IV Year – I Semester
Data Mining & Warehousing

Unit 1   **Warehouse**: What is it, Who Need It, and Why?, Things to Consider, Managing the Data Warehouse, Getting ready for your project, Picking a target and moving forward, Project management benefits, The Scope statement, Work breakdown structure, Project estimating, Scope creep & tracking project's progress

Unit 2   Data Warehouse Design Methodology, The preferred Architecture, Alternate warehouse architectures, Data Marts and Start Schema Design, Fundamentals of ETL Architecture, Partitioning Data, Indexing Data.

Unit 3   **Data mining** – Introduction, Data mining on what kind of data , Data mining functionalities classification of Data mining systems, Major issues in Data mining

Mining Association rules in large databases - Association rule mining, Mining single-Dimensional Boolean association rules from Transactional databases, Mining multi-Dimensional Association rules from relational Databases and Data Warehouses

Unit 4   **Classification and Prediction** - Introduction classification by decision tree induction, Bayesian Classification. Other classification methods, classification by back propagation, Prediction, classifier accuracy

Unit 5   **Cluster analysis** – Introduction, types of data in cluster analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods

Density based methods: DBSCAN, Grid-based method : STING , Model based clustering method: Statistical Approach, outlier analysis.

Text books

	Author	Title	Publisher
1	Michael Corey, Michael Abbey, Ian Abramson, Ben Taub	Oracle 8i Data Warehousing	TMH (Unit – I & II)
2	Jiawei Han Micheline Kamber	Data mining & Techniques	Morgan Kaufmann Publishers (Unit-III to V)

Reference books

	Author	Title	Publisher
1	S.N.Sivanandam, S.Sumathi	Data Mining – Concepts, Tasks and Techniques	Thomson (2006).
2	Ralph Kimball	The Data Warehousing Toolkit	Wiley
3	Margaret H. Dunham	Data mining - Introductory and advanced topics	Pearson Education
4	D.Hand, H. Mannila and P.Smyth	Principles of Data mining	PHI (2001)

IV Year – I Semester
Mobile Computing

Unit 1   **Introduction:** Wireless Networks, Structured and Unstructured Networks, Mobile Systems, 3G Networks, Next Generation Networks (NGN), Mobile Computing in Next Generation Networks (NGN), Applications of Mobile Computing in NGN, Location Based Services

Unit 2   **Mobile Computing Architectures:** Global Systems for Mobile Communications (GSM), General Packet Radio Service (GPRS), International Telecommunications Union (ITU) – T standards, NGN Architecture, Core Network, Access Network, Wi-Fi, WiMAX, Cellular Networks, Bluetooth

Unit 3   **Mobility Management:** Entities and Terminology, Mobility Management in GSM and GPRS, Home Location Register (HLR), Visitor Location Register (VLR), Features of IPv4 and IPv6, Mobile IP, IP Packet Delivery, changes in IPv6 for Mobile IPv6

Unit 4   **Mobile Transport Layer:** Traditional TCP, Implications of Traditional TCP for Mobility Management, Classical Improvements of TCP – Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/ Time-out Freezing, Selective Retransmission, Transaction-oriented TCP

                Handover Management: Entities and Terminology, Types of Handovers, Handover Detection, Strategies for Handover Detection- Mobile Controlled Handover, Network Controlled Handover, Mobile assisted Handover, Handover Failures

Unit 5   **Operating Systems for Mobile Computing:** Distributed Operating Systems, Issues related to Mobile Computing Systems, Features of Mobile Operating Systems - Apple iOS, Blackberry OS, Android, Windows Phone, Symbian OS

Text book

	Author	Title	Publisher
1	Asoke K Talukder and Roopa R Yavagal	Mobile Computing	TMH (2008)
2	Jochen Schiller	Mobile Communications	2nd Edition Pearson Education

Reference books

	Author	Title	Publisher
1	Rajkamal	Mobile Computing	Oxford (2008)
2	Mukesh Singhal and Niranjan G Shivaratri	Advanced Concepts in Operating Systems	TMH

IV Year – I Semester
Compiler Design

Unit 1   Introduction to Compiling, A simple One-pass Compiler,

Unit 2   Lexical Analysis, Syntax Analysis,

Unit 3   Syntax-directed translation, Type checking,

Unit 4   Run-time environments, Intermediate code generation

Unit 5   Code generation, Code Optimization

Text books

	Author	Title	Publisher
1	Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman	Compilers – Principles, Techniques and Tools	Pearson Education

Reference books

	Author	Title	Publisher
1	J.P. Bannett	Introduction to Compiling Techniques	McGraw Hill
2	Tremblay & Sorenson	Compiler Writing	McGraw Hill
3	Dhamdhere	Compiler Construction	MacMilan

IV Year – I Semester
Network Security

Unit 1   **Introduction:** Security trends, 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.
Block cipher and the data encryption standard: Block cipher principles, the strength of DES, Differential and linear cryptanalysis, Block cipher design principles.

Confidentiality using Symmetric Encryption: Placement of encryption function, Traffic confidentiality, key distribution, random number generator.

Unit 2   **Public key cryptography and RSA:** Principles of public key crypto systems, The RSA algorithm

Key management: Other public-key crypto systems: Key management, Diffie-Hellman key exchange.

Message authentication and hash functions: Authentication requirements, Authentication functions, message authentication codes, Hash functions, security of hash functions and MACs.

Unit 3   **Digital signatures and authentication protocols:** Digital signatures, Authentication protocols, Digital Signature standard

Authentication Applications: Kerberos, X.509 authentication service

Unit 4   **Email Security:** Pretty good privacy, S/MIME

IP security: IP security overview, IP security architecture, Authentication header, Encapsulating security payload, combining security associations, key management.

Web security: Web security considerations, Secure Socket Layer and transport layer security, Secure electronic transaction.

Unit 5   **Intruders:** Intruders, Intrusion detection, password management

Malicious Software: Viruses and related threads, virus counter measures, distributed denial of service attacks.

Firewalls: Firewall Design principles, trusted systems, common criteria for information technology, security evaluation.

Text books

	Author	Title	Publisher
1	William Stallings	Cryptography and Network Security	Fourth edition, PHI **Chapters:** 1,2,3,7,9,10,11,13,14,15,16,17,18,19,20

Reference books

	Author	Title	Publisher
1	William Stallings	Network Security Essentials – Applications and Standards	Third Edition, Pearson Education (2007)
2	Chris McNab	Network Security Assessment	2nd Edition, OReilly (2007).
3	Jon Erickson	Hacking – The Art of Exploitation	SPD, NOSTARCH Press (2006).
4	Neal Krawety	Introduction to Network Security	Thomson (2007)
5	Ankit Fadia	Network Security – A Hackers Perspective	Macmillan (2008)

IV Year – I Semester
Scientific and Technical Writing

UNIT 1	Communicating in Science and Technology, Writers and Experts, General versus Scientific/technical writing
UNIT 2	Scientific and technical style, pitfalls in scientific/technical writing, scientific and technical documents
UNIT 3	**Reports and Proposals :** Specific types of reports **Research Articles and Papers :** Structure of Research papers, Writing for Readers and Writing for listeners
UNIT 4	**Instructions and Manuals :** The audience, the writers, structure and layout, logic development
UNIT 5	Language and rapport, A writing-editing sequence to maximize usability **Case Study :** prepare a sample article for publication

References

1. **"Communicating in the 21st century", Baden Eunson, 3rd Edition, Wiley publications**

IV Year – I Semester
TCP/IP

Unit 1   **Methods of Information Transmission :** Synchronous Transmission, Packet Transmission, Asynchronous Transmission , Virtual Circuit,

Computer Networking : layer 1 routing, layer 2 routing, layer 3 routing,

Introduction to Network Protocols: OSI Reference Model, TCP/IP Protocol Stack, UDP/IP, Domain Name System, Telnet, FTP, HTTP, E-mail, SMTP, WWW.

Unit 2   **Internet Protocol :** IP Datagram, Internet Control Message Protocol, Fragmentation, Optional Entries in the IP Header, ARP and RARP Protocols, Internet Group Management Protocol, Multicast and Link Protocol.

IPV4 : IPV4 address format, IP Classes, Network address, Host Address, Subnet mask,IPV4 Header

Unit 3   **Routing :** Forwarding and Screening, Routing Processing, Handling Routing Tables, Routing Protocols, Neutral Exchange Point

IPV6 : Next Versions of IPV6 Datagram, ICMP version 6 Protocol : Address Resolution, Router Discovery, Redirect, IP Addresses

Unit 4   **Transmission Control Protocol :** TCP Segments, TCP Header options, Establishing and Terminating a connection with TCP, Determining the connection state, Response delay techniques, Window Technique, Network congestion, The window scale factor.

User Datagram Protocol : Fragmentation, Broadcasts and Multicasts

Unit 5   **CISCO Routers:** Interface Identification, Cables, Memory, Console. Commands, Configuration, Debugging

Text Books

	Author	Title	Publisher	Topics
1	E.Bryan Carne	A Professional's Guide to Data Communication in a TCP/IP World	Artech House, Inc	1.6,
2	Libor Dostálek , Alena Kabelová	Understanding TCP/IP	PACKT Publishing	1.2,1.3,1.4,5.1 to 5.7, 9.1 to 9.8, 10, Appendix-A

IV Year – I Semester
Compiler Design Lab

1. Implementation of symbol table.
2. Develop a lexical analyzer to recognize a few patterns in c (ex. Identifers, constants, comments, operators etc.)
3. Implementation of lexical analyzer using lex tool.
4. Generate yacc specification for a few syntatic categories.

    a) Program to recognize a valid arithmetic expression that uses operator +, -, * and /.
    b) Program to recognize a valid variable which starts with a letter followed by any number of letter or digits.
    c) Implementation of calculator using lex and yacc.

5. Convert the bnf rules into yacc form and write code to generate abstract syntax tree.
6. Implement type checking
7. Implement control flow analysis and data flow analysis.
8. Implement any one storage allocation strategies(heap, stack, static)
9. Construction of DAG
10. Implement the back end of the compiler which takes the three address code and produces the 8086nassembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move , add, sub, jump. Also simple addressing modes are used.
11. Implementation of simple code optimization techniques (constant folding. etc.)

IV Year – I Semester
Mini Project

Follow SDLC process for real time applications and develop sample application project

The objective of the project is to motivate the students to work in emerging/latest technologies, help the students to develop ability, to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories. Students are expected to do planning, analyzing, designing, coding, and implementing the project. The initiation of project should be with the project proposal. The synopsis approval will be given by the project guides. The project proposal should include the following:

1. Title
2. Objectives
3. Input and output
4. Details of modules and process logic
5. Limitations of the project
6. Tools/platforms, Languages to be used
7. Scope of future application

The Project work should be either an individual one or a group of not more than three members and submit a project report at the end of the semester. The students shall defend their dissertation in front of experts during viva-voce examinations.

IV Year – I Semester
TCP/IP Lab

1. Write a program to create socket, bind server's well-known port, wait for client connection to complete and close the connection

2. Write a simple program that can read a host name and convert it to an IP address.

3. Java Program to Send a Message from Client to Server and Receive a Response Back Using Socket Programming

4. Creating a Simple Broadcast Server.

5. Live Code for a chat server.

6. Write a program to implement Hashset API

7. Write a program to implement Linkedlist API

8. Write a program to implement Stack API

9. Write a program to implement Arraylist API

10. Write a program to implement Hashtable API

IV Year – II Semester
Software Testing

Unit 1   **Introduction :** Some Software Failures, Testing Process, Terminologies, Limitations of Testing, The V Shaped Software Life Cycle Model
Software Testing Activities : Levels of Testing : Unit Testing, Integration Testing, System Testing, Acceptance Testing; Debugging, Software Testing Tools, Software Test Plan

Unit 2   **Software Verification :** Verification Methods, SRS Document Verification, SDD Document Verification, Source Code Reviews, User Documentation Verification
Metrics and Models in Software Testing: Software Metrics, Categories of Metrics, Object Oriented Metrics used in Testing, What should we measure during Testing?

Unit 3   **Functional Testing :** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause-Effect Graphing Technique

Unit 4   **Structural Testing :** Control Flow Testing, Data Flow Testing, Slice Based Testing, Mutation Testing

Unit 5   **Object Oriented Testing: What** is Object Orientation? , What is Object Oriented Testing? , Path Testing, State based Testing, Class Testing.

Text books

	Author	Title	Publisher
1	Yogesh Singh	Software Testing	Cambridge University Press

Reference books

	Author	Title	Publisher
1	Aditya P.Mathur	Foundations of Software Testing	2nd Edition, Pearson Education

ELECTIVE – II : Image Processing

Unit 1   **Introduction** : Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system.. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels

Unit 2   **Image enhancement in the spatial domain :** Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods

         Image restoration : A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function.

Unit 3   **Color Image Processing** : Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation

         Image Compression : Fundamentals, image compression models, error-free compression, lossypredictive coding, image compression standards

Unit 4   **Morphological Image Processing** : Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms.

         Image Segmentation : Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation.

Unit 5   **Object Recognition :** Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching (p.nos: 693-735).

Text Books :

1. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI.

ELECTIVE – II: ADVANCED DBMS

Unit 1 **Algorithms for Query Processing and Optimization**: Translating SQL queries into relational algebra- algorithms for external sorting-algorithms for select and join operations-algorithms for project and set operations-implementing aggregate operations and outer joins-combining operations using pipelining-using heuristics in query optimization.

Unit 2 **Data base systems architecture and the system Catalog**: System architectures for DBMSs, Catalogs for Relational DBMSs, System catalog information in oracle. Practical database design and tuning:Physical Database Design in Relational Databases-an overview of Database Tuning in Relational systems.

Unit 3 **Distributed DBMS Concepts and Design**: Introduction-function and architecture of a Distributed DBMS- Distributed Relational Database Design-transparencies in a Distributed DBMS-Date's Twelve Rules for Distributed DBMS. **Distributed DBMS-Advanced Concepts:** Distributed Transaction Management-Distributed Concurrency Control-Distributed Deadlock Management-Distributed Database Recovery-The X/Open Distributed Transaction processing model-Replication Servers.

Unit 4 **Introduction to Object DBMSs**:Advanced Database Applications-Weaknesses of RDBMSs-Object oriented Concepts-Storing objects in a Relational Database-Next generation Database systems. Object-Oriented DBMSs-Concepts and Design :Introduction to Object-Oriented Data Models and DBMSs-OODBMS perspectives-Persistence-Issues in OODBMSs-The object Oriented Database System Manifesto-Advantages and Disadvantages of OODBMSs-Object oriented Database Design.

Unit 5 **Object-Oriented DBMSs-Standards and Systems:**Object management group-Object Database Standard ODMG3.0, 1999-Object store.Object relational DBMSs:Introduction to Object-relational Database systems- third generation Database manifesto-Postgres-an early ORDBMS-SQL3.

Emerging database technologies and applications: Hadoop, BIg Data characteristics, NO SQL databases, BASE, Brewer's theorem, Relationship between CAP, ACID and No SQL databases, comparison with Relational databases, No SQL databases types, Comparative study of NoSQL products, Case studies using MangoDB and Cassandra.

Text books

	Author	Title	Publisher
1	Elmasri Navate	Fundamentals of Database Systems	5th Edition, Pearson Education
2	S Ceri and Palgettgi	Principles of distributed databases	TMH
3	Gaurav Vaish	Getting started with No SQL Databases	

Reference books

	Author	Title	Publisher
1	Ozsu	Principles of Distributed Database Systems	2nd Edition, PHI

ELECTIVE II: API Programming and Social Network Design

UNIT 1   Windows 95/NT programming, menus, input controls, visual design, System integration

UNIT 2   Advantages of Win32, Obsolete and Delete functions Sample program
Creating main window, creating main window using existing classes, Messages when creating windows

UNIT 3   Windows Class data, attaching data to window, Change the appearance of windows

UNIT 4   Getting connected, what is a social network, Propinquity, Homophily, Basic network concepts, Dyada and Triads, Density, Structural Holes, The small world, Multiplexity,

UNIT 5   Network Segmentation, Psychological foundations of social networks, Small groups, Leadership and social networks

Text Books :

1. Windows NT Win32 API SuperBible (Publisher: Macmillan Computer Publishing) Author(s): Richard Simon, ISBN: 1571690891 (For Units I,II and III)
2. Kadushin, Charles. 2011. *Understanding Social Networks: Theories, Concepts, and Findings.* Oxford, UK: Oxford University Press (For Units IV and V)

ELECTIVE III : Mobile Applications

Unit 1   **Introduction:** Introduction to Mobile Computing, Introduction to Android Development Environment.
Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools-Android
development tools- Android Studio, Eclipse ADT, Generic UI Development, Architecture of Android. **More on UIs :**
VUIs and Mobile Apps- Text-to-Speech Techniques- Using dialogs in android Programming , Designing the Right UI

Unit 2   **Intents and Services** : Android Intents and Services, Characteristics of Mobile Applications ,Successful Mobile
Development. **Storing and Retrieving Data**: Synchronization and Replication of Mobile Data , Getting the Model
Right , Android Storing and Retrieving Data- Jquery, SQLLite, Android data backup .

Unit 3   **Communications Via Network and the Web** : State Machine , Correct Communications Model , Android Networking and Web-JSON in Android-Handling Media with web.
Telephony: Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony.
Notifications and Alarms: Performance, Performance and Memory Management- Android memory and performance optimization, Android Notifications and Alarms-- Scheduling of jobs with Alarm manager and job scheduler.

Unit 4   **Graphics** : Performance and Multithreading ,Graphics and UI Performance , Android Graphics- Android Animations.
Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia, Location – Mobility and Location Based Services- GPS, Android Location API.

Unit 5   **Putting It All Together** : Packaging and Deploying-creating libraries for Android applications , Android Field Service App.
Security and Hacking : Active Transactions, More on Security , Hacking Android .
Platforms Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App development Hurdles ,Testing-Android application testing with Android test framework.

Text books

1. PawPrints Learning Technologies, Beginning Android Development: Create Your Own Android Apps Today, 2014.
2. Erik Hellman, Android Programming: Pushing the Limits, John wiley and sons ltd,2014

Reference books

1. Neil Smyth, Android Studio Development Essentials.
2. Joseph Annuzzi, Jr,LaurenDarcey, Introduction to Android Application Development, Addison-Wesley, Fourth edition

ELECTIVE III : Computer Vision

UNIT 1   **IMAGE PROCESSING FOUNDATIONS** : Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT 2   **SHAPES AND REGIONS :** Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT 3   **HOUGH TRANSFORM :** Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT 4   **3D VISION AND MOTION :** Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – splinebased motion – optical flow – layered motion

UNIT 5   **APPLICATIONS :** Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and oc:clusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

Reference Books:
1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
5. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
6. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

ELECTIVE III : NEXT GENERATION NETWORKS

UNIT 1   **INTRODUCTION :** Evolution of public mobile services - motivations for IP based services, Wireless IP network architecture – 3GPP packet data network architecture. Introduction to next generation networks - Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next Generation Society, future Trends.

UNIT 2   **IMS AND CONVERGENT MANAGEMENT :** IMS Architecture - IMS services, QoS Control and Authentication, Network and Service management for NGN, IMS advantages, Next Generation OSS Architecture – standards important to oss architecture, Information framework, OSS interaction with IMS, NGN OSS function/ information view reference model, DMTF CIM

UNIT 3   **MPLS AND VPN :** Technology overview –MPLS & QoS, MPLS services and components – layer 2 VPN, layer 2 internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN

UNIT 4   **MULTICAST :** MPLS Multicast VPN overview – Applications, examples, IPv6 and MPLS – Technology overview, Future of MPLS –Integrating IP and optical networks, Future layer 3 services, future layer 2 services.

UNIT 5   **NGN Management** : Network Management and Provisioning – Configuration, Accounting, performance, security, case study for MPLS, Future enhancements – Adaptive self healing networks

Text Books :

1. Thomas Plavyk, "Next generation Telecommunication Networks, Services and Management", Wiley & IEEE Press Publications, 2012.

2. Neill Wilkinson, "Next Generation Network Services", John Wiley Publications, 2002.

Reference Books :

1. Monique J. Morrow, "Next Generation Networks", CISCO Press, 2007.

2. Robert Wood, "MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization", CISCO Press, 2006.

3. Ina Minie, Julian Lucek, "MPLS enabled Applications – Emerging developments and new technologies", 3rd edition, Wiley. 2011.