GOA UNIVERSITY
THIRD YEAR OF BACHELOR'S DEGREE COURSE IN COMPUTER ENGINEERING
(Revised in 2007-08)
SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER VI

Sub Code	Subjects	Scheme of Instruction Hrs/Week			Scheme of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	P	O	Total
CE 6.1	Modern Algorithm Design Foundation	3	0	0	3	100	20+ 5	-	-	125
CE 6.2	Object Oriented Software Engineering	3	0	2	3	100	20+ 5	-	-	125
CE 6.3	Artificial Intelligence	3	1	2	3	100	20+ 5	50	-	175
CE 6.4	Computer Graphics	3	1	2	3	100	20+ 5	50	-	175
CE 6.5	Device Interface and PC Maintenance	3	1	2	3	100	20+ 5	-	-	125
CE 6.6	Data Communications	3	1	2	3	100	20+ 5	-	-	125
	TOTAL	18	04	10	-	600	150	100	-	850

L-Lectures, T-Tutorials P-Practicals
Th-.Dur.- Duration of Theory paper
Th-Theory, S-Sessional, P-Pratical, O-Oral.

25 Sessional marks will be split as follows:

20 marks are for the Internal Test
5 marks are for continuous evaluation of Practicals/Assignments

CE6.1MADF MODERN ALGORITHM DESIGN FOUNDATION

Course Objectives: This course teaches techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. It covers the common algorithms, algorithmic paradigms, and data structures used to solve these problems.

Instructional Objective:
At the end of the course, the students would be familiar with the following:

- Sorting; search trees, heaps, and hashing
- Divide-and-Conquer
- Greedy Method; Dynamic programming; Backtracking; Branch and Bound
- Graph algorithms; shortest paths
- Internet and Network algorithms.

Lectures per week	**:**	**3+0+0**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module).

Module 1

Introduction to analysis of algorithm (5hrs)
Design and analysis fundamentals.
Performance analysis ,space and time complexity.
Growth of function – Big-O, Omega, theta notation.
Mathematical background for algorithm analysis.
Randomized and recursive algorithm

Divide and Conquer (6hrs)
General method , Binary search, finding the min and max.
Merge sort analysis.
Quick sort, performance measurement.
Randomized version of quick sort and analysis.
Partitioned algorithm selection sort, radix sort, efficiency considerations.
Strassen's matrix multiplication.

Module 2

Greedy Method (6hrs)
General method.
Knapsack problem.
Minimum cost spanning tree- Kruskal and Prim's algorithms, performance analysis.
Single source shortest path .
Job sequencing with deadlines.
Optimal storage on tapes.

Dynamic Programming (4hrs)
The general method
Multistage graphs, all pair shortest paths, single source shortest paths
Optimal BST ,0/1 knapsack
TSP, flow shop scheduling

Module 3

Backtracking (5hrs)
The general method.
8 Queens problem , sum of subsets.
Graph coloring, Hamiltonian cycles.
Knapsack problem.
Branch and Bound (5hrs)
The method, LC search.
15 puzzle: An example.
Bounding and FIFO branch and bound .
LC branch and bound .
0/1 knapsack problem.
TP efficiency considerations

Module 4

Internet Algorithms (6hrs)
Strings and patterns matching algorithm. Tries.
Text compression.
Text similarity testing.

Network Algorithms(6hrs)
Complexity measures and models
Fundamental Distributed Algorithms
Broadcast and Unicast Routing
Multicast routing

Text Books:

1. Fundamentals of computer Algorithms by Ellis Horowitz, Sarataj Sahni, S. Rajsekaran. University Press.
2. Algorithm Design Foundation, Analysis and Internet Examples by Michael Goodrich & Roberto Tamassia,, Second Edition, Wiley student Edition.

Reference Books:

1. Introduction to Algorithms by T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, 2nd Edition, MIT Press/McGraw Hill, 2001
2. Introduction to the Design and Analysis of Algorithms by Anany V. Levitin, Pearson Education publication, Second Edition.

CE 6.2OOSE OBJECT ORIENTED SOFTWARE ENGINEERING

Course Objective: This course addresses current issues and practices in object oriented software engineering with an emphasis on the software development process. Topics covered include concepts and terminology, the software development process, software planning and management, software requirements specifications, system modeling, quality specifications, program specifications, software design approaches.

Instructional Objective:
By the end of this course, student should be able to:

- Specify a software system.
- Create an object-oriented design for it.
- Implement it with readable, reusable, modular, object-oriented techniques.
- Test for validity, correctness and completeness.
- Understand and use software project management.

Lectures per week	**:**	**3+0+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module).

Module 1

Introduction to Software Engineering (2 hrs)
Scope of software engineering-
Historical aspects
Economic aspects
Maintenance aspects
Specification and design aspects
Team programming aspects

The Software Process- (2 hrs)
Client, Developer and User
Phases of SDLC Life Cycle
Requirement phase
Specification phase
Design phase
Implementation phase
Integration phase
Maintenance phase

Software Life Cycle Models (3 hrs)
- Build and Fix Model
- Waterfall
- Rapid Prototyping Model
- Incremental Model
- Extreme Programming
- Synchronize and Stabilize Model
- Spiral Model
- Object Oriented Life Cycle Model

Software Metrics(2 hrs)
Capability Maturity Model

Estimating Duration and Cost (2 hrs)
Metrics for size of product
Techniques for cost estimation and models
Teams (2 hrs)
Team Organization
Democratic Team Approach
Classical chief Programmer Team Approach
Synchronize and Stabilize Teams

Module 2

Object Oriented Software Engineering (4hrs)
- Object Oriented System Development
- Object Oriented Terminology
- Types of Cohesion
- Types of Coupling
- Data Encapsulation
- Software re-usability
- Portability
- Interoperability
- CASE tools in use for Object Oriented Software Engineering

Requirement Phase (1hr)
Techniques for Requirement Elicitation and Analysis
Metrics for Requirement Phase
Testing and CASE tools for Requirement Phase

Specification Phase (2 hrs)
Specification Document
Metrics for Specification Phase
Testing and CASE tools for Specification Phase

Analysis Phase(2 hrs)
OO Analysis
Use Case Modeling
Class Modeling
Dynamic Modeling
Testing and CASE tools for Analysis Phase

Design Phase (2 hrs)
Action oriented Design and Abstraction
DFA
Data Oriented Design
Object Oriented Design
Testing and CASE tools for Design Phase

Module 3

Software Quality Assurance (3 hrs)
Quality Concepts
Quality Movement
Software Reviews
Formal Technical Reviews
Formal Approaches to SQA
Statistical SQA
Software Reliability
SQA Plan

Software Testing (3 hrs)
Fundamentals
Test Case Designs
White Box Testing
Basic Path Testing
Control Structure Testing
Black Box Testing
Testing for specialized environment

Software Testing Strategies (2 hrs)
Strategic Approach to Software Testing
Strategic Issues
Unit Testing
Integration Testing
Validation Testing
Organizational approaches to testing,
Software testing tools- for classical engineering and object oriented engineering
Software testing standards

Object Oriented Testing (2 hrs)

Module 4

Software Project management: (10 hrs)
Managing software project
Project planning
Process planning-
Standard process
Requirement change management
Quality Planning
Risk management

Project management plan
Team structure
Communication
Team development and configuration management.
Project execution
Project monitoring and control Project Closure
Performing closure analysis,
Closure analysis report.

Text Books:

1. Object Oriented and Classical Software Engineering- Stephen R.Schah(TMH)
2. Software Project Management in practice- Pankaj Jalote- PEA

Reference Books:

1. Software Engineering – A practitioner's approach – by Roger S. Pressman, McGraw Hill
2. A discipline for Software Engineering – by Watts S. Humprey, Pearson Education
3. Software Engineering – by K. K. Aggarwal and Yogesh Singh, New Age Publications
4. 'Ed-Kit'- Software testing in real world. Addison Wesley 1995
5. Effective methods for software testing(second edition) John-Wiley 1999
6. Software testing techniques(2^{nd} edition) Van Nostrand Rein loud 1990
7. The art of software testing, Jon Wiley Mayers G.J.

CE 6.3AI ARTIFICIAL INTELLIGENCE

Course Objectives: Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. The course focuses on different heuristic algorithms, knowledge representation, machine learning and planning algorithms, expert system design and neural networks**.**

Instructional Objectives:
At the end of this course, the student will be able to:

- Formulate and assess problems in artificial intelligence.
- Understand several methods for representing knowledge.
- Assess the strengths and weaknesses of several AI algorithms in areas such as heuristic search, game search, logical inference, statistical inference, decision theory, planning, machine learning, neural networks, and natural language processing.

Lectures per week : 3+1+2
Max. Marks for Theory paper : 100
Max. Marks for Practical : 50
Max. Marks for Sessionals : 20 + 5
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5
(At least one question from each module with two compulsory questions from any one module.)

Module – 1

Introduction to AI and Techniques (2hrs)
Problems, Problem Spaces and Search (4hrs)
Defining the Problem
Production Systems
Problem characteristics
Production System Characteristics
Design Issues
Problem Solving (4hrs)
Heuristic Search Techniques
Hill Climbing
Best First Search, A*, OR graphs
Problem Reduction - AND-OR-Graph, AO*
Means Ends Analysis (2hrs)

Module -2

Knowledge Representation(3hrs)
Representation and Mapping
Approaches to knowledge Representation

Predicate Logic (4hrs)
Representing simple facts and logic
Representing instance and ISA relationship
Computable functions and predicates
Resolution

Symbolic Reasoning under uncertainty(3hrs)
Introduction to non-monotonic Reasoning
Logic for non-monotonic Reasoning
Weak slot and filter structures(2hrs)
Semantic nets
Frames
Strong Slot and Filter Structures (2hrs)
Conceptual dependency
Scripts

Module -3

Game Playing (2hr)
MiniMax Search Procedure
Adding alpha-beta cut offs
Planning (3hrs)
Overview
An example domain: Blocks world
Components of a planning system
Goal Stack Planning (2hrs)
Non –linear Planning
Hierarchical Planning
Introduction to natural language processing (1hrs)

Module 4

Learning (4hrs)
Inductive learning
Learning Decision Trees
Types of learning (4hrs)
Rote learning
Learning by taking advice
Learning in problem solving, Version Space
Expert Systems (2hrs)
Representing and using domain Knowledge
Expert System Shells
Knowledge Acquisition Explanation
Introduction to Neural Networks (2hrs)

Text Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight, TMH
2. Artificial Intelligence, a Modern Approach by Struart Russell and Peter Norvig,

References:

1. Artificial Intelligence: A new Synthesis by Nils J. Nillson, Harcourt Asia
2. Artificial Intelligence by Patrick Winston ,Pearson Education
3. Prolog Programming for Artificial Intelligence by Ivan Brakto, Pearson Education"
4. Decision Support Systems and Intelligent Systems by Efraim Turban "
5. George F. Luger "Artificial Intelligence : Structures and strategies for complex problem solving", Pearson education

CE 6.4CG COMPUTER GRAPHICS

Course Objectives:

- This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
- A thorough introduction to computer graphics techniques, including 3D modeling, rendering and animation. Topics cover: geometric transformations, geometric algorithms, 3D object models (surface and volume), visible surface detection algorithms, image synthesis, shading and mapping, global illumination and animation techniques
- Course material is structured to meet the needs of both designers and users of interactive computer graphics systems.

Instructional Objectives:

At the end of this course, the student will be able to:

- Describe the purpose of Computer Graphics and its applications
- Discuss picture generation procedures by examining device level algorithms and discuss various attributes that control the appearance of displayed primitives
- Describe and implement methods for performing 2-Dimentional geometric transformations.
- Describe the concept of 3-Dimentional Graphics and methods for performing 3-Dimensional geometric transformations.
- Discuss basic illumination models and surface rendering algorithms.

Lectures per week : 3+1+2
Max. Marks for Theory paper : 100
Max. Marks for Practical : 50
Max. Marks for Sessionals : 20 + 5
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Overview of graphic systems (3hrs)
Video display devices
Refresh cathode ray tubes
Raster scan displays
Random scan displays
Color CRT monitors
Direct view storage tubes
Flat panel Displays
Raster scans systems
Random scan systems
Input devices
Keyboard
Mouse
Trackball and Space ball
Joystick
Image scanners
Touch panels
Light pens

Output Primitives (5 hrs)
Points and lines
Line drawing algorithms
DDA
Bresenhams line algorithm
Circle generating algorithms
Properties of circles
Midpoint circle algorithm
Ellipse generating algorithm
Properties of Ellipses
Midpoint ellipse algorithm
Filled area primitives
Scan line polygon Fill algorithm
Inside – outside tests
Scan line fill of curved boundary
Boundary fill algorithm
Flood fill algorithm
Fill area functions

Attributes of Output Primitives (3 hrs)
Line Attributes
Line type
Line width
Pen and brush options
Line color
Curve attributes
Color and grayscale levels
Color tables
Grayscales
Area fill attributes
Fill styles
Pattern fill
Soft fill
Character attributes
Text attributes
Marker attributes
Antialiasing
Super sampling straight line
Segments
Pixel-weighting masks
Area sampling straight line
Segments
Filtering techniques
Pixel phasing
Compensating for line intensity differences
Anti aliasing area boundaries

MODULE 2

Two Dimensional Geometric Transformations (2 hrs)
Basic Transformations
Translation
Rotation
Scaling
Composite transformation
Translations
Rotations
Scaling
Other transformations
Shear

Two-Dimensional Viewing(4 hrs)
The viewing pipeline
Viewing coordinate reference frame
Window to viewport coordinate transformation
2-D viewing functions
Clipping operations
Point Clipping
Line clipping
Cohen- Sutherland Line Clipping
Polygon Clipping
Sutherland Hodgeman Polygon clipping
Weiler- Atherton Polygon Clipping
Other polygon clipping algorithm
Curve clipping
Text clipping

Clipping and Windowing
Midpoint Subdivision

Graphical User Interface and Interactive Input Methods (2 hrs)T1
Input to Graphical Data
Logical classification of Input devices
Locator devices
Stroke devices
String devices
Valuator devices
Choice devices
Pick devices

Graphical Input Devices (1 hr)
Pointing and positioning Devices
The Mouse
Tablets
The Light Pen

Graphical Input Techniques (1 hr)
Introduction
Positioning Techniques
Pointing and Selection
Inking and Painting
Event Handling (1hr)
Introduction
Polling
Interrupts
The Event Queue
Light-Pen Interrupts
Input functions (1 hr)
Dragging and Fixing
Hit Detection
On-Line Character Recognizers

Raster Graphics Fundamentals(2 hr)
Introduction
Generating a Raster Image: The Frame Buffer Display
Representing a Raster Image
Scan Converting Line Drawings
Displaying Characters
Natural Images

Window and View port
World Coordinates
Screen Coordinates
Normalized Screen Coordinates
Device Coordinates

Clipping
Example of Cohen-Sutherland Clipping Method
Problems on Cohen-Sutherland Clipping Method
Example of Mid Point Method

Modelling Transformations
Problems based on all Transformations

MODULE 3

Three Dimensional Concepts(2 hrs)
3- Dimensional display methods
Parallel projections
Perspective projection
Depth cueing
Surface rendering
Exploded and cutaway views

Three Dimensional Object representations (1 hr)
Polygon surfaces
Polygon tables
Blobby objects
Three Dimensional Geometric and Modeling transformations (1 hr)
Translation
Rotation
Coordinate Axes rotations
Scaling
Reflections
Shears

Three Dimensional Viewing (1 hr)
Viewing pipeline
Viewing coordinates
Transformation from world to viewing coordinates
Projections.

A Simple Graphics Package(1 hr)
Ground Rules for a Graphics Software Design
Functional Domains
Graphic Primitives
Windowing Functions
Miscellaneous Functions

Picture Structure (1 hr)
Defining Symbols By Procedures
Display Procedures
Boxing
Advantages and Limitations of Display Procedures
Structured Display Files

Realism In The Three-Dimensional Graphics
Techniques for Achieving Realism

Curves And Surfaces (1 hr)
Shape Description Requirements
Parametric Functions
Bezier Methods
B-Spline Methods

Three-Dimensional Transformations and Perspective (1hr)
Transformations
Three-Dimensional clipping

MODULE 4

Visible - surface Detection Methods (3 hrs)
Classification of visible – surface detection algorithms
Back – Face detection
Depth buffer method
A – Buffer method
Scan – Line method
Depth Sorting method
BSP- Tree method
Area Sub-division method
Octree method

Illumination Models and Surface- Rendering Methods(2 hrs)
Light sources
Basic illumination models
Ambient light
Diffuse reflection
Specular reflection and the Phong model
Combined Diffuse and specular reflections with multiple light sources
Halftone pattern and Dithering techniques
Halftone approximations
Dithering techniques
Gouraud shading
Phong shading

Color Models and Color Applications (2 hrs)
Properties of light
Standard primaries and the Chromaticity Diagram
XYZ Color model
CIE Chromaticity Diagram
RGB color model
YIQ Color Model
CMY Color Model
HSV Color Model
HLS Color Model

Computer Animation (2 hrs)
Design of animation sequences
General computer animation functions
Raster Animations
Computer animation languages
Motion specification
Direct motion specification
Goal directed systems
Kinematics and dynamics

Display Processors (1 hr)
The simple Refresh Line-Drawing Display
Random-Scan Storage-Tube Displays
The Unbuffered High- Performance Display
The Buffered High- Performance Display
Device-Independent Graphics Systems (1 hr)
Device Independence
Graphics System Design

User Interface Design(1 hr)
Components of the User Interface
The Users Model

TEXT BOOKS

1. Computer Graphics – By Donald Hearn and M. P. Baker, Prentice Hall of India Pvt. Ltd. ISBN-81-203-0944-8. (Syllabus topics covered as per 2nd edition) T1
2. Principles of Interactive Graphics – By William Newman and Robert Sproull, Tata McGraw hill Publishing company Ltd. ISBN-0-07-463293-0 (Syllabus topics covered as per 2nd edition) T2

REFERENCE BOOKS

1. Introduction to Computer Graphics – By N. Krishnamurthy, TMH (R1)
2. Computer Graphics – By Steven Harrington, Tata McGraw Hill. (R2)
3. Compute Graphics: Principles and Practice – By Foley, Van Dam, Feiner and Hughes (R3)

CE 6.5 DEVICE INTERFACING AND PC MAINTENANCE

Course Objective: The objective of this course is to review various components of a desktop computer including input/output and other interfacing devices. After a thorough understanding of the system it enables the students to diagnose, detect and resolve practical problems in computer systems.

Instructional Objectives:

At the end of this course, the student should be able to:

- Thoroughly understand the inner workings of a computer system.
- Detect and resolve practical problems in computer devices such as mother board, processors, cache memory, RAM, ROM, different types of cards, storage media, display units, printer, input devices and other peripheral devices.

Lectures per week	**:**	**3+1+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module).

Module 1

8086 Interrupts and Interrupt Responses (3 Hrs)

Overview
An 8086 Interrupt Response Example
An 8086 Interrupt Program Example
8086 Interrupt types

8254 Software-Programmable Timer/ counter (4 Hrs)

Basic 8253 and 8254 operation
System Connections for an 8254 Timer/Counter
Initializing an 8254 Programmable Peripheral Device
8254 Counter Modes and Applications

8259A Priority Interrupt Controller: (3 Hrs)

8259A Overview and system Connections
8259A System Connections and Cascading
Initializing an 8259A

Module 2

BIOS and CMOS (4 Hrs)
Function of BIOS
CMOS set up utilities
BIOS and device drivers
Power-On self test (POST)

Motherboards (6 Hrs)
How motherboard works
Types of motherboards
Chipset varieties
Upgrading and installing motherboards
Trouble shooting motherboards

Module 3

Hard drive Technologies (4 Hrs)
How Hard drives work
Hard drive interfaces
Bios support: configuring CMOS and installing drivers
Troubleshooting Hard drive installation

Implementing Hard drives (3 Hrs)
Partitioning Hard drives
Formatting Hard drives
Maintaining and troubleshooting Hard drives

CD and DVD Media (3Hrs)
CD media
DVD media
Installing CD and DVD media Drives
Troubleshooting

Module 4

VideoT2 (4 Hrs)
CRT and LCD Displays
The video card
Installing and configuring video software
Troubleshooting video

SoundT2 (3Hrs)
How sound works in a PC
Getting the right sound card
Installing a sound card in a windows system
Troubleshooting sound

PrintersT2 (3Hrs)

Printer Technologies
The Laser printing process
Installing a printer in windows
Trouble shooting printers

Text books:

1. Microprocessors and Interfacing – Programming and Hardware
   Author: Douglas V. Hall
   Publishers: Tata McGraw-Hill Publishing Company Limited

2. A+ Guide to Managing and Troubleshooting PCs.
   Authors: Michael Meyers, Scott Jernigan
   Publishers: Tata McGraw-Hill Publishing Company Limited

Reference Book:

1. Troubleshooting, Maintaining and Repairing PCs
   Author: Stephen J. Bigelow
   Publishers: Tata McGraw-Hill Publishing Company Limited

2. Advanced Microprocessors and peripherals – Architecture, programming and Interfacing
   Authors: Ajoy Kumar Ray, Kishor M. Bhurchandi
   Publishers: Tata McGraw-Hill Publishing Company Limited

CE6.6 DC DATA COMMUNICATIONS

Course Objective: This course will focus on imparting knowledge about various components of data communications emphasizing on the physical layer and data link layer of the OSI stack. It also provides overview of computer networks .

Instructional Objectives:

At the end of the course, the student will:

- Understand the basic concepts of data communication components used at various transmission speeds.
- Identify the characteristics and analyze specific role of Data Communication technologies such as multiplexers, ISDN, ATM, wireless, satellite and fiber optic communication.
- Get an overview of 3G networks, LAN and WAN

Lectures per week	**:**	**3+0+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module).

MODULE 1

An overview of Data Communications (4 hrs)

The Importance of Data Communications
The First Data Communications Systems
Two-State Communications Systems
Early Communications Codes
Modern Codes
Teleprinters
Data Communications in Computing
Changes in the Industries
General Description of Data Communications Systems.

Terminal Devices (2 hrs)

PC Terminals
The Need for Speed
Data Transmission.

Messages and Transmission Channels (5 hrs)
Information as a Quantity
Bounded Medium
Unbounded Medium
Effects of Bandwidth on a Transmission Channel
Bandwidth Requirements for Signals
Carrier Systems.

MODULE 2

Asynchronous Modems and Interfaces (3 hrs)
Why Data Can't be Transmitted Directly
Solving the Problem with Modems
Analog Modulation
Interface and Signaling Standards
The RS-232 Interface
Asynchronous Modem Operations.

Synchronous Modems, Digital Transmission, and Service Units (3 hrs)
Synchronous Signaling and Standards
Typical Synchronous Components
High-Speed Modems
Access Control
Digital Transmission.

Multiplexing Techniques (1 hrs)
Sharing a Channel
Statistical Time-Division Multiplexing
Low-Speed Voice/Data Multiplexers

Fiber optic and satellite communications (4 hrs)
Introduction and Historical Perspective
Fundamentals of Fiber-Optic System
Fiber-Optic Subsystems and Components
Transmission Systems
Wavelength Division Multiplexing
Satellite Transmission System

MODULE 3

Protocols and Error Control (4 hrs)
Protocols Versus Interfaces
Elements of a Protocol
Teletypewriter Protocols
Convolutional Coding – Cyclic Redundancy Checks
Half-Duplex Protocols
Full-Duplex Protocols.

PC Communication Softwares (3 hrs)
Communication Program features
Dial-up Networking
Using Procomm Plus for Windows

WAN Architectures and Packet Networks (4 hrs)
The Open Systems Interconnect (OSI) Reference Model,
Protocol Layering,
Packet Networks,
Advantages of Packet Switching,
X.25 Packet Systems.
The X-Series of Recommended Standards.

MODULE 4

ISDN (4 hrs)
The Road to ISDN
ISDN Architecture
ISDN Implementation Standards
Growth and Adaptation of ISDN
Applications.

Asynchronous Transfer Mode (4 hrs)
Evolution
The Rationale for ATM and Its Underlying Technology
Architecture
Network Connections
The ATM Protocol Reference Model.

Wireless Transmission (3 hrs)
Mobile Wireless
Cellular Component Relationship
Internet Access
3G Networks.

TEXT BOOK

1. Understanding Data Communications by Gilbert Held, 7th Edition, Pearson Education.

REFERENCE BOOKS

1. Data Communications, Computer Networks and Open Systems by Fred Halsall, Pearson Education.
2. Data Communications and Networking by Behrouz Forouzan, Tata McGraw Hill Publications.
3. Data and Computer Communications by William Stallings, Pearson Education.