E.G.S. PILLAY ENGINEERING COLLEGE (AUTONOMOUS)
Approved by AICTE, New Delhi
(Affiliated to Anna University, Chennai | Re-accredited by NAAC with 'A++ 'Grade)
Accredited by NBA (B.Tech - IT, B.E-CSE and ECE)(Tier-1)
NAGAPATTINAM – 611002

B.TECH - INFORMATION TECHNOLOGY
(R–2023)

CURRICULUM AND SYLLABUS FOR SECOND YEAR

SEMESTER IV						
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Category**
2302IT401	Java Programming	2	0	4	4	PCC
2302IT402	Operating Systems	3	0	0	3	PCC
2302IT403	Software Engineering and Project Management	3	0	0	3	PCC
2302IT404	Data Warehousing and Data Mining	3	0	4	4	PCC
2302IT405	Computer Networks	3	0	0	3	PCC
2302IT451	Operating Systems Laboratory	0	0	2	1	PCC
2302IT452	Computer Networks Laboratory	0	0	2	1	PCC
2301GEX07	Environmental Sciences and Sustainability	2	0	0	2	BSC
2304GE401	Professional Development Course II	0	0	2	1	EEC
2301MC40X	Mandatory Course I	3	0	0	0	MC
2301LS401	Life skill IV	0	0	0	0	MC
Total		**19**	**2**	**10**	**22**	

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA–Continuous Assessment |ES–End Semester

2302IT401	JAVA PROGRAMMING	L	T	P	C
		2	0	4	4

AIM: The main objective of this course is used to develop object oriented programming, event driven, programming paradigm concept using Java.

PREREQUISITE: Programming and Problem Solving, Data Structures and Algorithms.

COURSE OBJECTIVES:	
	1. Enable learners to write Java programming using Object Oriented Programming Concepts.
	2. Develop Java programming using Event Driven and Strings.
	3. Familiar with Swings concepts using Java.
	4. Learn to think Java program using real time concepts and paradigms.

COURSE OUTCOMES:

At the end of this course, students will able to,

CO1:	Understand the basic concepts of Java Programming .
CO2:	Develop Java program using classes, objects, and encapsulation.
CO3:	Design Inheritance and Interface using Java.
CO4:	Implement Event Handler, JDBC and Exception Handling concepts using Java.
CO5:	Create real time application using Java.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	2	-
CO2	3	3	3	2	-	-	-	-	-	-	3	-
CO3	3	3	3	3	2	-	-	-	-	-	3	-
CO4	3	3	3	3	3	-	-	-	-	-	3	-
CO5	3	3	3	3	3	-	-	-	-	-	3	-
CO6	2	2	-	-	-	-	-	-	-	-	2	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

MODULE I	CLASSES AND OBJECTS	7 Hours

Object oriented Programming – Objects - Classes – Encapsulation – Methods – Constructor – Java Documents

MODULE II	ARRAYS, STRINGS, INHERITANCE	8 Hours

O operations - Arrays – Strings – Inheritance – Interface- Polymorphism

MODULE III	EVENT DRIVEN PROGRAMMING	5 Hours

Packages - Events Handlers - Applets – Swings

MODULE IV	CONNECTIVITY	5 Hours

ODBC-JDBC – Threading – Exception Handling

MODULE-V	APPLICATION PROGRAMMING	5 Hours

Scripting – JSP- Servlet – Session Management – Full Stack Development

LIST OF EXPERIMENTS:

PHASE-I:

1. Study of key features of the Java language, intro to the Java Development Kit (JDK) and Java Virtual Machine

2. Play with Data types, keywords, encapsulation, conditional and control statements, looping, branching

3. Implement Java programming concepts using Classes and Objects

4. Implement Java programming concepts using Arrays, Inheritance and Interfaces

5. Perform event handlers program using Java

PHASE-II:

1. Design a class for Complex numbers in Java. In addition to methods for basic operations on complex numbers, provide a method to return the number of active objects created.

2. Develop a simple paint-like program that can draw basic graphical primitives in different dimensions and colors. Use appropriate menu and buttons.

3. Develop a scientific calculator using even-driven programming paradigm of Java.

4. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and Fibonacci number

5. Develop Mini-Project for various real applications using Events, JDBC and Exception Handling

FURTHER READING / SEMINAR

J2EE, J2ME, Mobile Application Development, Software Development

	TOTAL: 30 HOURS

REFERENCES:

1.Herbert Schidt, *"The Complete Reference of Java", Ninth Edition, Oracle Press, 2023*

2.Cay S. Horstmann and Gary Cornell, *"Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2021.*

3.K. Arnold and J. Gosling, *"The JAVA programming language", Pearson Education, 2020.*

4.Timothy Budd, *"Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2021.*

5.C. Thomas Wu, *"An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2019.*

6. *https://ilearning.oracle.com/*

7. *http://nptel.ac.in/*

2302IT402	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

PREREQUISITE: Programming and Problem Solving, Data Structures and Algorithms, Computer Organization and Architecture.

COURSE OBJECTIVES:

	1.Study the basic concepts and functions of operating systems.
	2.Learn about Processes, Threads and Scheduling algorithms.
	3.Understand the principles of concurrency and Deadlocks.
	4.Learn various memory management schemes.
	5.Learn the basics of Linux system and perform administrative tasks on Linux Servers.

COURSE OUTCOMES:

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

CO1:	Understand the key concepts of operating system, process and process management
CO2:	Implement various Scheduling algorithms and deadlock, prevention and avoidance algorithms.
CO3:	Implement techniques for synchronization of concurrent processes and memory management approach.
CO4:	Demonstrate the functionality of file systems and mass storage structure
CO5:	Explain the features of virtual machine and Compare iOS and Android Operating Systems.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	-	-	-	-	-	-	-	-
CO2	3	3	1	3	-	-	-	-	-	-	-	-
CO3	3	3	1	3	-	-	-	-	-	-	-	-
CO4	2	3	1	1	-	-	-	-	-	-	-	-
CO5	2	3	1	1	1	-	-	-	-	-	-	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

COURSE CONTENTS:

MODULE I	INTRODUCTION AND PROCESS MANAGEMENT	10 Hours

Computer-System Organization- Computer-System Architecture- Operating-System Operations- Resource Management- Operating-System Services- System Calls- Operating-System Structure- Process management: Process Concept- Process Scheduling- Threads- Multithreading models.

MODULE II	CPU SCHEDULING AND DEADLOCK	8 Hours

Levels of scheduling, comparative study of scheduling algorithms – Dead Lock: Characterization, Prevention Detection , Avoidance and Recovery.

MODULE III	CONCURRENT PROCESSES AND MEMORY MANAGEMENT	10 Hours

Critical section problem: Semaphores, monitors, Inter-process communication, message passing – Memory management: introduction- paging- segmentation- virtual memory concept- demand paging, page

replacement algorithms-thrashing.		
MODULE IV	**FILE SYSTEMS AND MASS STORAGE STRUCTURE**	**10 Hours**
File system: File concept- access methods-directory structure, file system implementation: File system structure- Directory Implementation-Allocation methods, Overview of Mass-Storage Structure, HDD Scheduling- Storage Device Management.		
MODULE V	**VIRTUAL MACHINES AND MOBILE OS**	**7 Hours**
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.		
		TOTAL: 45 HOURS
REFERENCES:		
1.Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts‖, John Wiley & Sons (Asia) Pvt. Ltd, Tenth Edition, 2018		
2.Gary Nutt, ―Operating Systems- A Modern Perspective‖, Pearson Education Pvt. Ltd, Second Edition, 2013.		
3.Andrew S. Tanenbaum, ―Modern Operating Systems‖, 3rd edition Prentice Hall of India Pvt. Ltd, 2015.		
4.Harvey M. Deitel, Operating Systems‖, Pearson Education Pvt. Ltd, Third Edition, 2013.		
5.William Stallings, Operating System‖, Pearson Education, Sixth edition, 2015.		
6.http://nptel.ac.in/		

2302IT403	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE: Programming and Problem Solving, Engineering Exploration.

COURSE OBJECTIVES:

	1.To apply software engineering theory, principles, emerging tools and processes, to the development and maintenance of complex, scalable software systems.
	2.To elicit, analyze and specify software requirements through a productive working relationship with project stakeholders.
	3.To apply various testing techniques, skills, and testing tools to build robust software products
	4.To learn Aspect Oriented Programming Concepts.
	5.To outline the need for Software Project Management and to Control Concepts.

COURSE OUTCOMES:

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

CO1:	Understand the software development process models.
CO2:	Determine the requirements to develop software.
CO3:	Apply various testing techniques and to build a robust software product.
CO4:	Understand the basic concepts of AOP.
CO5:	Manage Software Projects and to understand control concepts.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	-	-	2	-
CO2	3	3	2	2	2	-	-	-	-	-	2	-
CO3	3	3	3	2	2	-	-	-	-	-	2	-
CO4	3	3	2	2	2	-	-	-	-	-	3	-
CO5	3	3	3	2	2	-	-	-	-	-	3	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	2	2
CO3	3	2	2
CO4	2	2	2
CO5	3	2	2

COURSE CONTENTS:

MODULE I	PHASES AND LIFE CYCLE MODELS OF SOFTWARE DEVELOPMENT	9 Hours

Software Engineering – Importance – Emergence - Phases of software development - Feasibility study, Requirement Analysis, Design, Implementation, Testing, and Maintenance phases - Software Life Cycle Models - Classical waterfall, Iterative, prototyping, Spiral, and Agile - Compare Life cycle models

MODULE II	REQUIREMENTS ANALYSIS AND DESIGN	9 Hours

Requirement Analysis – Analysis process, Requirement specification, Desirable characteristics of an SRS, structure of an SRS document, Data Flow Diagrams - Planning for a Software Project Software Design - Software design concepts .

MODULE III	SOFTWARE IMPLEMENTATION AND TESTING	9 Hours

Software Coding - Programming principles and coding guidelines – Levels of testing: Unit Testing, Integration Testing, System Testing, Acceptance testing - Debugging-Regression Testing- Black-box testing - White box testing.

MODULE IV	ASPECT ORIENTED SOFTWARE DEVELOPMENT	9 Hours

AO Design Principles -Separations of Concerns, Subject Oriented Decomposition, Traits, Aspect Oriented Decomposition, Theme Approach, Designing Base and Crosscutting Themes, Aspect-Oriented Programming using Aspect-J.

MODULE V	SOFTWARE PROJECT MANAGEMENT AND CONTROL	9 Hours

Estimation – FP Based, LOC Based, COCOMO Models - Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM - Scheduling and Tracking –Process and Project Metrics Document Preparation and Production- Cost monitoring – Earned Value Analysis – Change control- Software Configuration Management – Managing contracts – Contract Management-Managing people.

TOTAL: 45 HOURS

REFERENCES:

1.Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2017.

2. Software Engineering, A Precise Approach: Pankaj Jalote, Wiley India-2010

3. Software Project Management: Saikat Dutt /S. Chandramouli, Pearson-Second Edition

4. Software Engineering: Ian Sommerville, Pearson, Nineth Edition

5.Software Engineering a practitioner's approach – Roger S Pressman, Seventh Edition

6.Project Management Absolute Beginner's Guide: Greg Horine, Pearson, Second Edition

7. http://nptel.ac.in/.

2302IT404	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

PREREQUISITE:

	1.Database Management Systems
	2.Java Programming
	3.Python Programming

COURSE OBJECTIVES:

	1.Learn about the safe storage of data and architecture of data warehouse.
	2.Learn about the Elimination of errors from the data.
	3.Understand the Deleting data that is no longer important to the organization.
	4.Study the extraction of implicit, previously unknown, and potentially useful information from data.
	5.To help in the generation of reports for the management.

COURSE OUTCOMES:

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

CO1:	1.Explain the concepts of Data Warehousing Architecture and Implementations.
CO2:	2.Apply different association rules to solve various dataset.
CO3:	3.Design high dimensional data analytics system using classification and prediction techniques.
CO4:	4.Analyse large dataset using clustering and association techniques.
CO5:	5.Analyse various complex data objects and real time dataset using advanced mining techniques.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	-	-	-	-	-	3	-
CO2	3	2	2	-	2	-	-	-	-	-	2	-
CO3	3	3	3	-	3	-	-	-	-	-	3	-
CO4	3	3	3	-	3	-	-	-	-	-	3	-
CO5	3	2	2	-	2	-	-	-	-	-	2	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	2	2
CO3	3	3	2
CO4	3	3	2
CO5	3	2	2

COURSE CONTENTS:

MODULE I	INTRODUCTION TO DATA WAREHOUSING	6 Hours
Data warehouse and OLAP technology – Types of Database – Multidimensional data model – Data warehouse architecture – Data warehouse schema – Implementation		
MODULE II	DATA MINING PRIMITIVES AND CONCEPT DESCRIPTION	6 Hours
Introduction to Data mining – Preprocessing – Predictive Analysis - Data mining primitives – Data mining query language - Data generalization and characterization		
MODULE III	CLASSIFICATION AND PREDICTION	6 Hours

Introduction – Decision Tree Induction – Bayesian Classification – Back propagation – Lazy Learners – Prediction – Evaluating the accuracy.

MODULE IV	CLUSTERING AND ASSOCIATION	6 Hours

Similarity and Distance Measures – Hierarchical Algorithms – Partition Algorithms – Outlier Analysis – Mining Frequent Patterns, Associations, and Correlations.

MODULE V	ADVANCED TOPICS	6 Hours

Web Mining – Web Content Mining – Structure and Usage Mining – Spatial Mining – Time Series and Sequence Mining – Graph Mining.

	TOTAL: 30 HOURS

LIST OF EXPERIMENTS:

1.Installation of WEKA Tool	3 Hours
2.Implementation for Creating new ARFF File	3 Hours
3.Implementation of Data Processing Techniques on Data set	4 Hours
4.Implementation of Data cube construction – OLAP operations	4 Hours
5.Implementation of Apriori algorithm	4 Hours
6.Implementation of FP- Growth algorithm	4 Hours
7.Implementation of Decision Tree Induction	4 Hours
8.Implementation of Classification of data using Bayesian approach	4 Hours
	TOTAL: 30 HOURS

REFERENCES:

1.Jiawei. Han, Design high dimensional data analytics system using classification and prediction techniques.Micheline Kamber, "Data Mining: Concepts and Techniques", Second Edition, Elsevier, New Delhi, 2017

2.Vipin Kumar, Michael Steinbach," Introduction to Data Mining", Second Edition, Addison Wesley, 2015

3.Dunham M, ―Data Mining: Introductory and Advanced Topics‖, Prentice Hall, New Delhi, 2013.

4.http://nptel.ac.in/

2302IT405	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

PREREQUISITE: Digital principles and System Design, Programming and Problem Solving.

COURSE OBJECTIVES:

	1.To understand the concept of layering in networks and identify the components required to build different types of networks.
	2.To learn the functions of data link layer.
	3.To learn the functions of network layer and the various routing protocols.
	4.To familiarize the functions and protocols of the Transport layer.
	5.To know the functions of protocols in application layer.

COURSE OUTCOMES:

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

CO1:	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and components.
CO2:	Explain the functionalities of data link layer and medium access control mechanism.
CO3:	Explain the functionalities of network layer with various routing services.
CO4:	Understand the functionalities of transport layer and congestion control mechanism.
CO5:	Analyze the working of various application layer protocols.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	2	1	2	-	-	-	-	2	2	3
CO5	3	2	2	1	2	-	-	-	-	2	2	3

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	1
CO2	3	1	1
CO3	3	2	1
CO4	3	3	1
CO5	3	3	1

COURSE CONTENTS:

MODULE I	INTRODUCTION AND PHYSICAL LAYER	9 Hours

Computer Network – OSI Model – Communication Systems – Protocol and Standards – Wired vs Wireless Physical Layer: Data and Signals – Performance – Transmission media- Switching – Circuit Switching.

MODULE II	DATA LINK LAYER	9 Hours

Data Link Layer: Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC -PPP – Media Access Control – Ethernet Basics – Case study: CSMA/CD &CA – Token Bus, Token Ring, Hub, Bridges.

MODULE III	NETWORK LAYER	9 Hours

Internetworking – Virtual and Datagram - IP Address: IPv4, IPv6 – Routing: Link state, Distance vector – Inter domain Routing – RIP – OSPF – BGP – ICMP – ARP – DHCP – Multicast routing –Case study: Router.

MODULE IV	TRANSPORT LAYER	9 Hours

UDP – TCP– Connection Management – Flow control – Congestion Control- QoS - Case study: Switch.

MODULE V	APPLICATION LAYER	9 Hours
HTTP – FTP – Web Services - Email protocols ((SMTP – POP3 – IMAP – MIME) – HTTP – DNS – DNS – SNMP - Blue tooth – Wi-Fi – Case study: Gateway.		
		TOTAL: 45 HOURS

REFERENCES:

1.Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

2.James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.

3.Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

4.William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

5.Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014

6.Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

2302IT451	OPERATING SYSTEMS LAB	L	T	P	C
		0	0	2	1

PREREQUISITE: Programming in C & C++, Database Management Systems, Computer Architecture.

COURSE OBJECTIVES:

	1.To understand the concept of layering in networks and identify the components required to build different types of networks.
	2.To learn the functions of data link layer.
	3.To learn the functions of network layer and the various routing protocols.
	4.To familiarize the functions and protocols of the Transport layer.
	5.To know the functions of protocols in application layer.

COURSE OUTCOMES:

At the end of this course, students will be able to,

CO1:	Demonstrate proficiency in using essential UNIX commands (POs: 1, 2 & 3 | PSOs : 1 & 2)
CO2:	Utilize system calls effectively for process creation, process management, inter-process communication, file system operations, and I/O operations (POs: 1, 2, 3 & 4 | PSOs : 1, 2 & 3)
CO3:	Write shell scripts for automating tasks, managing processes, and interacting with the operating system (POs: 1, 2 & 3 | PSOs : 1 & 2)
CO4:	Implement and analyze CPU scheduling algorithms and synchronization mechanisms (POs: 1, 2, 3 & 4 | PSOs : 1, 2 & 3)
CO5:	Implement and analyze deadlock handling techniques, file allocation methods and memory management techniques (POs: 1, 2, 3, 4 & 5 | PSOs : 1, 2 & 3)

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-
CO5	2	3	1	1	1	-	-	-	-	-	-	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	3	3
CO3	3	3	-
CO4	3	3	3
CO5	3	3	3

COURSE CONTENTS:

List of Experiments

1. Study of basic Commands in Unix Operating System

2. Shell Programming: Creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).

3. Implementation of CPU Scheduling Algorithms (FCFS, SJF, RR, Priority).

4. Simulation of Process synchronization using semaphores

5. Simulate Bankers Algorithm for Dead Lock Avoidance

6. Simulation of inter process communication using Shared Memory Concept	
7. Simulate all file allocation strategies	
8. Simulation of Page Replacement Algorithms (LRU, OPT, FIFO).	
9. Install and Simulate Mobile OS, Virtual OS	
	TOTAL: 30 HOURS

Requirements
Software: Operating System: Windows /Linux operating system Tool: JDK 1.6 (or above) IDE: Net beans or Eclipse
REFERENCES:
1.Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts‖, John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2017
2. Gary Nutt, ―Operating Systems- A Modern Perspective‖, Pearson Education Pvt. Ltd, Second Edition, 2013
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, 3rd edition Prentice Hall of India Pvt. Ltd, 2015
4. Harvey M. Deitel, Operating Systems‖, Pearson Education Pvt. Ltd, Third Edition, 2013.
5. William Stallings, Operating System‖, Pearson Education, Sixth edition, 2015.
6. http://nptel.ac.in/

2302IT452		**COMPUTER NETWORKS LAB**	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**

PREREQUISITE: Digital principles and System Design, Programming and Problem Solving

COURSE OBJECTIVES:

	1.To understand the concept of layering in networks and identify the components required to build different types of networks
	2.To learn the functions of data link layer
	3.To learn the functions of network layer and the various routing protocols
	4.To familiarize the functions and protocols of the Transport layer
	5.To know the functions of protocols in application layer

COURSE OUTCOMES:

	On the successful completion of the course, students will be able to
CO1:	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and components
CO2:	Explain the functionalities of data link layer and medium access control mechanism
CO3:	Explain the functionalities of network layer with various routing services
CO4:	Understand the functionalities of transport layer and congestion control mechanism
CO5:	Analyze the working of various application layer protocols

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	2	1	2	-	-	-	-	2	2	3
CO5	3	2	2	1	2	-	-	-	-	2	2	3

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	1
CO2	3	1	1
CO3	3	2	1
CO4	3	3	1
CO5	3	3	1

COURSE CONTENTS:

List of Experiments

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.

2. Simple Chat Program using TCP Sockets

3. Write a HTTP web client program to download a web page using TCP sockets.

4. Simulation of DNS using UDP sockets.

5. Simulation of Sliding Window Protocol using TCP Sockets

6. Performance comparison of MAC protocols using simulation tool

7. Performance comparison of Routing protocols using simulation tool

8. Use a tool like Wireshark to capture packets and examine the packets

9. Write a code simulating ARP /RARP protocols

10. Simulate networks using network simulators like NS-2
11.Case Study: Firewall Configuration, IDS, VPN and SAN
TOTAL: 30 HOURS

REFERENCES:
1.   Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022
2.   James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
3.Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
4.William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
5.Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014
6.Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source.
7.Approach", McGraw Hill, 2012.

2301GEX07	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
		1	0	2	2

PREREQUISITE: Basic Knowledge about the valuable environment

Basic Knowledge to conserve the precious environment

COURSE OBJECTIVES:

	Realize the interdisciplinary and holistic nature of the environment.
	Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.

COURSE OUTCOMES:

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

CO1:	Describe the importance of ecosystem.
CO2:	Describe the various environmental issues and its prevention.
CO3:	Organize various natural resources and the immediate need to conserve it.
CO4:	Select the various ways of conservation of biodiversity.
CO5:	Investigate the different types of pollution and its effects.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	3	-	-	-	-	-
CO2	2	1	-	-	-	-	3	-	-	-	-	-
CO3	3	2	1	1	1	1	3	2	2	2	3	2
CO4	3	2	1	1	1	1	3	2	2	2	3	2
CO5	3	2	1	1	1	1	3	2	2	2	3	2

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-

COURSE CONTENTS:

MODULE I	ECOSYSTEM	8 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers. Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans)

MODULE II	ENVIRONMENT AL ISSUES AND SOLUTIONS	7 Hours

Current Environmental Issues: Acid rain, Ozone layer depletion, Global warming, Green house effect.
Solutions: 12 principles of green chemistry-Rain water harvesting.

Mini Project Modules

MODULE III	BIODIVERSITY	10 Hours

Introduction to biodiversity -genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

MODULE IV	NATURAL RESOURCES	9 Hours

Forest resources: Use and over-exploitation, deforestation- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-

benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity– Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes Biogas – production and uses, anaerobic digestion – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

MODULE V	ENVIRONMENTAL POLLUTION	10 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution –(f) Nuclear pollution (g) Thermal pollution role of an individual in prevention of pollution.

	TOTAL: 45 HOURS

MINI PROJECT ADDITIONAL TOPICS

Soil Science
1. Effects of climate change on soil erosion.
2. The role of land management in maintaining soil health.
3. Effects of salinity in coastal region Agricultural activity.

4. The effects of climate change on agriculture.

Urban Ecology
1. How road construction impacts biodiversity and ecosystems.
2. The effects of urbanization and city planning on water cycles.

3. Impacts of noise pollution on human health.

Pollution and Bio-remediation
1. The role of bio-remediation in removing "forever" chemicals from the environment.
2. Impacts of air pollution on human health.
3. How to improve plastic recycling processes.
4. Individual measures to reduce consumption and creation of microplastics.

General Topics
1. Impact of Urbanization on Local Biodiversity
2. Renewable Energy Options for Sustainable Living.
3. Waste Management Strategies in Urban Areas
4. Climate Change and Its Effects on Local Ecosystems
5. Air Quality Monitoring in Urban centers
6. Water Quality Assessment in Local Water Bodies
7. Green Roof Technology and Its Environmental Benefits
8. Impact of Plastic Pollution on Marine Life.
9. Eco-friendly Practices in Agriculture:
10. The Role of Community Gardens in Urban Sustainability
11. Alternate energy sources for community Development.
12. E-Waste Management.
13. Energy Audit of a building.
14. Rainwater harvesting system.
15. Population growth variation among nations.
16. Population explosion.
17. Family welfare programme.
18. Women welfare programme.
19. Child welfare programme.
20. Environmental impact analysis.
21. Role of information technology in environmental protection and human health.

REFERENCES:

1. Trivedi.R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.

2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publication House, Mumbai, 2001.

3.Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi,2007.
4.Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.