Unit-5	**Legal and regulatory aspects:** country risk and bank risk management, international debt management
Unit-6	**International regulatory bodies:** Role of IMF and World Bank in international debt crisis management, anti-money laundering laws
Unit-7	**Foreign exchange business:** Foreign exchange management act (FEMA), foreign exchange management philosophy, different types of exchange rates
Unit-8	**International Financial Markets:** Foreign exchange markets, international money markets, international credit markets, international bond markets & international stock markets; Regulatory asymmetry & its implications; Recycling of petrodollars
Unit-9	**Role of RBI towards FOREX:** RBI and FEDAI role in regulating foreign exchange, rules regarding rate structure, Indian norms
Unit-10	**International trade:** regulations covering international trade, various aspects of international trade, government policies
Unit-11	**International Trade organization:** DGFT and their schemes, customs procedures, banks' role in implementing these policies and schemes, WTO-its impact
Unit-12	**Foreign Exchange Risk Management -** Risk of forex fluctuations, impacts of global milieu, Types of fore risks, strategies for managing the risk, comprising policies, procedures and controls
Unit-13	**Challenges of international Banking:** Bank failure & safety nets, the problem of moral hazard & systemically important financial institutions; Problems in regulating international banking, regulatory arbitrage; BIS & Basel Committee-issues & challenges.

Unit-14	**Contemporary issues:** lessons from recent crisis in international banking crude oil relationship with foreign exchange, countries holding foreign exchange reserves, impact of federal policy decision on forex valuations, India economic crises of early nineties

READINGS:

1. INTERNATIONAL BANKING BY P. SUBRAMANIAN, MACMILLAN
2. INTERNATIONAL BANKING OPERATIONS by B. Y. OLKAR, A. K. TRIVEDI, A. K. PATWARDHAN, A. R. PAWSE, MACMILLAN

Course Code	DEOPR639	Course Title	OPERATIONS MANAGEMENT AND RESEARCH

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Analyze how to optimally utilize the resources.

CO2: Apply the concepts in solving real life problems.

CO3: Adapt different opinions and make correct judgment.

CO4: Select right decision-making tools.

Unit No.	Contents
Unit- 1	**Introduction to Operations Management**: introduction and scope of operation management, production of goods versus delivery of services, product-process matrix
Unit- 2	**Forecasting**: introduction, features and elements of forecasting, forecast based on judgment and opinion, forecast based on time- series data, associative forecasting techniques, concept of forecasting errors
Unit- 3	**Product and service design:** design process, product design, service design
Unit- 4	**Process selection and facility layout**: introduction, process types, product and service profiling, automation, facility layout, line balancing
Unit- 5	**Location planning and analysis**: need and nature of location decisions, factors that affect location decisions, evaluating location alternatives
Unit- 6	**Management of quality**: defining quality-dimensions of quality, determinants of quality, the cost of quality, quality tools, total quality management
Unit- 7	**Quality control**: inspection, control charts for variables (mean and range chart), control charts for attributes (p-chart, c-chart), run test
Unit- 8	**Inventory management**: nature and importance of inventories, inventory counting systems and inventory costs, economic production quantity, quantity discounts, EOQ model
Unit- 9	**Buying and sourcing in e-commerce**: definition e-sourcing and e- buying, typical e-sourcing cycle, barriers to successful e-sourcing deployment and how to overcome them, benefits of e-sourcing
Unit- 10	**Planning**: Aggregate Production Planning; Master Production Schedule and MRP, MRP-II, ERP
Unit- 11	**Maintenance**: Preventive maintenance, Breakdown maintenance, Replacement
Unit- 12	**Supply chain management**: need, elements and benefit of effective SCM, logistics and reverse logistics, requirements and steps for creating an effective supply chain, lean vs. agile supply chains
Unit- 13	**JIT and lean operations**: goals and building blocks of lean systems
Unit- 14	**Emerging issues in operations management**: Sustainable Operations Management, Trends in Operations Management

READINGS:

1. OPERATIONS MANAGEMENT by WILLIAM J STEVENSON, MCGRAW HILL EDUCATION
2. OPERATIONS MANAGEMENT by NORMAN GAITHER, GREGORY FRAZIER, CENGAGE LEARNING

Course Code	DEMKT517	Course Title	CUSTOMER RELATIONSHIP MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Develop an insight and new learning in the area of customer relationship management.

CO2: Identify and respond to customers' needs, expectations and issues to build productive and rewarding relationships with customers.

CO3: Discuss the conceptual foundations of relationship marketing and its implications for further knowledge development in the field of business.

CO4: Develop a conceptual understanding and the knowledge pertaining to practical application for building and managing partnering relationships with customers and suppliers.

CO5: Analyze how CRM is being used in consumer and business markets-implementation, management, benefits, problems and solutions.

Unit No.	Content
Unit-1	**Introduction to CRM:** definition, CRM as a business strategy, elements of CRM, processes and systems, entrance, applications and success of CRM.
Unit-2	**Conceptual Foundations:** evolution and benefits of CRM; building customer relationship and zero customer defection.
Unit-3	**Strategy and Organization of CRM:** customer-supplier relationships, CRM as an integral business strategy and the relationship-oriented organization.
Unit-4	**CRM Marketing Aspects:** customer knowledge, communication and multichannel, the individualized customer proposition and the relationship policy.
Unit-5	**Analytical CRM:** relationship data management, data analyses and data mining, segmentation and selections, retention and cross-sell analyses.
Unit-6	**Operational CRM:** call center management, use of internet, website and applications of direct mail.
Unit-7	**CRM Systems and their Implementation:** CRM systems, implementation of CRM systems, and the future aspects.
Unit-8	**E CRM:** application of e-CRM technologies-emails, websites, chat rooms, forums and other channels.
Unit-9	**CRM Process:** introduction and objectives of a CRM process, an insight into CRM and ECRTA and online CRM.
Unit-10	**Developing CRM Strategy:** role of CRM in business strategy and understanding service quality with regard to CRM.
Unit-11	**CRM Links in E-Business:** E-Commerce and customer relationships on the internet.
Unit-12	**Economics of Customer Relationship Management**: market share Vs customer share orientation, customer life time value and customer profitability.
Unit-13	**CRM Implementation:** choosing the right CRM solution and framework for implementing CRM.
Unit-14	**CRM Application in B2B and B2C Market:** importance of CRM in B2B and B2C market, benefits of B2C and B2B CRM, B2B and B2C application in banking and hospitality sectors.

READINGS:

1. CUSTOMER RELATIONSHIP MANAGMENT by ED PEELEN, Pearson Education India
2. THE CRM HANDBOOK- A BUSINESS GUIDE TO CUSTOMERRELATIONSHIP MANAGEMENT by JILL DYCHE, Pearson Education India.
3. CUSTOMER RELATIONSHIP MANAGEMENT-GETTING IT RIGHT by JUDITH W. KINCAID. Pearson Education India.

Course Code	DEFIN576	Course Title	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

WEIGHTAGE	
CA	ETE(Th.)
30	70

Course Outcomes:

CO1: Assess the characteristics of different Investment alternatives and how to trade in the stock market.

CO2: Apply different valuation models to find the intrinsic value of the shares.

CO3: Use the fundamental and technical analysis to predict the stock price movement.

CO4: Construct, revise and evaluate portfolios of different securities.

Unit No.	Content
Unit-1	**Introduction to Security Analysis**: securities market structure, major Indian stock exchanges, stock exchange players, investment objectives, investment process, investment alternatives, investment alternatives evaluation, and common error in investment process
Unit-2	**Risk and Return**: concept of return, measurement of return, concept of risk, types of risk, measurement of risk
Unit-3	**Equity valuation**: balance sheet valuation, dividend discount model, free cash flow model, earning multiplier approach
Unit-4	**Fixed Income and Other Investment Alternatives**: pricing, yields and risks of investments in fixed income securities, real estate, commodities, other alternative investments, strategies for investments in various investment alternatives
Unit-5	**Efficient Market Hypothesis:** forms of EMH, test for EMH, depository system, depository process and participants, calculation of sensex and nifty, listing of securities
Unit-6	**Fundamental Analysis**: industry analysis, economic analysis, company analysis, introduction to fundamental analysis, financial health
Unit-7	**Technical Analysis:** technical indicators, Dow Theory, fundamental v/s technical analysis, Elliot wave theory, chart patterns
Unit-8	**Portfolio Construction and Management**: portfolio risk, portfolio return, diversification, Markowitz model
Unit-9	**Portfolio Risk and Return Management**: portfolio risk and return with different correlations, efficient frontier, optimal portfolio
Unit-10	**Asset Pricing**: standard capital asset pricing model, capital asset pricing model, arbitrage pricing theory
Unit-11	**Derivative and Regulatory Aspect**: meaning and reasons of derivative trading, types of derivatives, forward, futures and options, regulation of derivative market
Unit-12	**Evaluation of Portfolio Performance**: Sharpe's performance index, Treynor's performance index, Jensen performance index
Unit-13	**Portfolio Revision**: active and passive management, rupee cost averaging, constant rupee plan, constant ratio plan, variable ratio plan
Unit-14	**Contemporary Issues in Investment**: fintech scope and challenges, algo trading issues and development, robo advisors, high frequency trade

READINGS:

1. SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT by K SASIDHARAN & ALEX K MATHEWS, MCGRAW HILL EDUCATION
2. SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT by PUNITHAVATHY PANDIAN, VIKAS PUBLISHING HOUSE