

UNIVERSITY OF MADRAS
MASTER OF COMPUTER APPLICATIONS (MCA) DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Discrete Mathematics		
Core - I Theory	I Year & I Semester	Credit:4	435C1A

Course Objective

- To know the concepts of relations and functions
- To distinguish among different normal forms and quantifiers
- To solve recurrence relations and permutations & combinations
- To know and solve matrices , rank of matrix & characteristic equations
- To study the graphs and its types

Unit I: Relations- Binary Relations-Operations on relations- properties of binary relations in a set – Equivalence relations— Representation of a relation by a matrix -Representation of a relation by a digraph – Functions-Definition and examples-Classification of functions-Composition of functions-Inverse function

Unit II: Mathematical Logic-Logical connectives-Well formed formulas – Truth table of well formed formula –Algebra of proposition – Quine’s method- Normal forms of well formed formulas- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form-Rules of Inference for propositional calculus – Quantifiers-Universal Quantifiers- Existential Quantifiers

Unit III: Recurrence Relations- Formulation - solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. Permutations-Cyclic permutation-Permutations with repetitions- permutations of sets with indistinguishable objects-Combinations- Combinations with repetition

Unit IV: Matrices- special types of matrices-Determinants-Inverse of a square matrix-Cramer’s rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations-characteristic roots and characteristic vectors-Cayley-Hamilton Theorem-problems.

Unit V: Graphs - Connected Graphs - Euler Graphs - Euler line - Hamiltonian circuits and paths - planar graphs - Complete graph - Bipartite graph-Hyper cube graph-Matrix representation of graphs

Text book

1. N.Chandrasekaran and M.Umaparvathi, Discrete Mathematics, PHI Learning Private Limited, New Delhi, 2010.

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Reference Book

1. Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Studentlitteratur AB, 2015.
2. Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill, 2012

Course Outcomes

On the successful completion of the course, students will be able

CO1	To understand the concepts of relations and functions distinguish among normal forms	K2	IO
CO2	To analyze and evaluate the recurrence relations	K4,K5	HO
CO3	To distinguish among various normal forms and predicate calculus	K5	HO
CO4	To solve and know various types of matrices	K1	LO
CO5	To evaluate and solve various types of graphs	K5	HO

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Data Structures and Algorithms		
Core - II Theory	I Year & I Semester	Credit:4	435C1B

Course Objectives:

To get a clear understanding of various ADT structures.

To understand how to implement different ADT structures with real-time scenarios.

To analyze the various data structures with their different implementations.

To get an idea of applying right models based on the problem domain.

To realize, and understand how and where to implement modern data structures with Python language.

Unit I: Abstract Data Types: Introduction-Date Abstract Data Type-Bags-Iterators. Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.

Unit II: Algorithm Analysis: Experimental Studies-Seven Functions-Asymptotic Analysis. Recursion: Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

Unit III: Stacks, Queues, and Deques: Stacks- Queues- Double-Ended Queues Linked. Lists: Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

Unit IV: Priority Queues: Priority Queue Abstract Data Type- Implementing a Priority Queue-Heaps-Sorting with a Priority Queue. Maps, Hash Tables, and Skip Lists: Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.

Unit V: Search Trees: Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. Sorting and Selection: Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection. Graph Algorithms: Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.

Text book:

1. Rance D. Necaie, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011. (Unit – 1)Chapters: 1, 2, 3.
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5)Chapters: 3 to 12, and 14.

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Reference books:

1. Dr. Basant Agarwal; Benjamin Baka, “Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7”, Packt Publishing, 2018.
2. Magnus Lie Hetland, “Python Algorithms: Mastering Basic Algorithms in the Python Language”, Apress, 2014.

Course Outcome:

On the successful completion of the course, students will be able to

CO1	Understand various ADT concepts	K2	LO
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems	K4,K5	HO
CO3	Apply with proper ADT models with problem understanding	K5	HO
CO4	Apply and Analyze right models based on the problem domain	K1	LO
CO5	Evaluate modern data structures with Python language	K5	HO

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

Mapping with Programme Outcomes:

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

L - Low, M- Medium, S - Strong

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Python Programming		
Core - III Theory	I Year & I Semester	Credit:3	435C1C

Course Objectives:

- To acquire programming skills in core Python
- To learn Strings and function
- To develop object oriented skills in Python
- To comprehend various Python Packages
- To develop web applications using Django

Unit I: Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop

Unit II: Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program’s namespace - Higher-Order Functions

Unit III: Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism-Graphical User Interfaces-The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events

Unit IV: Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.

Unit V: Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views

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Text Book:

1. K.A. Lambert, “Fundamentals of Python: first programs”, Second Edition, Cengage Learning, 2018 (Unit - I, II and III)
2. Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Second Edition, Kindle Edition, 2018 (Unit - IV)
3. Antonio Mele, “Django 3 By Example”, Third Edition, 2020 (Unit - V)

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Comprehend the programming skills in python and develop applications using conditional branches and loop	K1-K6
CO2	Create python applications with strings and functions	
CO3	Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism	
CO4	Evaluate the use of Python packages to perform numerical computations and data vizualization	
CO5	Design interactive web applications using Django	

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Data Structures Using Python Lab		
Core - IV Practical - I	I Year & I Semester	Credit:3	435C1D

Course Objectives:

- To understand Stack, Queue and Doubly Linked ADT structures.
- To implement different ADT structures with real-time scenarios.
- To analyze the recursion concepts.
- To apply different sorting and tree techniques.
- To implement modern data structures with Python language.

Implement the following problems using Python 3.4 and above

1. Recursion concepts.
 - i) Linear recursion
 - ii) Binary recursion.
2. Stack ADT.
3. Queue ADT.
4. Doubly Linked List ADT.
5. Heaps using Priority Queues.
6. Merge sort.
7. Quick sort.
8. Binary Search Tree.
9. Minimum Spanning Tree.
10. Depth First Search Tree traversal.

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Course Outcome:

On the successful completion of the course, students will be able to,

CO1	Strong understanding in various ADT concepts	K1-K6
CO2	To become a familiar with implementation of ADT models	
CO3	Apply sort and tree search algorithms	
CO4	Evaluate the different data structure models	
CO5	Learn how to develop ADT for the various real-time problems	

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

Mapping with Programme Outcomes:

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

L - Low, M- Medium, S - Strong

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Title of the Paper	Data Engineering and Management
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Title of the Paper	Database Management Systems		
Core -V Theory	I Year & II Semester	Credit:4	435C2A

OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing - concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

Unit I: Introduction to Database Systems – Relational Model – Structure – Relational Algebra – Null Values – SQL – Set Operation – Views – Advanced SQL – Embedded SQL – Recursive Queries – The Tuple Relational Calculus – Domain Relational Calculus.

Unit II: E-R Model – Constraints – E-R- Diagrams Weak Entity Sets – Reduction to Relational Schemes – Relational Database Design – Features of Relational Design – Automatic Domains and First Normal Form – Decomposition using Functional Dependencies – Multivalued Dependencies – More Normal Forms – Web Interface – Object – Based Databases – Structured Types and inheritance in SQL – Table inheritance – Persistent.

Unit III: Storage and File Structure – RAID – File Organization – Indexing and Hashing – B Tree – B Tree Index files - Static and Dynamic Hashing – Query Processing – Sorting & Join Operators – Query Optimization – Choice of Evaluation Plans.

Unit IV: Transaction Management – Implementation of Atomicity and Durability – Serializability – Recoverability – Concurrency Control – Dead Lock Handling – Recovery System – Buffer Management.

Unit V: Database – System Architecture – Client Server – Architectures – Parallel System – Network Types – Distributed Database – Homogeneous and Hetrogeneous Database – Directory System – Case Study – Oracle – MSSQL Server.

Recommended Text

1. A. Silberschatz, H.F. Korth and S. Sudharshan, 2006, Database System Concepts, 5th Edition, Tata McGraw Hill, New Delhi.

Reference Books

1. J. D. Ullman, 1988, Principles of Database Systems, Galgotia Publishers, New Delhi.
2. C.J. Date, 1985, An Introduction to Database Systems, Third Edition, Narosa, New Delhi.

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3. Elmasri and Navathe, 1999, Fundamentals of Database Systems, Third Edition, Pearson Education, Delhi.
4. C. Ritchie, 2004, Relational Database Principals, 2nd Edition, Thomson, Singapore.

Website and e-Learning Source :

- 1) <http://www.cse.iitb.ac.in/dbms/DataPapers-Local/DBConceptsBook/slide-dir/>

Course Outcomes

Course Outcome	Description	Knowledge Level
CO1	Classify the modern and futuristic database applications based on size and complexity	K1-K6
CO2	Map ER model to Relational model to perform database design effectively	K1-K6
CO3	Write queries using normalization criteria and optimize queries	K1-K6
CO4	Compare and contrast various indexing strategies in different database systems	K1-K6
CO5	Appraise how advanced databases differ from traditional databases.	K1-K6

- 2) K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes:

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

S-Strong

M-Medium

L-Low

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Title of the Paper	Big Data Analytics		
Core - VI Theory	I Year & II Semester	Credit:4	435C2B

Course Objectives

- To introduce big data tools & Information Standard formats.
- To understand the basic concepts of big data.
- To learn Hadoop, HDFS and Map Reduce concepts.
- To teach the importance of NoSQL.
- To explore the big data tools such as Hive, HBase and Pig.

UNIT I: Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools

UNIT II: Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

UNIT III: MongoDB and Mapreduce Programming: MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

UNIT IV: Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

UNIT V: Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

Text Book:

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2015

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Reference Book:

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. (2013)
2. Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, “Hadoop For Dummies”, Wiley Publications, 2014
4. Robert D.Schneider, “Hadoop For Dummies”, John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, “Hadoop In Action”, Dreamtech Publications, 2010

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools.	K1-K6
CO2	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.	K1-K6
CO3	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB.	K1-K6
CO4	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	K1-K6
CO5	To illustrate, develop and review the concepts of PIG database in Hadoop environment.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Computer Networks		
Core - VII Theory	I Year & II Semester	Credit:4	435C2C

Course Objectives

To understand the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions

Explore to describe the internet architecture and its processes associated with the data transfer and to provide the quality of service

To understand technologies and services associated with network protocols along with the challenges of data transfer.

Learners will understand the importance and functioning of Routing Protocols over communication service.

Empower the learners to comprehend and manage the issues associated with IP protocols like data traffic problems, security and mobility.

Unit I: Transmission Control Protocol/Internet Protocol : Fundamental Architecture - Internet Protocol Basics - Routing - Transport-Layer Protocols : Transmission Control Protocol - User Datagram Protocol - Stream Control Transmission Protocol - Real-Time Transport Protocol.

Unit II: Internet Architecture: Internet Exchange Point - History of Internet Exchange Points - Internet Service Provider Interconnection Relationships - Peering and Transit - IP Routing Protocols: Overview of Routing Protocols - Routing Information Protocol - Open Shortest Path First - Border Gateway Protocol - Multiprotocol Label Switching.

Unit III: IP Quality Of Service : Introduction - Quality of Service in IP Version 4 - Integrated Services - Differentiated Services - Quality of Service with Nested Differentiated Services Levels - IP Multicast and Anycast: Addressing - Multicast Routing - Routing Protocols – Anycasting- IPv6 Anycast Routing Protocol: Protocol Independent Anycast—Sparse Mode - Transport over Packet: Draft-Martini Signaling and Encapsulation - Layer-2 Tunneling Protocol.

Unit IV: Virtual Private Wired Service - Types of Private Wire Services - Generic Routing Encapsulation - Layer-2 Tunneling Protocol - Layer-3 Virtual Private Network 2547bis, Virtual Router - IP and Optical Networking: IP/Optical Network Evolution - Challenges in Legacy Traditional IP/Optical Networks - Automated Provisioning in IP/Optical Networks - Control Plane Models for IP/Optical Networking - Next-Generation MultiLayer Network Design Requirements - Benefits and Challenges in IP/Optical Networking - IP Version 6: Addresses in IP Version 6 - IP Packet Headers - IP Address Resolution - IP Version 6 Deployment: Drivers and Impediments.

Unit V: IP Traffic Engineering: Models of Traffic Demands - Optimal Routing with Multiprotocol Label Switching - Link-Weight Optimization with Open Shortest Path First - Extended Shortest-Path-Based Routing Schemes - IP Network Security: Introduction - Detection of Denial-of-Service Attack - IP Trace back- Edge Sampling Scheme - Advanced Marking Scheme - Mobility Support for IP: Mobility Management Approaches - Security Threats Related to IP Mobility - Mobility Support in IPv6 - Reactive Versus Proactive Mobility Support -

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Relation to Multihoming - Protocols Supplementing.

Text Book :

1. “Advanced Internet Protocols, Services and Applications”, Eiji Oki, Roberto Rojas-Cessa, Mallikarjun Tatipamula, Christian Vogt, Copyright © 2012 by John Wiley & Sons, Inc.

Reference Books :

1. “TCP/IP Protocol Suite”, Behrouz A. Forouzan, Fourth Edition, Tata McGraw-Hill Edition 2010.
2. “Computer Communications and Networking Technologies” - Michael A. Gallo & William M. Hancock- BROOKS&COLE
3. “Computer Networks and Internets” -Douglas E. Comer- PEARSON.
4. Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.
5. Network Security Bible, 2nd edition, Eric Cole, Wiley Publishers.
6. Data communication and networks –James Irvine and David Harley- Publishers: Wiley India

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Understand, analyse and examine the concepts of Communication Protocols with its architecture and functions.	K1-K6
CO2	Illustrate and apply the appropriate internet architecture along with efficient protocol models for the user defined communication environment.	K1-K6
CO3	Comprehend, categorize and formulate the appropriate IP routing protocol to establish a efficient data transfer.	K1-K6
CO4	Comprehend, analyse and evaluate the concepts of Virtual wired service and IP/optical networking with its functions and deployment.	K1-K6
CO5	Elucidate, analyse and inspect the IP traffic engineering and its models along with the security mechanisms.	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

UNIVERSITY OF MADRAS
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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	RDBMS with VB.NET Lab		
Core - VIII Practical - III	I Year & II Semester	Credit:3	435C2D

OBJECTIVES:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

List of Experiments:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying–Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications.
 - i. Library Information Processing.
 - ii. Students Mark sheet processing using images.
 - iii. Bank Transactions (SB).
 - iv. Pay roll processing.
 - v. Inventory
 - vi. Purchase order processing.

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Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Use typical data definitions and manipulation commands.	K1-K6
CO2	Design applications to test Nested and Join Queries	K1-K6
CO3	Implement simple applications that use Views	K1-K6
CO4	Implement applications that require a Front-end Tool	K1-K6
CO5	Critically analyze the use of Tables, Views, Functions and Procedures	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create

Mapping with Programme Outcomes:

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

S-Strong

M-Medium

L-Low

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Data Engineering and Management		
Elective - I Theory	I Year & I Semester	Credit:3	435E1A

Course Objectives:

- To understand Data Management concepts
- To get brief knowledge on Data Modeling
- To analyse the techniques used in Distributed Databases
- To assess Distributed database and Business Modeling
- To get familiar with CRM tools

Unit I: DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles of a data model-Physical database design. **DATA MANAGEMENT:** Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data management-Relationship between data management and enterprise

Unit II: CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. **DATA DEFINITION AND NAMING:** Elements of a data definition-Data naming conventions. **DATA QUALITY:** Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. **DATA ACCESSIBILITY:** Data security-Data integrity-Data recovery

Unit III: USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management. **DISTRIBUTED DATA AND DATABASES:** Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. **BUSINESS INTELLIGENCE:** Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.

Unit IV: CRM: Three main pillars of CRM. **GETTING TO KNOW YOUR CUSTOMER:** 360-degree client view. **UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY:** Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes.

Unit V: CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. **CRM DIFFERENTIATORS:** It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart

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cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform.

Text Books:

1. Keith Gordon, “Principles of Data Management Facilitating Information Sharing”, BCS Learning, 2013. (Chapters:1-5, 7,8,12,13,14)
2. Max Fatouretchi, “The Art of CRM”, Packt Publishing, 2019.(Chapters: 1,2,5,8,9)

Reference Books:

1. Peter Ghavami, “Big Data Management_ Data Governance Principles for Big Data Analytics”, De Gruyter, 2020.
2. Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.

Course Outcome:

On the successful completion of the course, students will be able to

CO1	Comprehend the Data Management concepts and analyse the relationship with the enterprise	K1-K6
CO2	Analyze Data Modelling concepts and assess its quality	
CO3	Understand and implement business modelling techniques	
CO4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM	
CO5	Develop CRM applications in cloud	

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

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

L - Low, M- Medium, S – Strong

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Title of the Paper	Architecture and Frameworks		
Elective - I Theory	I Year & I Semester	Credit:3	435E1B

Course Objectives

To understand the basics, benefits and purpose of software architecture

Understand the quality attributes to fulfil the software requirements and relates the software with an organization

Explore the design patterns, best practice and paradigms of efficient software development

Understand the performance and security measures of software architecture

Enable the developers to advance their carrier in software domain

Unit I: Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role - software architecture in an organization – Types of software architects – Software development methodologies – Project management – Office politics – Software risk management – Configuration management – Software product lines

Unit II: Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation –Software Quality attributes: Maintainability – Usability –Availability – Portability – Interoperability - Testability

Unit III: Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design – Systematic approach - Attribute-driven design – Microsoft’s technique for architecture and design – Architecture-centric design method – Architecture development method – Tracking the progress of the software architecture’s design.

Unit IV: Designing orthogonal software systems – Minimizing complexity – SOLID design principles – Software architecture patterns – layered – Event-driven architecture – Model-View patterns – Service-oriented architecture

Unit V: Architecting Modern Applications.- Importance of Performance – Performance improvement - Server side caching – Web application performance – Database performance - Securing software systems – Threat modelling – Secure by design

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Text Book

1. Joseph Ingeno, “Software Architect’s Handbook” Packt Publishing 2018.

Reference books

1. Oliver Vogel, Indo Arnold, ArifChughtaiandTImoKehrer, “Software Architecture” Springer-Verlag, 2011.
2. Ian Gorton, “Essential Software architecture”, Second Edition, Springer, 2011
3. Len Bass, Paul Clements and Rick Kazman, “Software architecture in practice”, Third edition, Addison-Wesley, 2013

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management.	K1-K6
CO2	Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.	K1-K6
CO3	Understand, track and examine the systematic approach for various software design models with effective document process.	K1-K6
CO4	Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture.	K1-K6
CO5	Comprehend, analyze and evaluate the performance and security measures for Server, Web and Database applications in order to create the secure software systems for various domain applications.	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Operating Systems and UNIX		
Elective - I Theory	I Year & I Semester	Credit:3	435E1C

Course Objectives:

- To understand the basic concepts and functions of operating systems
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To provide a comprehensive introduction to UNIX operating system and shell programming.

OUTCOMES

At the end of the course, the students should be able to:

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.

Unit 1: Defining a Operating System - Clustered Systems - Operating-System Structure - Operating-System Operations - Process Management - Memory Management - Storage Management - Protection and Security- Computing Environments - Open-Source Operating Systems - Operating system services - System Calls- Types of System Calls - System Programs - Operating-System Structure - System Boot.

Unit-2: Process Management: Process concept – Process Scheduling - Operations on Processes -Interprocess Communication - Communication in Client – Server Systems - Threads – Multithreading Models - Basic Concepts – Scheduling Criteria – Scheduling Algorithms - Process Synchronization -Critical section Problem - Peterson s Solution - Synchronization hardware – Semaphores, classical problem of synchronization – System model - Deadlock Characterization - Methods for Handling Deadlocks -Prevention, Avoidance, and Detection – Recovery.

Unit 3: Storage management – Background- Swapping - Contiguous Memory Allocation - Paging -Structure of the Page Table - Segmentation - virtual memory background - demand paging - Copy-on-Write- page replacement and algorithms

Unit 4: Storage management – File system - File concept - access methods - directory and directory structure - protection - File-System Structure - File-System Implementation - Directory Implementation -Allocation Methods - Free-Space Management - Secondary Storage structure - disk structure – disk attachment - Disk scheduling

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Unit 5: Introduction to Unix and Unix commands. Introduction of sed, awk and grep family
Shell Scripting: Introduction to Shell, Types of Shell, C shell features, writing first script
writing script, Executing & Debugging script.
Shell Programming: Shell variables, Output, Input, exit Status of a Command, Branching
Control Structures, Loop-Control Structure, and Continue and break Statements, Expressions,
Command Substitution, Command Line Arguments and Functions.

TEXT BOOK:

1. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
2. Modern Operating Systems – Andrew S. Tanenbaum, 3rd Edition, PHI
3. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
4. Unix Shell Programming :Yashavant P. Kanetkar, BPB Publications.

REFERENCE BOOK:

1. Operating Systems – Flynn, McHoes, Cengage Learning
2. Operating Systems – Pabitra Pal Choudhury, PHI
3. Operating Systems – William Stallings, Prentice Hall
4. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
5. Introduction to Unix & Shell -Venkatesh Murthy, Pearson Edu.
6. Unix & Shell Programming - Forouzan, Cengage Learning.

E-Resources:

<https://applied-programming.github.io/Operating-Systems-Notes/>

<https://ecomputernotes.com/fundamental/disk-operating-system/what-is-operating-system>

Course Outcomes

On the successful completion of the course, students will be able

CO1	Analyze various scheduling algorithms.	K1-K6
CO2	Understand deadlock, prevention and avoidance algorithms.	K1-K6
CO3	Compare and contrast various memory management schemes.	K1-K6
CO4	Understand the functionality of file systems.	K1-K6
CO5	To comprehend, use and illustrate the advance concepts such as alternate shell script, data connectivity and bash scripting	K1-K6

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

Mapping with Programme Outcome:

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

S-Strong M-Medium L-Low

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Title of the Paper	Data Engineering and Management Lab		
Elective- II Practical - II	I Year & I Semester	Credit:3	435E1D

Course Objectives:

- To acquire basic scripting knowledge in MongoDB
- To learn CRUD Operation on MongoDB database
- To comprehend MongoDB using DbVisualizer
- To be familiar with Zoho CRM features

1. To customize your application using Zoho CRM
2. Write a script to create a MongoDB database and perform insert operation
3. Write a MongoDB script to perform query operations
4. Write a MongoDB Script to perform update operations
5. Write a MongoDB Script to update documents with aggregation pipeline
6. Write a MongoDB script to delete single and multiple documents
7. Write a MongoDB script to perform string aggregation operations
8. Design a Data Model for MongoDB using DbVisualizer
9. Perform CRUD operations using DbVisualizer
10. Create a Zoho CRM account and organize your Tasks, Meetings and Deals
11. Create and maintain a project using Zoho CRM features

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Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome	Description	Knowledge Level
CO1	Comprehend the scripting knowledge in MongoDB and perform basic operations in shell prompt.	K1-K6
CO2	Implement, Create, Read, Update and Delete Operations on MongoDB database.	K1-K6
CO3	Analyze MongoDB using DbVisualizer.	K1-K6
CO4	Assess Zoho CRM features for managing the customer relationships.	K1-K6
CO5	Create a customized application in Zoho CRM.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Architecture and Frameworks - Lab		
Elective – II Practical - II	I Year & I Semester	Credit:3	435E1E

Course Objectives

To understand and implement the basic concepts of Software architecture and its functions.

To acquire programming skills to develop Implement various technologies and services associated with network protocols along with the challenges of data transfer.

Implement the importance and functioning of Routing Protocols over communication service.

To acquire skills to connect two routers and any two switches.

To comprehend related to SSH protocols and accessing the remote device.

Note: Use the solid servers and client specification for implementation

<https://github.com/solid/specification/>.

Implement the following using Linux / Windows environments

1. Find the WebID profile document and display the necessary attributes
2. Set and access the primary authentications with account recovery mechanisms
3. Set and access the secondary authentications with account recovery mechanisms
4. Design authorization and web access control
5. Find the content representation
6. Reading resources from HTTP REST API and WebSockets API
7. Writing resources from HTTP REST API and WebSockets API
8. Data notification using Social Web App protocol
9. Managing subscriptions and friends list using Social Web App protocol
10. Managing list of followers and following list using Social Web App protocol

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Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome	Description	Knowledge Level
CO1	Comprehend the programming skills of Software architecture tools and packages.	K1-K6
CO2	Understand and implement the user profiles and authentication with recovery mechanism.	K1-K6
CO3	Comprehend and evaluate the access control and content representation use of FTP server.	K1-K6
CO4	Understand and implement reading and writing resources for various applications.	K1-K6
CO5	Identify and examine the notifications, friends, and follower list of social application protocols.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Operating Systems and UNIX - Lab		
Elective - II Practical - II	I Year & I Semester	Credit:3	435E1F

Course Objectives

- To enable the students to run various UNIX commands.
- To develop and implement the shell scripts on UNIX OS.
- To develop and implement the shell script for GUI processing.
- To implement Inter process communication.
- To implement Deadlock detection algorithm.
- To implement various process scheduling algorithms.

List of Programs

- 1) IPC using pipes.
- 2) Implementations of wait and signal using counting semaphores.
- 3) Signalling processes.
- 4) Deadlock detection (for processes passing messages)
- 5) Process Scheduling: FCFS
- 6) Process Scheduling: Least Frequently Used.
- 7) Process Scheduling: Round Robin.
- 8) Two Process Mutual Exclusion.
- 9) Shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions
- 10) Shell program to simulate cat' command and wc command to count the number of lines and number of words in the given input file.
- 11) grep command that Count the number of blank lines in the file1 and Select the lines from the file1 that have the string, "UNIX".
- 12) sed command that Print lines numbers of lines beginning with "O" and swap the first and second word in each line in the file
- 13) awk script to Count the number of lines in a file that do not contain vowels and find the number of characters, words and lines in a file.
- 14) Shell script to find out whether the given number is prime number or not

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- 15) Shell program to find out factorial of the given number
- 16) Shell program to find out reverse string of the given string and check the given string is palindrome or not
- 17) Shell script to search an element in the list
- 18) Shell script to implement menu driven program to display list of users who are currently working in the system, copying files (cp command), rename a file, list of files in the directory and quit option.(Hint: use case structure)

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome	Description	Knowledge Level
CO1	To understand, apply and analyze the concepts and methodology of Unix shell programming.	K1-K6
CO2	To comprehend, impart and apply fundamentals of control structure and script controls.	K1-K6
CO3	To understand, analyses and evaluate the functions, graphical desktop interface and editors.	K1-K6
CO4	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk.	K1-K6
CO5	To comprehend, use and analyze the advance concepts such as alternate shell script, dy and bash scripting	K1-K6

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

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	-	-	-	M	-	-	-
CO2	S	S	S	-	S	-	-	-	M	-	-	-
CO3	S	S	S	-	S	-	-	-	M	S	S	S
CO4	S	S	S	-	S	-	-	-	M	-	-	-
CO5	S	S	S	-	S	-	-	-	M	S	S	S

S- Strong; M-Medium; L-Low

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Title of the Paper	Social Networking		
Elective - III Theory	I Year & II Semester	Credit:3	435E2A

Course Objectives

To learn about Social media, Social networking and Webcasts

To understanding and building a Word Press Powered Website

To analysis the Social Networking & Micro-Blogging.

To learn and analysis the Widgets & Badges.

To explore the importance of Website optimization.

Unit I: Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed

Unit II: Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast- Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- Webcasting

Unit III: Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking & Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.

Unit IV: Widgets & Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.

Unit V: Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan- Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and - Defriending-Web 3.0 or The Semantic Web-Mobile Technology- Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions

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Text Book:

1. Deltina hay —A Survival Guide To social Media and Web 2.0 Optimization, Dalton Publishing, 2009

Reference Books:

1. Miriam Salpeter —Social Networking for Career Success, Learning Express, 2011.
2. Miles, Peggy, —Internet world guide to webcasting, Wiley, 2008

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts	K1-K6
CO2	To comprehend, design and develop a Word Press Powered Website	K1-K6
CO3	To understand, implement and perform evaluation of Social Networking and Micro-Blogging	K1-K6
CO4	To collaborate, implement and analyse the Widgets and Badges in social networking environment	K1-K6
CO5	To understand, illustrate and perform evaluation of web optimization for social networks	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Cyber Security		
Elective - III Theory	I Year & II Semester	Credit:3	435E2B

Course Objectives:

- To understand the basics of Cybercrime and Computer forensics with protecting mechanism
- To explore the working principles of WLAN, Email and Smartphone along with security mechanism and guidelines
- To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of Wi Fi and its security measures
- To understand and learn the method of seize the digital evidence
- To learn and analyze the concepts of digital forensics with cybercrime prevention techniques

Unit I: Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.

Unit II: Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites – email security tips – introduction-smartphone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smartphone.

Unit III: Cyber investigation roles: Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on Wi-Fi – fourth amendment expectation of privacy in WLAN.

Unit IV: Seizure of digital information: introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware – other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method– conducting cyber investigations–demystifying computer/cyber crime – IP addresses – the explosion of networking – interpersonal communication.

Unit V: Digital forensics and analyzing data: introduction – the evolution of computer forensics–phases of digital forensics-collection – examination-analysis – reporting – Cyber crime prevention: Introduction – crime targeted at a government agency.

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Text books:

1. Dr.JeetendraPande, “Introduction to Cyber Security” Published by Uttarakhand Open University, 2017.(Chapter: 1.2-6.4,9.3-12.2)
2. Anthony reyes, Kevin o’shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, “Cyber-crime investigations” - bridging the gaps between security professionals, law enforcement, and prosecutors, 2007.(Chapter: 4, 5, 6, 7, 8, 9,10)

Reference Books:

1. Sebastian Klipper,“ Cyber Security: Ein Einblick fur Wirtschaftswissenschaftler Fachmedien Wiesbaden,2015.
2. John G.Voller Black and Veatch, “Cyber Security” Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India.	K1-K6
CO2	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics.	K1-K6
CO3	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	K1-K6
CO4	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports.	K1-K6
CO5	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Block Chain Technologies		
Elective - III Theory	I Year & II Semester	Credit:3	435E2C

COURSE OBJECTIVES

- To understand about Blockchain is an emerging technology platform for developing decentralized applications and data storage.
- To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
- To familiarize with Bitcoin Network, Bitcoin Clients, APIs and Payments technology of blockchain operations.
- To engage with Components of the Ethereum ecosystem.
- To grasp about Development Tools and Frameworks.

Unit I: Blockchain, Decentralization

Blockchain :The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain. Decentralization: Decentralization using blockchain - Methods of decentralization -Routes to decentralization - Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.

Unit II: Public Key Cryptography, Consensus Algorithms and Smart Contracts

Public Key Cryptography: Asymmetric cryptography - Cryptographic constructs and blockchain technology. Consensus Algorithms: Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm. Smart Contracts: History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts - DAO

Unit III: Bitcoin

Bitcoin: Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain – Mining. Bitcoin Network and Payments: The Bitcoin network - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and sellingBitcoin. Bitcoin Clients and APIs: Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.

Unit IV: Alternative Coins

Alternative Coins: Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins.Ethereum: Ethereum – an overview - Ethereum network - Components of the Ethereum ecosystem - EthereumVirtual Machine (EVM) - Smart contracts. - Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.

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Unit V: Development Tools and Frameworks, Use Cases & Security

Development Tools and Frameworks :Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. Use Cases: IoT – Government - Health -Finance – Media. Scalability and Other Challenges: Scalability - Privacy - Security - Other challenges.

TEXT BOOKS

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Crypto currency Technologies. Princeton University Press, 2016. ISBN 978-0691171692

REFERENCES

1. Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017. ISBN 978-9352135745

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand, apply and examine the characteristics of blockchain, bitcoin and consensus algorithm in centralized and decentralized methods.	K1-K6
CO2	Comprehend and demonstrate the application of hashing and public key cryptography in protecting the blockchain.	K1-K6
CO3	Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.	K1-K6
CO4	Comprehend and evaluate the alternate coin, Ethereum and smart contract.	K1-K6
CO5	Grasp and apply the knowledge of Tools and languages for applications.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Social Networking Lab		
Elective - IV Practical - IV	I Year & II Semester	Credit:3	435E2D

Course Objectives

- To familiarize the tools required to manage social network applications
- To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- To teach the fundamental techniques and principles in achieving social networking environment.
- To enable students to have skills that will help them to solve real time applications.
- To get explore in the Github API.

List of Programs

1. Creating and Exploring Twitter's API
2. To analyzing and visualizing tweets and tweet entities with frequency analysis
3. Creating and Exploring Facebook's Social Graph API
4. To analyzing the Facebook's Social Graph connections
5. Creating and Exploring LinkedIn API
6. To downloading LinkedIn connections as a CSV file
7. Creating and Exploring Google+ API
8. To create and querying Human Language Data with TF-IDF
9. Creating and Exploring GitHub's API
10. To analyzing GitHub interest graph

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On the successful completion of the course, students will be able to

CO1	To understand , implement and review the fundamental techniques and principles for social networks.	K1-K6
CO2	To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub.	K1-K6
CO3	To create and explore the functionality of social networking tools such as GitHub.	K1-K6
CO4	To understand , implement and review the fundamental principles for social network graph.	K1-K6
CO5	To comprehend and critically analyse the existing API for social networks.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Cyber Security Lab		
Elective - IV Practical - IV	I Year & II Semester	Credit:3	435E2E

COURSE OBJECTIVES

- To learn and implement to Change the wireless device mode as monitor mode
- To develop in multiple vulnerabilities webserver
- To understand and implement the open ports in the network
- To acquire programming skills in Implement various wireless device modes
- To comprehend related to find the sub domains of webpage

Implement the following using any cyber security tools

1. Install virtual box (kali Linux)
2. Generate a secure password using keepass
3. Change the wireless device mode as monitor mode
4. Find the known and open vulnerabilities of system using metaspolit
5. Identify the multiple vulnerabilities webserver using nikto tool
6. Identify the open ports in the network using nmap tools
7. List all the network around us and display the information about the networks
8. Sniff and capture the packet sent over HTTP requests
9. Find the owners of internet resources using Whois Lookup tool
10. Find the subdomains of webpage using knock tool

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	Comprehend the programming skills in Change the wireless device mode as monitor mode	K1-K6
CO2	Understand and implement multiple vulnerabilities webserver	K1-K6
CO3	Evaluate the use of different wireless device modes	K1-K6
CO4	Design to Solve related to find the subdomains of webpage	K1-K6
CO5	Create and apply open ports in the network	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Block Chain Technologies Lab		
Elective - IV - Practical - IV	I Year & II Semester	Credit:3	435E2F

Course Objectives

- To learn the basics of Blockchain and apply cryptographic algorithms
- To design, build, and deploy smart contracts and distributed applications,
- To deploy Private Blockchain and smart contracts on Ethereum.
- To understand and deploy cryptocurrencies and their functions in applications
- To implement Blockchain for various use cases.

Implement the following

1. Create a Public Ledger and Private Ledger with the various attributes like Access, Network Actors, Native token, Security, Speed and examples.
2. Building and Deploying MultiChain private Blockchain
3. Write Hello World smart contract in a higher programming language (Solidity)
4. Construct the Naïve block chain
5. Construct and deploy your contract (Use deploy method)
6. Set up a Regtest environment
7. Build a payment request URI
8. Hashcash implementation
9. Develop a toy application using Blockchain
10. Create simple wallet transaction from one account to another account using Metamask.

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Course Outcomes

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

CO1	Enable to setup your own private Blockchain and deploy smart contracts on Ethereum.	K1-K6
CO2	Gains familiarity and implement with cryptography and Consensus algorithms.	K1-K6
CO3	Create and deploy projects using Web3j.	K1-K6
CO4	Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger	K1-K6
CO5	Implement Blockchain for various use cases	K1-K6

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

Mapping with Programme Outcomes:

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

S – Strong, M – Medium, L - Low

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Title of the Paper	Fundamentals of Human Rights		
SEC - I Theory	I Year & II Semester	Credit:2	435S2A

Unit I: Introduction: Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

Unit II: Human Rights in India: Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

Unit III: Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.

Unit IV: Human Rights Movements: Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements (Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).

Unit V: Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.

References

1. SudarshanamGankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
5. Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.

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7. Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
9. Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

Mapping with Programme Outcomes:

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

S – Strong, M – Medium, L - Low

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Title of the Paper	Web Technology and Advanced Java Programming		
Core- IX Theory	II Year & III Semester	Credit:4	535C3A

Objectives:

- To gain knowledge of Object Oriented Programming Concept in Java
- To understand usages of String functions in Java.
- To familiarize with the applet and swing
- To grasp the concepts on Java Beans
- To comprehend the connection between Relational Database and Java

Outcomes:

- Object Oriented Program including classes and methods, Web technologies.
- Understand JavaScript, Client Side benefits using Java script.
- Understand Advanced XML, Extensible Style Sheet Transformation (XSLT) and Java Beans.
- To understand usages of String functions in Java.
- JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs To familiarize with the applet and swing
- To grasp the concepts on Java Beans.
- Understanding JSP, Describing the JSP Life Cycle

Unit I: INTRODUCTION TO WEB TECHNOLOGIES: History of the web, Understanding Web System Architecture, Understanding 3-tier Web Architecture, Overview of HTTP, Introducing HTML document structure, Creating Headings on a web page, Working with links, Creating a Paragraph, Working with images (Hot Spots), Working with tables, working with frames, Introduction to Forms and HTML controls. Inline, External, Internal, Style class, Multiple styles.

Unit II: Introducing DHTML, Introducing JavaScript, Client Side benefits of using JavaScript, Embedding JavaScript in an HTML page, Using Variables, Using Operators, Working with Control Flow statements, Working with functions, Handling Events, Using Arrays, Creating objects in JavaScript.

Unit III: Introduction to XML, XML Basics, Advanced XML, XML Technologies(DTD), Extensible Style Sheet Transformation (XSLT). Introducing Java Beans, Introspection Design Patterns for properties, methods, events.

Unit IV: JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs, Creating a Simple Application, Describing Basic JDBC Statement, Creating tables by using JDBC, Working with Prepared Statement. Introducing the MVC architecture, Describing Servlets, Understanding Servlets, Introducing the Servlet API, Servlet Life Cycle, Developing First Servlet Application, Generic Servlet Class.

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Unit V: Understanding Request Processing and HTTP Describing the Servlet Request Interface, Working with Initialization Parameters.

Introduction to JSP, Understanding JSP, Describing the JSP Life Cycle, Creating a Simple JSP pages, Working with JSP basic tags and Implicit objects, Working with Java Beans and Action tags in JSP

Text Books

1. Web Technologies, Black Book, Kogent Learning Solutions Inc, DreamtechPress. (UNIT – I, II)
2. JDBC, Servlets, and JSP, New Edition, Santhosh Kumar K , Kogent LearningSolutions Inc, Dreamtech Press (UNIT -III, IV, V)

References

1. Web Technologies,Uttam K. Roy, Volume 2 , Oxford University.
2. Core Servlets and Java Server Pages Volume 1 CORE TECHNOLOGIES, Marty Hall and Larry Brown Pearson.
3. Java Server Pages, Pekowsky, Pearson.
4. Java Script, D.Flanagan, O Reilly, SPD.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the Object Oriented Program including classes and methods, Web technologies	K1-K6
CO2	Understand JavaScript, Client Side benefits using Java script	K1-K6
CO3	Understand Advanced XML, , Extensible Style Sheet Transformation (XSLT) and Java Beans	K1-K6
CO4	JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs	K1-K6
CO5	Understanding JSP, Describing the JSP Life Cycle	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Artificial Intelligence		
Core- X Theory	II Year & III Semester	Credit:4	535C3B

Objectives:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications.
- To identify the scope of Artificial Intelligence in real life applications
- To enable decoding of human thinking process and find the ways of making the machine decide intelligently in lieu of number crunching.

Outcomes:

- Solve basic AI based problems.
- Define the concept of Artificial Intelligence.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from arrange of techniques when implementing intelligent systems.
- Possess the basic knowledge of different machine learning techniques.

Unit I: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit II: Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Betapruning, Evaluation functions.

Unit III: Knowledge representation issues, predicate logic- logic programming, semanticnets-frames and inheritance, constraint propagation, representing knowledge using rules,rules-based deduction systems. Reasoning under uncertainty, review of probability, Baye’s probabilistic interferences and dempster Shaferttheory.

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Unit IV: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

Unit V: Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

Recommended Texts:

1. S. Russel and P. Norvig, 2003, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel, 1998, "Computational Intelligence : a logical approach", Oxford University Press.
2. G. Luger, 2001, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, 1998, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Elaine Rich, Kevin Knight and Shivashankar B Nair, 2010, Artificial Intelligence, 3rd ed., Tata McGraw Hill.
5. Dan W. Patterson, 1995, Introduction to Artificial Intelligence and Expert Systems, Pearson Education.

Web References:

1. <https://artint.info/index.html>

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	Outline the applicability, strength and weakness of artificial intelligence in	K1-K6
CO2	solving computational problems	K1-K6
CO3	Demonstrate the role of knowledge representation, problem solving and learning in Intelligent-system engineering	K1-K6
CO4	Identify the characteristics of AI, Knowledge representation, Experts systems and its variants with ANN and robotics.	K1-K6
CO5	Assess the scientific background through various real time examples	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Advanced Machine Learning		
Core- XI Theory	II Year & III Semester	Credit:5	535C3C

Course Objectives

- To understand the concepts of Machine Learning.
- To understand the theoretical and practical aspects of types of machine learning
- To teach and get familiarized with supervised learning and their applications.
- To teach and get familiarized with the concepts and algorithms of unsupervised learning.
- To appreciate the concepts and algorithms of deep learning.

Unit I: Introducing Machine Learning: The Origins of Machine Learning, Uses and Abuses of Machine Learning _ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts.

Managing and Understanding Data: Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.

Unit II: Lazy Learning – Classification Using Nearest Neighbors: The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm.

Divide and Conquer – Classification Using Decision Trees and Rules: Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.

Unit III: Forecasting Numeric Data – Regression Methods: Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees.

Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.

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Unit IV: Finding Groups of Data – Clustering with K-Means: Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs.

Improving Model Performance: Tuning Stock Models for Better Performance-Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.

Unit V: Introduction to Deep Learning: Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs).

Convolutional Neural Networks (CNNs): Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.

Text Books:

1. Brett Lantz, “Machine Learning with R”, Addison-Wesley Packt Publishing, 2013.
2. TawehBeysolow, “Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R”, San Francisco, California, USA, 2017.

Reference Books:

1. Daniel T. Larose, Chantal D. Larose, “Data mining and Predictive analytics”, Second Ed., Wiley Publication, 2015.
2. Bertt Lantz, “Machine Learning with R: Expert techniques for predictive modeling”, 3rd Edition, April 15,2019,
3. Jason Bell, “Machine Learning: Hands-On for Developers and Technical Professionals”, Wiley Publication,2015.

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data.	K1-K6
CO2	To comprehend, apply and evaluate the classification techniques for real-world applications.	K1-K6
CO3	To understand, use and perform evaluation of Regression methods.	K1-K6
CO4	To recognize, implement and analyse the unsupervised techniques for real-world applications.	K1-K6
CO5	To understand, identify, implement and review the deep learning techniques for real-time applications.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Web Technology and Advanced Java Programming lab		
Core–XII Practical -V	II Year & III Semester	Credit:4	535C3D

COURSE OBJECTIVES:

- To implement object oriented concepts in JAVA
- Develop the program using concepts Network programme
- Learn how to create a program in java beans.
- Learn how to connect relational database to Java
- Develop the program using concepts Applet

List of Experiments:

1. HTML programs
 - i. Demonstrate Lists.
 - ii. Demonstrate Hyperlinks.
 - iii. Navigation from one page to another.
 - iv. Navigation within the page.
 - v. Develop a static Home Page using frames.
 - vi. Develop a static Login Page.
 - vii. Develop a static Web Page for Shopping Cart.
2. Javascript programs
 - i. Validate USER LOGIN page.
 - ii. Validate REGISTRATION FORM
3. XML
 - i. Implement XML document for CUSTOMER DETAILS.
 - ii. Internal Document Type Definition to validate XML for Customer Details
 - iii. External Document Type Definition to validate XML for Customer Details
 - iv. XML for Person information and access the data using XSL.
 - v. To display contents of XML file in a table using Extensible StyleSheets.

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4. Advanced Java

- i. To invoke a servlet from HTML forms.
- ii. To invoke servlet from Applets.
- iii. Designing online applications with JSP
- iv. To invoke servlet from JSP.
- v. Creating JSP program using JavaBeans
- vi. Write a program to connect databases using JDBC.
- vii. Implementation of Java Beans.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.	K1-K2
CO2	Apply Applets and Swing programs.	K3
CO3	Develop Servlets and JSP for creating Web based applications using JDBC.	K4-K56

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Computer Vision		
Core -XIII Theory	II Year & IV Semester	Credit:4	535C4A

Course Objectives:

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

Unit I: Basic Image Handling and Processing: PIL – the Python Imaging Library-Matplotlib-NumPy-SciPy-Advanced example: Image de-noising. Local Image Descriptors: Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.

Unit II: Image to Image Mappings:Homographies-Warping images-Creating Panoramas. Camera Models and Augmented Reality: The Pin-hole Camera Model-Camera Calibration-Pose Estimation from Planes and Markers-Augmented Reality.

Unit III: Multiple View Geometry:Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images. Clustering Images: K-means Clustering-Hierarchical Clustering-Spectral Clustering.

Unit IV: Searching Images: Content based Image Retrieval-Visual Words-Indexing Images-Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. Classifying Image Content: K-Nearest Neighbors-Bayes Classifier-Support Vector Machines-Optical Character Recognition.

Unit V: Image Segmentation: Graph Cuts-Segmentation using Clustering-Variational Methods. OpenCV: Python Interface-OpenCV Basics-Processing Video-Tracking.

TEXT BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015

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REFERENCES:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006 3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand basic knowledge, theories and methods in image processing and computer vision.	K1-K6
CO2	To implement basic and some advanced image processing techniques in OpenCV	K1-K6
CO3	To apply 2D a feature-based based image alignment, segmentation and motion estimations	K1-K6
CO4	To apply 3D image reconstruction techniques	K1-K6
CO5	To design and develop innovative image processing and computer vision applications	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Software Development Technologies		
Elective - V Theory	II Year & III Semester	Credit:3	535E3A

Course Objectives

- To learn and Implementing Micro services
- To analysing the Azure Kubernetes Service
- To learn and anlyse .NET DevOps for Azure and its applications
- To building code for .NET core applications
- To get familiarized with Azure pipelines

Unit I: Implementing Micro services: Client to microservices communication, Interservice communication, data considerations, security, monitoring, microservices hosting platform options. Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric. Monitoring Azure Service Fabric Clusters: Azure application, resource manager template, Adding Application Monitoring to a Stateless Service Using Application Insights, Cluster monitoring, Infrastructure monitoring.

Unit II: Azure Kubernetes Service (AKS): Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Microservices: Authentication in microservices, Implenting security using API gateway pattern, Creating application using Ocrlot and securing APIs with Azure AD. Database Design for Microservices: Data stores, monolithic approach, Microservices approach, harnessing cloud computing, database options on MS Azure, overcoming application development challenges. Building Microservices on Azure Stack: Azure stack, Offering IaaS, PaaS on-premises simplified, SaaS on Azure stack.

Unit III : .NET DevOps for Azure: DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional DevOps environment, DevOps centered application. Tracking work: Process template, Types of work items, Customizing the process, Working with the process. Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.

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Unit IV: Building the code: Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection. Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, Deploying the release: Designing deployment pipeline, Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.

Unit V: Introduction to APIs: Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain, API architecture, API management. API Development: Considerations, Standards, kick-start API development, team orientation. API Gateways: API Gateways in public cloud, Azure API management, AWS API gateway. API Security: Request-based security, Authentication and authorization.

Text Book

1. Harsh Chawla and Hemant Kathuria, Building Microservices Applications on Microsoft Azure- Designing, Developing, Deploying, and Monitoring, Apress, 2019.
2. Jeffrey Palermo , NET DevOps for Azure A Developer's Guide to DevOps Architecture the Right Way, Apress, 2019.
3. Thurupathan and Vijayakumar, Practical API Architecture and Development with Azure and AWS - Design and Implementation of APIs for the Cloud, Apress, 2018.

Reference Books

1. Karl Matthias and Sean P. Kane, Docker: Up and Running, O'Reilly Publication, Second Edition 2018.
2. Len Bass,IngoWeber,LimingZhu,"DevOps, A Software Architects Perspective", AddisonWesley-Pearson Publication, First Ediiton 2015.
3. John Ferguson Smart,"Jenkins, The Definitive Guide", O'Reilly Publication, First Ediiton 2011.

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle.	K1-K6
CO2	To illustrate, and implement Azure Kubernetes Service tools for software development life cycle.	K1-K6
CO3	To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications.	K1-K6
CO4	To understand, design and evaluate the principles and architecture service tools for software development life cycle.	K1-K6
CO5	To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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 SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Cryptography and Network Security		
Elective -V Theory	II Year & III Semester	Credit:3	535E3B

Course Objectives

- To familiarize classical encryption techniques and advanced encryption standards
 To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
 To recognize different encryption and decryption techniques to solve problems related to confidentiality and authentication
 To develop the ability to use existing cryptographic utilities to build programs for secure communication.
 To learn the need of digital signatures to secure the document with key management

Unit I: Overview: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms –A Model for Network Security – Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography.

Unit II: Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure – The Data Encryption Standard – The DES Example – The Strength of DES – Block Cipher Design Principles –Basic Concepts in Number Theory and Finite Fields: Divisibility and the Division Algorithm – The Euclidean Algorithm – Modular Arithmetic – Groups, Rings, and Fields – Finite Fields of the Form $GF(p)$ – Polynomial Arithmetic.

Unit III: Advanced Encryption Standard: Finite Field Arithmetic– AES Structure – AES Transformation Functions – AES Key Expansion –Block Cipher Operation: Multiple Encryption and Triple DES – Stream Ciphers – RC4 – Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems – The RSA Algorithm –Diffe-Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation Based on an Asymmetric Cipher.

Unit IV: Cryptographic Hash Functions: Applications of Cryptographic Hash Functions – Two Simple Hash Functions – Requirements and Security – Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm(SHA) – SHA-3 – Message Authentication Codes: Requirements – Functions – Security of MACs – MACs Based on Hash Functions: HMAC – MACs based on Block Ciphers: DAA and CMAC – Authenticated Encryption: CCM and GCM – Key Wrapping.

Unit V: Digital Signatures – Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature Algorithm – Key Management and Distribution: Symmetric Key

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Distribution Using Symmetric Encryption – Symmetric Key Distribution Using Asymmetric Encryption – Distribution of Public Keys – X.509 Certificates – Public-Key Infrastructure.

Text Books

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education / PHI, 7th Edition.
2. Behrouz A Forouzan, DebdeepMukhopadhyay, “Cryptography And Network Security”, McGraw Hill Education, 3rd Edition.

Reference Books

1. Bernard Menezes, “Network Security and Cryptography”, Cengage, 1st Edition, 2010.
2. William Stallings, “Cryptography and Network Security”, Pearson Education India, Sixth Edition, 2016.
3. V.K. Jain, “Cryptography and Network Security”, Khanna Book Publishing, New Delhi, 2016.
4. C.K. Shyamala, N. Harini, Dr. T. R. Padmanabhan, “Cryptography and Security”, Wiley India Pvt. Ltd., 2011

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Comprehend and analyze the security concepts to apply and evaluate the encryption techniques in various models.	K1-K6
CO2	Understand and examine the various data encryption standards and number theory. Illustrate and evaluate the various techniques in different applications.	K1-K6
CO3	Grasp the knowledge of AES techniques and apply to evaluate the performance with different key types.	K1-K6
CO4	Comprehend and analyse the basics of hash function and MAC that helps to develop the encryption models in various application.	K1-K6
CO5	Understand and illustrate the need of digital signature to examine the method of providing good security to the document. And also learn the concept of key management.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Cloud Computing		
Elective -V Theory	II Year & III Semester	Credit:3	535E3C

Objectives:

- To introduce the cloud computing concepts and map reduce programming model.
- To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.
- To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
- To provide Knowledge of different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS); cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- To introduce the variety of programming models and develop working experience in several of them.

Outcomes:

- Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
- Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
- Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
- Infer architectural style, work flow of real-world applications and to implement the cloud applications using map reduce programming models.
- Compare operation and economic models of various trending cloud platforms prevailing in IT industry.

Unit I: Foundations of cloud: Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures.

Unit II: Service Delivery and Deployment Models: Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) - Deployment

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Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements
- Types of SLA – Lifecycle of SLA- SLA Management

Unit III: Cloud Resource Virtualization: Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations Cloud Computing Applications and Paradigms: Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The MapReduce Programming Model - A Case Study: The Grep The Web Application

Unit IV: Resource Management and Scheduling in Cloud: Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture-Feedback Control Based on Dynamic Thresholds - Coordination of Specialized Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services - Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling

Unit V: Cloud Platforms and Application Development: Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2 API – Google App Engine API - Facebook API, Twitter API. Advances in Cloud: Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds – Federated Clouds – Hybrid Clouds

Recommended Texts:

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.

Reference Books:

1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.
3. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

Web References:

1. <https://www.youtube.com/watch?v=-8O32k26RWA>

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	Benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.	K1-K6
CO2	Suitable model to capture the business needs by interpreting different service delivery.	K1-K6
CO3	Virtualization as Foundation of Cloud.	K1-K6
CO4	Resource Management and Scheduling in Cloud.	K1-K6
CO5	Cloud Platforms and Application Development: Comparing Amazon web services.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Internet of Things		
Elective -VI Theory	II Year & IV Semester	Credit:3	535E4A

Course Objectives:

- To get familiar with the evolution of IOT with its design principles
- To outline the functionalities and protocols of internet communication
- To analyze the hardware and software components needed to construct IOT applications
- To identify the appropriate protocol for API construction and writing embedded code
- To realize various business models and ethics in Internet of Things

UNIT I: FUNDAMENTALS OF IOT: Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack – Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II - IOT PROTOCOLS : IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT : Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

UNIT IV: Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.

UNIT V: Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.

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Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, - IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. (UNIT III, IV and V)

Reference Books:

1. Ovidiu Vermesan and Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment” , River Publishers, 2014.
2. Peter Waher, “Learning Internet of Things” ,Packt Publishing, 2015.
3. Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBoneBlack” ,McGraw Hill, 2015.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Comprehend the IoT evolution with its architecture and sensors.	K1-K6
CO2	Understand the networking concepts for communication and underlying IoT protocols.	K1-K6
CO3	Assess the embedded technologies and develop prototypes for the IoT products.	K1-K6
CO4	Evaluate the use of Application Programming Interface and design an API for IoT in realtime.	K1-K6
CO5	Recognize the ethics of business models and perform security analysis.	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	High Performance Computing		
Elective- VI Theory	II Year & IV Semester	Credit:3	535E4B

Course Objectives:

- To get a clear idea of High Performance Computing concept.
- To get brief knowledge about how to function the HPC systems.
- To get idea of what techniques used in HPC models.
- To understand a Parallel computing concepts.
- To get familiar with OpenMP technology that is widely used in HPC technology.

Unit I: Modern processors: Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies-Multicore processors-Multithreaded processors-Vector processors. Basic optimization techniques for serial code: Scalar profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.

Unit II: Data access optimization: Balance analysis and light speed estimates-Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply. Parallel computers: Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.

Unit III: Basics of parallelization: Introduction to Parallelism -Parallel scalability. Shared memory parallel programming with OpenMP: Short introduction to OpenMP-OpenMP-parallel Jacobi algorithm.

Unit IV: Efficient OpenMP programming: Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. Locality optimizations on ccNUMA architectures: Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.

Unit V: Distributed-memory parallel programming with MPI: Message passing-A short introduction to MPI-MPI parallelization of a Jacobi solver. Efficient MPI programming: MPI performance tools-Communication parameters-Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.

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Text book:

1. Georg Hager, Gerhard Wellein “Introduction to High Performance Computing for Scientists and Engineers”, CRC Press, 2011.Chapters: 1 to 10.

Reference books:

1. Michael W. Berry, Kyle A. Gallivan, Efstratios Gallopoulos, Ananth Grama, Bernard Philippe, Yousef Saad, Faisal Saied, “High-performance scientific computing: algorithms and applications”, Springer, 2012.
2. Victor Eijkhout, “Introduction to High Performance Scientific Computing”, MIT Press, 2011.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand of the HPC and ccNUMA concepts	K1-K6
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN	K1-K6
CO3	Apply with parallel computing	K1-K6
CO4	Develop an efficient OpenMP programming	K1-K6
CO5	Evaluate an efficient MPI programming	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Parallel and Distributed Computing		
Elective- VI Theory	II Year & IV Semester	Credit:3	535E4C

Objectives:

- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
- To learn and apply knowledge of parallel and distributed computing techniques and methodologies.
- To learn the architecture and parallel programming in graphics processing units (GPUs).
- To understand the memory hierarchy and cost-performance tradeoffs.
- To gain experience in the design, development, and performance analysis of parallel and distributed applications

Outcomes:

- Develop and apply knowledge of parallel and distributed computing techniques and methodologies.
- Apply design, development, and performance analysis of parallel and distributed applications.
- Use the application of fundamental Computer Science methods and algorithms in the development of parallel applications.
- Explain the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.
- Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

Unit I: Introduction to Parallel Computing: The Idea of Parallelism, Power and potential of parallelism, examining sequential and parallel programs, Scope and issues of parallel and distributed computing, Goals of parallelism, Parallelism and concurrency using multiple instruction streams.

Unit II: Parallel Architecture: Pipeline architecture, Array processor, Multi-processor architecture, Systolic architecture, Dataflow architecture, Architectural classification schemes, Memory access classification, Memory Issues: Shared vs. distributed, Symmetric multiprocessing (SMP), SIMD, Vector processing, GPU co-processing, Flynn's Taxonomy, Instruction Level support for parallel programming, Multiprocessor caches and Cache Coherence, Non-Uniform Memory Access (NUMA).

Unit III: Parallel Algorithm Design Principles and Programming: Need for communication and coordination/synchronization, Scheduling and contention, Independence and partitioning, Task-Based Decomposition, Data Parallel Decomposition, Characteristics of task and interaction, Load balancing, Data Management, parallel algorithm models, Sources of overhead in parallel

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programs, Performance metrics for parallel algorithm implementations, Parallel algorithmic patterns like divide and conquer, Map and Reduce, Specific algorithms like parallel Merge Sort, Parallel graph Algorithms.

Unit IV: Architectures Of Distributed Systems - Architectural Styles – System Architectures - Architectures Versus Middleware - Self-Management In Distributed Systems - Processes - Threads - Virtualization - Clients -Servers - Communication - Remote Procedure Call - Message-Oriented Communication - Stream-Oriented Communication - Multicast Communication

Unit V: Distributed Object Based Systems - Architecture - Processes - Communication - Naming - Synchronization - Fault Tolerance - Security - Distributed System Examples - File Systems And Web Based Systems

Recommended Texts:

1. Ananth Grama, Anshul Gupta, and George Karypis, Vipin Kumar; Introduction to Parallel Computing; Addison Wesley; 2nd Edition; 2003.
2. A.S. Tanenbaum; Distributed Operating Systems; Create Space Independent Publishing Platform; 3rd edition;2017

Reference Books:

1. Introduction To Parallel Programming, Steven Brawer, Academic Press
2. Introduction To Parallel Processing, M. Sasikumar, Dinesh Shikhare and P. Ravi Prakash, PHI
3. Randy Chow, T. Johnson, Distributed Operating Systems and Algorithms, Addison Wesley
4. Ian Foster: Designing and Building Parallel Programs – Concepts and tools for Parallel Software Engineering, Pearson Publisher, 1st Edition, 2019.
5. Parallel Programming in C with MPI and OpenMP Michael J. Quinn, McGrawHill Higher Education.

Web References:

1. <https://www.youtube.com/watch?v=qbQCQ0U6H0o&list=PLbMVogVj5nJQRvzENlvMKA9q70ScSRZBQ>

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop and apply knowledge of parallel and distributed computing techniques and methodologies	K1-K6
CO2	Apply design, development, and performance analysis of parallel and distributed applications	K1-K6
CO3	Use the application of fundamental Computer Science methods and algorithms in the development of parallel applications	K1-K6
CO4	Explain the design, testing, and performance analysis of a software system, and to be able to communicate that design to others	K1-K6
CO5	Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems	K1-K6

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

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

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Title of the Paper	Advanced Machine Learning Lab (AML)		
NME - II Practical - VI	II Year & III Semester	Credit:2	535S3A

Course Objectives

- To formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To apply machine learning algorithms to solve problems of moderate complexity.
- To apply CNN to solve problems of moderate complexity.
- To apply LSTM and RNN to solve problems.

List of Programs

1. Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset
3. Implementation of Logistic Regression using sklearn
4. Implement a binary classification model.
5. Classification with Nearest Neighbours and NavieBayes Algorithm
6. Implementation Decision tree for classification using sklearn and its parameter tuning
7. Implement the k-means algorithm.
8. Implement an Image Classifier using CNN in TensorFlow/Keras.
9. Implement an Autoencoder in TensorFlow/Keras.
10. Implement a SimpleLSTM using TensorFlow/Keras.

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Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming.	K1-K6
CO2	To recognize and develop the machine learning models through python in built functions.	K1-K6
CO3	To understand, impart and develop the machine learning models for real-time dataset	K1-K6
CO4	To comprehend , impart and implement the deep learning models for real-time applications	K1-K6
CO5	To identify and evaluate the performance machine learning models for real-time dataset	K1-K6

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

Mapping with Programme Outcomes:

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

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Title of the Paper	Documentation and Interview skills for Software Engineers		
Skill Enhancement Professional Competency Skill	II Year & IV Semester	Credit:2	535S4A

Objectives:

- Ensure that you understand what the job involves, and that you have the necessary skills
- Make sure you do want to work for the company
- Check that the philosophy / values of the company match your personal requirements
- Find out more about the job, training, career structure etc.

Outcomes:

- Understand the purpose of interviews
- Be aware of the processes involved in different types of interviews
- Know how to prepare for interview
- Be clear about the importance of self presentation

Unit I: Job Interviews: The Gate way to the Job Market

Types of Interviews – Ground work Before the Interview – Abide by the Dress Code – Importance of Body Language in Interviews – Need for Proper Articulation – **Probable Interview Questions:** Tell Us about Yourself - Would You Call Yourself a Team Player? -**Few Tricky Questions and Possible Answers:** Why Should We Employ You?- Do You Have Offers from Other Companies?- What Salary are You Expecting?- How Much do You think You are Worth?- What Kind of a Culture are You Comfortable with?- What is More Important to You— Salary or Growth Opportunities? - What do You Know about Our Company? - Tell Us about Your Strengths and Weaknesses - Where do You See Yourself in 5 or 10 Years? - What are Your Plans for Higher Studies? - When Leading a Team, How Will You Motivate Your Team Members and Resolve Any Differences between them?- What Has Been the Biggest Challenge You Have Faced, and How Did You Handle It? - What Do You think are the Essential Qualities of a Good Employee?- You Claim to be Computer-savvy. Can You Mention Any Innovative Way to Enhance the Sales of the Company Using Your Computer Knowledge and Skills? —

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Concluding an Interview - Telephonic or Video Interview—A Growing Trend - Disadvantages of Telephonic or Video Interview - **A Mock Interview:** Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?

Unit II: Body Language: Reveals Your Inner Self and Personality

Emotions Displayed by Body Language: Aggressive - Submissive - Attentive - Nervous -Upset-Bored-Relaxed-Power-Defensive—Handshake—TheMostCommonBodyLanguage— Eyes— A Powerful Reflection of One's Inner Self—Entry to My Space—Personal Zones May Vary: Intimate Zone – Personal Zone – Social Zone – Public Zone – Typical Body Language when Zones are Intruded — Body Language Exhibited During Different Professional Interactions - Interview - Manager's Discussions with a Subordinate Employee – Discussions with Supervisor – Presentation to a Large Audience – Group Discussions – Video - conference

Unit III: Enhance Your Writing Skill to Create an Impression Fifteen Principles to Increase Clarity of Communication - Use Short, Simple and Clear Words - Use Short Sentences - Do not Cram Different Points into One Sentence – Using Compact Substitutes for Wordy Phrases- Remove Redundant Words and Expressions-Avoid Use of Mixed Metaphors - Avoid Hackneyed and Stilted Phrases - Avoid Verbosity in the Use of Common Prepositions - Do not Twist the Word Order - Present Similar Ideas in a Sentence with Same Structural and Grammatical Form - Make Positive Statements Without Being Hesitant Non-committal-Statements Without Being Hesitant Non-committal - Avoid Pompous Words and Phrases- Use Active Instead of Passive Voice - Ensure Correct Spelling and Grammar in the Text - Substitute Easily-understood Words for Words Imported from Other Fields – Edit – Edit – Edit – The Reader's Perspective-Clarity of Thought – Clarity of Text- Example of Poorly and Well-written Texts

Unit IV: Fog Index: Provides Guidance for Proper Writing

Fog Index or Clarity Index – Examples of Passages with High and Low Fog Index – Infogineering Clarity Rating - Flesch Kincaid Reading Ease Index - Other Readability Indices - Checking Grammar, Spelling and Voice - Clarity of Verbal Communication -Case1-Case 2

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Recommended Texts:

1. Personality Development and SOFTSKILLS, BARUNK.MITRA, Oxford University Press

Reference Books:

1. Communicating Effectively in English, Book – I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R.K.Chadha; Dhanpat Rai Publications, New Delhi.

Web References:

1. <http://www.mindtools.com>
2. <http://www.letstalk.com.in>
3. <http://www.englishlearning.com>
4. <http://learnenglish.britishcouncil.org/en/>
5. <http://swayam.gov.in>

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low