Final

DIPLOMA CURRICULUM OF
COMPUTER SCIENCE AND ENGINEERING
(SECOND YEAR)
(4th Semester)

(To be implemented from 2025-26)

Prepared by;

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PROGRAMME TITLE: COMPUTER SCIENCE AND ENGINEERING

SEMESTER - IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	CSEPC 202/TH1	Operating Systems		3	0	0	70	30	-	-	100	3
2		CSEPC 204/TH2	Database Management Systems		3	0	0	70	30	-	-	100	3
3		CSEPC 206/TH3	Computer Networks		3	0	0	70	30	-	-	100	3
4		CSEPC 208/PR1	Operating Systems Lab		0	0	4	-	-	15	35	50	2
5		CSEPC 210/PR2	Database Management Lab		0	0	4	-	-	15	35	50	2
6		CSEPC 212/PR3	Computer Networks Lab		0	0	4	-	-	15	35	50	2
7	Programme Elective	CSEPE 202 Any One	(A) Microprocessor and Microcontroller (B) FOSS (Free and Open-Source Software) (C) Blockchain		3	0	0	70	30	-	-	100	3
8		CSEPE 204 Any One	(A) Information Security (B) Multimedia Technologies (C) Intelligent Computing		3	0	0	70	30	-	-	100	3
9	Minor Project	PR 202	Minor Project		0	0	4	-	-	30	70	100	2
10	Mandatory	AU 202	Essence of Indian Knowledge and Tradition		2	0	0	-	-	0	0	0	0
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**23**

All Audit (mandatory) courses will have assessment, but will have no credit.

SEMESTER – IV COURSES

TH:1- OPERATING SYSTEMS

L	T	P		Course Code: CSEPC 202/TH1	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	: 70
				Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PC

RATIONALE: Operating System (OS) has been designed to provide an overview to the students of polytechnics how the hardware is managed by the system software. OS being the interfacing layer between the hardware and other system software and application software. This course is therefore an important to the students to understand the overall operation of the entire system including peripherals.

LEARNING OUTCOMES: After competing this course, student will be able to:

- Explain the basic concept about the OS,
- Illustrate UNIX/LINUX architecture,
- Explain Process management, memory management and file management,
- Demonstrate I/O system including RAID,
- Explain the concept of deadlocks and measures to prevent them,
- Illustrate OS Security.

DETAILED COURSE CONTENT:

UNIT NO.	TOPIC/SUB-TOPIC	ALLOTED TIME (HRS.)
I	**Overview of Operating System:** • Basic concepts, • UNIX/LINUX Architecture, • Kernel, services and systems calls, • System programs.	**6**
II	**Process Management:** • Process concepts, • Operations on processes, • IPC, • Process Scheduling, • Multi-threaded programming	**7**

III	**Memory management:** • Memory allocation, • Swapping, • Paging, • Segmentation, • Virtual Memory, • Various faults.	**6**
IV	**File management:** • Concept of a file, • Access methods, • Directory structure, • File system mounting, • Filesharing and protection, • File system structure and implementation, • Directory implementation, • Free space management, • Efficiency and performance. • Different types of file systems	**10**
V	**I/O System:** • Mass storage structure- overview, • Disk structure, • Disk attachment, • Disk scheduling algorithms, • Swap space management, • RAID types–RAID0.RAID –1, RAID 5.	**6**
VI	**Dead Locks:** • Concept of deadlock • Resources • Deadlock Prevention: Blanker Algorithm & Safety Algorithm • The Ostrich Algorithm • Deadlock Detection and Recovery • Deadlock Prevention	**6**
VII	**OS Security:** • Authentication, • Access Control, • Access Rights, • System Logs	**4**

REFERENCEBOOKS:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

TH:2- DATABASE MANAGEMENT SYSTEMS

L	T	P		Course Code: CSEPC 204/TH2	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	: 70
				Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PC

RATIONALE:

This course introduces the principles of database systems, covering foundational topics such as data models, relational algebra, and database design, progressing to advanced topics like SQL, transaction management, and database security. The course emphasizes the efficient storage, retrieval, and manipulation of data, which is essential for modern applications in various domains. The goal is to equip students with the knowledge and skills required to design, implement, and manage databases effectively, fostering analytical thinking and preparing them for data-driven decision-making in real-world scenarios.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe core database management concepts, including data models, schemas, architecture, and principles of transaction management.
- Design efficient databases using entity-relationship (ER) models, normalization techniques, and execute SQL queries for data manipulation and retrieval.
- Analyze relational algebra to optimize database queries and ensure consistency, isolation, and durability through transaction management.
- Evaluate database recovery techniques and security measures to ensure data integrity, performance, and protection from unauthorized access.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Database Basics:** Definition, Need, and Applications of DBMS. Database vs File System, DBMS Architecture: Components, Views of Data, Data Models (Hierarchical, Network, Relational), Introduction to RDBMS, Advantages and Disadvantages of DBMS.	6
II	**Introduction to ER Models:** Entities, Attributes, Relationships, and Constraints, Keys: Primary, Foreign, Candidate, and Super Keys, ER Diagrams and their components, Converting ER Diagrams to Relational Models.	8

III	**Relational Algebra:** Selection, Projection, Union, Intersection, Difference, Cartesian Product, and Joins, SQL Basics: Data Definition Language (DDL) and Data Manipulation Language (DML), SQL Queries: Create, Alter, Drop, Insert, Update, Delete. Basic and Advanced Queries: Filtering, Sorting, Aggregate Functions, and Group By, Joins: Inner, Outer, Left, Right, and Cross Joins.	9
IV	**Database Design and Normalization:** Data Redundancy and Anomalies, Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF, and BCNF, Decomposition of Relations	8
V	**Database Transaction Management and Concurrency Control:** Transactions: Properties (ACID), States, and Schedules, Serializability and Recoverability, Concurrency Control: Locks, Deadlocks, and Timestamp Ordering.	8
VI	**Database Administration and Security Management:** User Management in DBMS, Privileges and Roles, Backup and Recovery, Database Security: Authentication, Authorization, and Data Encryption	6

REFERENCES:

1.	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, 6th Edition, McGraw-Hill Education, New York, 2010.
2.	Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education, India, 2015.
3.	C.J. Date, An Introduction to Database Systems, 8th Edition, Pearson Education, India, 2003.
4.	Dalwinder Singh and R.S. Salaria, Fundamentals of Database Management Systems, 1st Edition, Khanna Publishers, New Delhi, 2023.
5.	Rajiv Chopra, Database Management Systems, 1st Edition, S. Chand Publishing, New Delhi, 2016.
6.	R. Panneerselvam, Database Management Systems, 3rd Edition, PHI Learning, New Delhi, 2018.
7.	P.K. Yadav, Introduction to Database Management System, 3rd Edition, S.K. Kataria & Sons, New Delhi, 2011.

TH:3- COMPUTER NETWORKS

L	T	P		Course Code: CSEPC 206/TH3	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	: 70
				Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PC

RATIONALE:

Computer Networks are the backbone of any knowledge society. The entire ICT infrastructure is based on the Computer Networks. The course covers in depth the various tools and technologies that are used to cover the entire gamut of ICT based system

LEARNING OUTCOMES: After competing this course, student will be able to:

- Explain the basic concepts related to computer networks
- Explain various network media and topologies used in computer network
- Exhibit LAN & VLAN concept related to datalink layer
- Exhibit Routing algorithm and Routing Protocols
- Explain Protocols related to Application Layer
- Illustrate Networking Devices.

DETAILED COURSE CONTENT:

UNITNO.	TOPIC/SUB-TOPIC	ALLOTED TIME (HRS.)
I	**Introduction:** • Introduction to computer networks • Network Models • OSI Reference Model, The layer architecture • TCP/IP Model • 4LayerofTCP/IP suite	**8**
II	**Physical Layer:** • Transmission Media–Principles and issues • Wired Media-Coaxial, UTP, STP, Fiber Optic Cables -Single Mode & Multimode. • Wireless Media–HF, VHF, UHF, Microwave, Ku Band, WIFI 802.11 a/b/g/n/ac • CellularData-2G,3G,4G,&5G • Network topologies	**8**
III	**Data Link Layer:** • Design issues • DLL protocols (Ethernet, WLAN, Bluetooth) • Switching Techniques, VLAN	**5**

IV	**Network Layer:** • Design issues • Internet Protocols (IPv4& IPv6) • Routing–principles and issues • Routing Algorithms: Distance-vector, Link-state • Routing Protocols: RIP, OSPF	**8**
V	**Transport Layer:** • Design issues, • UDP&TCP	**4**
VI	**Application Layer:** • Design Issues • DNS • DHCP • SNMP • FTP &TFTP • SMTP • WWW • Telnet & SSH	**7**
VII	**Network Devices:** • NIC, • Hub, • Switch-Core, Distribution & Access Switches • Router, • WiFi Access-Point & Wireless LAN Controller;	**5**
Total		**45**

REFERENCEBOOKS:

1. Computer Networks,4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IPIl lustrated, Volume-1,W.RichardStevens,AddisionWesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addision Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House
6. Data Communication & Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Ed.

PR:1- OPERATING SYSTEMS LAB

L	T	P		Course Code: CSEPC 208/PR1	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam	: 15
				Progressive Assessment	: 35
Pre-Requisite		**: Nil**			
Credit		**: 2**		Category of Course	: PC

RATIONALE:

Operating Systems (OS) are the backbone of modern computing, managing hardware resources and providing essential services for software execution. They ensure efficient multitasking, resource allocation, and system security, enabling seamless user and application interactions. Studying OS equips students with insights into system design, performance optimization, and troubleshooting.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain fundamental operating system concepts, including UNIX/Linux architecture, processes, memory management, and file systems.
- Demonstrate the use of system calls, inter-process communication (IPC) mechanisms, and process scheduling techniques in practical scenarios.
- Analyze memory allocation techniques, virtual memory concepts, and disk scheduling algorithms to assess their impact on system performance.
- Evaluate file system implementation techniques and security measures like authentication, access control, and system logs for maintaining system integrity.
- Design a system simulation that integrates process management, memory allocation, and disk scheduling to demonstrate OS functionality.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Linux & Terminal Commands:** Use ls, pwd, cd, mkdir, rmdir, touch, cp, mv, rm, File permissions (chmod, chown, chgrp)	8
II	**File Operations & Text Processing:** Use cat, nano, vi, grep, awk, sed, cut, sort, uniq, diff, Redirection (>, >>, |, <, tee)	8
III	**Process Management:** Use ps, top, htop, kill, nice, renice, jobs, fg, bg Schedule tasks using cron and at, Add, modify, and delete users/groups (useradd, usermod, passwd, groupadd, gpasswd), File ownership and permissions (chown, chmod, umask)	10
IV	**Package Management:** Install, remove, and update packages (apt, yum, dnf,	8

	zypper, snap), Use ifconfig, ip, ping, netstat, ss, traceroute, wget, curl SSH (ssh, scp, rsync)	
V	**Disk & Storage Management:** Use df, du, mount, umount, fdisk, mkfs, fsck, Creating and managing partitions & file systems, Shell Scripting - Write basic and advanced shell scripts, Implement loops, conditions, functions in bash	8
VI	**System Monitoring & Performance Tuning:** Use vmstat, iostat, sar, uptime, dstat, iotop, Log Management - Use journalctl, dmesg, syslog, logrotate	8
VII	**Firewall & Security:** Use iptables, firewalld, ufw, Configure SSH security, Linux Services & Daemons - Manage services (systemctl, service), Configure web servers (Apache, Nginx)	10

REFERENCES:

1.	Yashavant Kanetkar, UNIX Shell Programming, BPB
2.	Sumitabha Das, UNIX Concepts and Applications, 4th Edition, McGraw-Hill Education, New Delhi, 2006.
3.	Scott Seely, Windows Shell Programming, Prentice Hall India.

PR:2- DATABASE MANAGEMENT LAB

L	T	P	Total Marks: 50	Course Code: CSEPC 210/PR2	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	: 15
				Progressive Assessment	: 35
Pre-Requisite		**: Nil**			
Credit		**: 2**		Category of Course	: PC

RATIONALE:

This course introduces the principles of database systems, covering foundational topics such as data models, relational algebra, and database design, progressing to advanced topics like SQL, transaction management, and database security. The course emphasizes the efficient storage, retrieval, and manipulation of data, which is essential for modern applications in various domains. The goal is to equip students with the knowledge and skills required to design, implement, and manage databases effectively, fostering analytical thinking and preparing them for data-driven decision-making in real-world scenarios.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the core concepts of database management, including data models, schemas, database architecture, and the role of relational algebra in query optimization.
- Design efficient databases using Entity-Relationship (ER) models and normalization techniques to reduce redundancy and enhance performance.
- Apply SQL queries for data definition, manipulation, retrieval, and optimization, and understand transaction management principles such as concurrency control, consistency, isolation, and durability.
- Analyze advanced database features like indexing, views, triggers, and stored procedures to enhance database functionality, security, and integrity.
- Develop problem-solving skills to design and manage databases for real-world applications, ensuring effective database recovery, security, and data protection.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**DBMS Lab: Installation and Basic Operations:** • Installation and exploration of DBMS tools (e.g., MySQL, Oracle, or PostgreSQL). • Create a basic database and perform simple operations (e.g., create,insert, update, delete).	8
II	**Database Design and ER Diagrams:** • Design ER diagrams for small real-world applications (e.g., Library System, Student Management System).	8

	• Create tables from ER diagrams.	
III	**Write SQL queries for:** • Table creation and modification. • Data insertion, deletion, and updating. • Querying data with filters and sorting. • Joining multiple tables.	10
IV	**Database Normalization and Schema Design:** • Normalize given datasets to remove redundancy and anomalies. • Identify keys and dependencies in sample schemas.	8
V	**Transaction Management and Locking Mechanisms in SQL:** 1. Simulate transaction operations (commit, rollback). 2. Demonstrate locking mechanisms using SQL.	8
VI	**Indexing and File Organization Techniques for Query Optimization:** • Create indexes on tables to optimize query performance. • Demonstrate the use of different file organization techniques.	8
VII	**Database Security and User Management:** • Create user accounts and assign privileges. • Implement basic database security using roles and permissions. • Demonstrate database backup and restore operations.	05
VIII	Take Any Case Study from the following	05
a)	Case Study-1: Employee database – 'Create' employee table, 'Select' and display an employee matching a given condition, 'Delete' duplicate records, delete rows using triggers, insert and update records, find net salary, etc.	
b)	Case Study-2: Visitor Management database	
c)	Case Study-3: Students Academic database	
d)	Case Study-4: Inventory Management System database	
e)	Case study-5: Bank Operations database	

REFERENCES:

1.	Sergey Skudaev, Learn SQL By Examples,
2.	Ivan Bayross, SQL, PL/SQL – The Programming Language of Oracle, BPB
3.	Brandon Cooper, SQL: The Ultimate Beginner's Step-by-Step Guide to Learn SQL Programming with Hands-On Projects, El-Gorr International Consulting Limited

LIST OF EQUIPMENTS:

Hardware : i) Windows based Server
ii) Stand alone PC
(for detail, please refer Annex – I)
* Connected in Client Server environment.

Software : i) Oracle & JDeveloper/IDS Oracle

PR:3- COMPUTER NETWORKS LAB

L	T	P	Total Marks: 50	Course Code: CSEPC 212/PR3	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	: 15
				Progressive Assessment	: 35
Pre-Requisite		**: Nil**			
Credit		**: 2**		Category of Course	: PC

RATIONALE:

This course introduces the fundamental concepts of computer networking, covering key topics such as network architecture, protocols, and communication models. It progresses to advanced topics like network security, routing algorithms, and emerging technologies in networking. The course emphasizes the design, implementation, and troubleshooting of networks in real-world scenarios. The goal is to provide students with a comprehensive understanding of how computer networks operate, enabling them to build, manage, and secure efficient communication systems across diverse platforms.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe the different types of networks (LAN, MAN, WAN) and understand their respective components (routers, switches, NICs).
- Explain the OSI and TCP/IP models, mapping the corresponding protocols and devices to each layer.
- Perform basic networking tasks such as measuring transmission speeds, configuring cables (Ethernet, UTP, STP), and setting up wireless networks using Wi-Fi devices.
- Analyze the performance characteristics of different network topologies (latency, throughput).
- Design network configurations using various protocols (Ethernet, WLAN, Bluetooth) and network devices (NICs, routers, switches), and troubleshoot issues to ensure seamless communication.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Showing various types of networking cables and connectors, identifying them clearly	4
II	Looking at specifications of cables and connectors of various companies on Internet, find out differences.	8
III	Making patch cords using different types of cables and connectors - crimping, splicing, etc.	8
IV	Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals	8

V	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc	8
VI	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.	8
VII	Setting up a small wired LAN in the Lab	8
VIII	Setting up a small wireless LAN in the Lab	8

REFERENCES:

1.	Andrew S. Tanenbaum, Computer Networks, 6th Edition, Pearson India, India, 2022.
2.	Behrouz A. Forouzan, Computer Networks: A Top-Down Approach, 1st Edition, McGraw-Hill Education, India, 2012.
3.	Sanjay Sharma, Computer Networks, 6th Edition, S.K. Kataria & Sons, New Delhi, India, 2013 (Reprint 2022).
4.	Bhushan Trivedi, Computer Networks, 1st Edition, Oxford University Press, India, 2011.
5.	Dr. Bhavana P. Shrivastava & Mr. Ajay Sharma**,** Basics of Computer Networks, 1st Edition**,** Mahi Publication**,** India**,** 2023**.**

TH:4(a)- MICROPROCESSOR AND MICROCONTROLLER

L	T	P		
3	0	0		**Course Code: CSEPE 202A/ TH4A**
Total Contact Hrs: 45				**Theory Assessment**
Theory: 45			**Total Marks = 100**	End Term Exam: 70
Tutorial: 0				Progressive Assessment: 30
Practical: 0				
Pre-requisite: NIL				
Credit: 3				**Category of Course: PE**

RATIONAL: The course Microprocessor and Microcontroller is designed to explain the concept of single chip computer with minimum hardware peripherals attached to execute programs. The students will understand the configuration of the Intel 8085 and 8086 microprocessors. The student will also learn how to do assembly level programming using these microprocessors including memory and I/O interface. This course will also provide details of microcontroller.

LEARNING OUTCOMES: After competing this course, student will be able to:

- Demonstrate the internal architecture of Microprocessor.
- Demonstrate Assembly Level Language Programming
- Exhibit interfacing with memory, IO and peripheral devices
- Exhibit microcontroller architecture and its instruction set.

DETAILED COURSE CONTENT:

UNIT NO.	TOPIC / SUB-TOPIC	ALLOTED TIME (HRS.)
I	**Introduction to Microprocessor** • Evolution of Microprocessors, • Specific features of Microprocessors, • Application in our daily life (a few examples)	3
II	**Internal architecture of a microprocessor (using block diagram)** • Explanation of each block in brief, • Concept of bus structure, • Register-to-register transfer, • Communication with I/O and memory (This part can be explained using the specific microprocessors like 8085 or 8086/8088). • Pin details of 8085 and 8086/8088 CPU and their functions in brief	6
III	**Addressing modes in general (may be limited to 8085 and 8086/8088 CPU)** • Instruction cycles, • Instruction set, • timing diagram (may be limited to 8085 and 8086/8088 CPU). Concept of assemblers and compilers	4

IV	**Interfacing of Memory and I/O devices** • Concept of address space, address/data bus demultiplexing, • Address and data bus buffering, address decoding, • I/O concepts, • Memory interfacing concept of I/O mapped I/O and memory mapped I/O. • Interrupts - Types of interrupts, Hardware and software data transfer schemes - Synchronous, asynchronous and interrupt driven.	5
V	**Assembly Language Programming:** (This part may be limited to the use assembly language of 8085 or 8086/8088 CPU) • Example for register to register, register to memory, memory to register, block of data movement from one area of memory to another, merging of two blocks of data, data block exchange. • Examples of arithmetic addition, subtraction, multiplication and division • Examples of searching and sorting (simple) • Examples using of look up tables • Use subroutines and delay programme.	10
VI	**Peripheral chips and their Interfacing:** • Functional description of 8255, 8253, 8251, 8257, 8237 and 8259. • Interfacing of these chips with some standard CPU. • Simple assembly language programme to explain the function of these chips.	6
VII	**Special Purpose Interfacing Devices and their Interfacing :** • Keyboard interfacing, • 7 segment and dot matrix display interfacing, • A/D and D/A interfacing, • Stepper motor interfacing	4
VIII	**Microcontroller** • Introduction to 8051 Microcontroller • 8051 Instruction Set and Programming • Hardware features of 8051 • Example of 8051 Interface	7
Total		**45**

REFERENCE BOOKS:

1. Microprocessor and Interfacing by Douglas V. Hall and SSSP Rao 3rd Edition TMH
2. Microprocessor by Ramesh S. Gaonkar, PHI
3. Introduction to Microprocessor – by A.P. Mathur, TMH
4. IBM PC & Clones by Govindraju, TMH

TH:4(b)- FOSS (FREE AND OPEN-SOURCE SOFTWARE)

L	T	P	Total Marks: 100	Course Code: CSEPE 202B/TH4B	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	: 70
				Progressive Assessment	: 30
Pre-Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PE

RATIONALE:

Free and Open-Source Software (FOSS) promotes software freedom by allowing users to freely use, modify, and distribute software. It fosters innovation, collaboration, and transparency by enabling community-driven development. By adopting FOSS, organizations can reduce costs, improve security, and contribute to a global ecosystem of shared knowledge.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the core principles of Free and Open-Source Software (FOSS) philosophy, its community, licensing models, and its benefits for software development.
- Apply Linux installation, hardware configuration, and system administration techniques to effectively manage Linux environments.
- Configure programming tools, databases, and version control systems to create and manage software projects in an open-source environment.
- Evaluate the significance of FOSS case studies in real-world applications, recognizing the impact and success of FOSS implementations across industries.
- Manage open-source software projects using version control, project management tools, and collaboration practices within the FOSS community.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**FOSS PHILOSOPHY:** Understanding the FOSS Community and FOSS Philosophy, Benefits of Community based Software Development, Guidelines for working with FOSS community Requirements for being open, free software, open-source software, FOSS Licensing Models, FOSS examples	11
II	**LINUX:** Linux Installation and Hardware Configuration, Boot Process, Dual-Booting Linux and other Operating Systems, Kernel Options during Boot, X Windows System Configuration, System Administration (Server Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server)	11

III	**Programming Tools and Techniques:** LibreOffice Tools; Samba: Cross platform, Introduction about LAMP, Brief Introduction, Database Management Systems Mysql, PostgreSQL or equivalent, Open Source UML Tools; Introduction to Mobile Programming, Version Control Systems like SVN, Git or equivalent, Project Management Tools; Bug Tracking Systems; Package Management Systems	11
IV	**FOSS CASE STUDIES:** Some example case studies of FOSS implementation	12

REFERENCES:

1.	Ellen Siever, Linux in a Nutshell, 6th Edition, O'Reilly Media, Sebastopol, 2009.
2.	K. Gopalakrishnan, Free and Open Source Software (FOSS), Scitech Publications, Chennai, 2014.
3.	N. B. Venkateshwarlu, Introduction to Linux: Installation and Programming, BS Publications, Hyderabad, 2005.
4.	Sandeep Koranne, *Open Source Software Development*, Narosa Publishing House, New Delhi, 2011.
5.	Vikas Kumar, Open Source Software: Concepts and Applications, BPB Publications, New Delhi, 2020.

TH:4(c)- BLOCKCHAIN

L	T	P		Course Code: CSEPE 202C/ TH4C	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	: 70
				Progressive Assessment	: 30
Pre-Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PE

RATIONALE:

The Blockchain course provides students with a foundational understanding of Blockchain technology, enabling them to explore decentralized applications and cryptographic principles. With the growing demand for Blockchain in various industries, this course prepares students for real-world problem-solving through hands- on experience in developing smart contracts, digital wallets, and decentralized applications (dApps). Students will gain insights into how Blockchain is transforming industries like finance, healthcare, and supply chain management.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe the core concepts of Blockchain technology, including its architecture, consensus mechanisms, and cryptographic foundations.
- Develop smart contracts on the Ethereum network using Solidity, and implement decentralized applications (dApps).
- Apply Blockchain to real-world applications, such as cryptocurrency, supply chain management, and identity verification.
- Manage private Blockchain networks using development tools like Ganache, Truffle, and Hyperledger.
- Apply techniques such as Zero Knowledge Proofs (ZKPs) to enhance data confidentiality.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Blockchain:** Definition of Blockchain and its components (Blocks, Chain, Nodes). History and evolution of Blockchain technology. Understanding Distributed Ledger Technology (DLT), Key features of Blockchain: Decentralization, Transparency, Immutability, Use cases of Blockchain in various industries: Finance, Supply Chain, Healthcare.	9
II	**Blockchain Architecture:** Blockchain structure: Blocks, Transactions, Cryptographic Hashing, Merkle Trees, Consensus	9

	mechanisms: Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS). Peer-to-Peer (P2P) network architecture. Blockchain nodes: Full nodes, Light nodes, Mining nodes, Smart Contracts and their role in Blockchain.	
III	**Cryptography in Blockchain:** Cryptographic Hash Functions: SHA- 256 and its importance in Blockchain, Public and Private Keys: Digital signatures and their role in Blockchain transactions, Symmetric vs Asymmetric Encryption. Blockchain security and confidentiality through cryptography, Digital Wallets: Hot Wallets, Cold Wallets	9
IV	**Consensus Algorithms:** Consensus Mechanism Overview: Proof of Work, Proof of Stake, Proof of Authority, Mining and Block Validation Blockchain forks: Hard forks, Soft forks, Case Study: Bitcoin's Proof of Work and Ethereum's Proof of Stake	9
V	**Ethereum and Smart Contracts:** Overview of Ethereum Blockchain. Introduction to Smart Contracts: Definition, Benefits, and Working, Ethereum Virtual Machine (EVM), Developing and deploying smart contracts using Solidity, Gas and Gas Limit in Ethereum, Use cases of Ethereum and Smart Contracts in real-world applications.	9

REFERENCES:

1.	Imran Bashir, Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, 1st Edition, Wiley, Hoboken, 2017.
2.	Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps, 1st Edition, Apress, New York, 2017.
3.	Arshdeep Bahga and Vijay Madisetti, Blockchain Applications: A Hands-On Approach, 1st Edition, VPT, India, 2018.
4.	Mayukh Mukhopadhyay, Ethereum Smart Contract Development: Build Decentralized Applications with Solidity, 1st Edition, Packt Publishing, Birmingham, 2018.

TH:5(a)- INFORMATION SECURITY

L	T	P		Course Code: CSEPE 204A/TH5A	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	: 70
				Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PE

RATIONALE:

The Information Security course is designed to equip students with the knowledge and skills to protect digital information from unauthorized access, attacks, and disruptions. By covering essential topics like cryptography, network security, and risk management, students will understand the importance of securing both systems and data. This course fosters a practical understanding of securing information in an increasingly interconnected world.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe key principles of information security, including confidentiality, integrity, and availability.
- Describe common cryptographic techniques such as symmetric and asymmetric encryption, hashing, and public key infrastructure.
- Explain network security threats, such as malware, DoS, and phishing.
- Demonstrate the ability to implement secure web applications by applying best practices to prevent vulnerabilities like SQL injection, XSS, and CSRF.
- Analyze the security posture of operating systems by developing security policies, incident response strategies.
- Evaluate emerging security challenges in modern technologies such as IoT, cloud computing, and mobile applications.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Information Security:** Definition of Information Security, Importance of Information Security in the digital age, Key principles of Information Security: Confidentiality, Integrity, and Availability (CIA Triad), Types of security threats and attacks (e.g., malware, hacking, phishing, DoS), Security policies and best practices, Risk management and mitigation strategies, Overview of security standards (ISO/IEC 27001, NIST)	8

II	**Cryptography:** Introduction to Cryptography and its importance in information security, Symmetric vs Asymmetric cryptography, Common cryptographic algorithms: DES, AES, RSA, ECC, Hashing functions and digital signatures, Public Key Infrastructure (PKI), Certificates and encryption protocols (SSL/TLS)	8
III	**Network Security:** Protecting data during transmission and network-based attacks, Firewalls: Types and configuration, Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS), Virtual Private Networks (VPNs), Network Security Protocols: IPsec, SSL/TLS, HTTPS, Network vulnerabilities and defense techniques	8
IV	**Security in Operating Systems:** User authentication and access control (e.g., passwords, biometrics), File system security and encryption, OS security hardening techniques, Patch management and updates, Security auditing and monitoring	7
V	**Web Security:** Common web security threats (SQL injection, XSS, CSRF, etc.), Secure Web Application Development Practices, Secure HTTP headers and cookies management, Web application firewalls (WAF), Website security tools and testing (e.g., OWASP, penetration testing)	7
VI	**Security Policies and Incident Response:** Designing security policies (access control, data protection), Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP), Incident response lifecycle (identification, containment, eradication, recovery), Forensics and evidence gathering, Legal and ethical considerations in information security	7

REFERENCES:

1.	Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 6th Edition, Cengage Learning, Boston, 2020.
2.	William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 4th Edition, Pearson Education, India, 2018.
3.	William Stallings, Network Security Essentials, 6th Edition, Pearson Education, India, 2017.
4.	Mark Ciampa, Security+ Guide to Network Security Fundamentals, 6th Edition, Cengage Learning, Boston, 2018.

TH:5(b)- MULTIMEDIA TECHNOLOGIES

L	T	P	Total Marks: 100	Course Code: CSEPE 204B/TH5B	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	: 70
				Progressive Assessment	: 30
Pre-Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PE

RATIONALE:

Multimedia Technologies is one of the important application areas of Computer Science & Engineering. An introductory course on this area is indispensable for the budding Computer Professionals in today's world.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain multimedia concepts, including hardware, software, operating systems, and communication systems.
- Apply compression techniques for audio and video using lossy and lossless algorithms.
- Develop multimedia content using desktop publishing and animation tools.
- Describe digital imaging concepts, including graphic design and digital image processing.
- Explore techniques for multimedia content distribution and special effects creation.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Multimedia** - Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia Operating Systems, Multimedia Communication System	10
II	**Basic Compression Techniques** - Video and Audio Data Compression Techniques - Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265	10
III	**Content Development and Distribution** - Desktop publishing (Corel Draw, Photoshop, PageMaker) - Multimedia Animation & Special Effects (2D/3D Animation, Flash)	12
IV	**Introduction to Digital Imaging** - Basics of Graphic Design and Use of Digital Technology - Definition of Digital Images - Digital Imaging in Multimedia	13

REFERENCES:

1	An Introduction to Multimedia Authoring, A. Eliens
2	Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew
3	Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4	Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

TH:5(c)- INTELLIGENT COMPUTING

L	T	P		Course Code: CSEPE 204C/TH5C	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	: 70
				Progressive Assessment	: 30
Pre-Requisite		**: Nil**			
Credit		**: 3**		Category of Course	: PE

RATIONALE:

Intelligent Computing explores advanced computing techniques inspired by artificial intelligence, machine learning, and data-driven decision-making. This course introduces students to fundamental concepts such as neural networks, evolutionary computing, and fuzzy logic, enabling them to develop intelligent systems. By understanding these techniques, students will be able to design and implement AI-driven solutions for real-world problems.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the fundamental concepts of intelligent computing, including neural networks, evolutionary algorithms, and fuzzy logic.
- Apply intelligent computing techniques to solve real-world computational problems.
- Analyze different AI models and evaluate their effectiveness for various tasks.
- Develop intelligent computing solutions using tools like TensorFlow, Keras, and other AI frameworks.
- Evaluate the performance of intelligent computing techniques and optimize them for specific applications.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Intelligent Computing:** Definition and Scope of Intelligent Computing, Evolution of Intelligent Systems, Applications of Intelligent Computing, Difference Between Symbolic AI and Statistical AI, Basics of Computational Intelligence.	9
II	**Fuzzy Logic and Evolutionary Computing:** Introduction to Fuzzy Systems and Fuzzy Sets, Fuzzy Inference Systems and Membership Functions, Applications of Fuzzy Logic in Control Systems, Genetic Algorithms: Basics and Applications.	9

III	**Fundamentals of Machine Learning:** Introduction to Supervised, Unsupervised, and Reinforcement Learning, Data Preprocessing and Feature Engineering, Basic Regression and Classification Algorithms, Model Evaluation Metrics (Accuracy, Precision, Recall, F1-score).	9
IV	**Natural Language Processing (NLP) and Expert Systems:** Basics of NLP: Tokenization, Stemming, Lemmatization, Named Entity Recognition and POS Tagging, Sentiment Analysis using NLP Techniques, Introduction to Expert Systems and Knowledge Representation	9
V	**Neural Networks and Deep Learning:** Basics of Artificial Neural Networks (ANN), Perceptron and Multilayer Perceptron (MLP), Activation Functions and Backpropagation, Introduction to Convolutional Neural Networks (CNNs), Introduction to Recurrent Neural Networks (RNNs) and LSTMs	9

REFERENCES:

1	Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, New Jersey, 2020.
2	Elaine Rich, Kevin Knight, Shivashankar B. Nair, Artificial Intelligence, 3rd Edition, McGraw-Hill, New York, 2009.
3	Simon Haykin, Neural Networks and Learning Machines, 3rd Edition, Pearson, Boston, 2008.
4	Christopher M. Bishop, Pattern Recognition and Machine Learning, 1st Edition, Springer, Berlin, 2006.
5	Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, New Jersey, 2020.

PR:4- MINOR PROJECT

L	T	P		Course Code: PR 202	
0	0	4			
Total Contact Hours			**Total Marks: 100**	**Laboratory Assessment**	
Theory		: 60Hrs		End Term Exam	: 30
				Progressive Assessment	: 70
Pre Requisite		**: Nil**			
Credit		**: 2**		Category of Course	: Project

RATIONALE:

A Minor project is generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilisation of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

○ Minimum three and maximum five students can form a group for the minor project.
○ Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey. • Solution for society/industry problems
○ Project domain may not be limited to the specific area / discipline.
○ Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P	Total Marks: 100	Course Code: AU 202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 30Hrs		End Term Exam	: 0
				Progressive Assessment	: 0
Pre Requisite		**: Nil**			
Credit		**: 0**		Category of Course	: AU

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

After completion of the course, the students will be able to**:**

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha.	7
II	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Governmentto harness TK.	7

III	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 andRules 2004, the protection of traditional knowledge bill, 2016.	6
IV	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	4
V	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	6

REFERENCES:

1.	Cultural Heritage of India- Course Material by V. Sivaramakrishna Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2.	Modern Physics and Vedant by Swami Jitatmanand, Bharatiya Vidya Bhavan.
3.	The wave of Life by Fritzof Capra
4.	Tao of Physics by Fritzof Capra
5.	Tarkasangraha of Annam Bhatta, Inernational by V N Jha Chinmay Foundation, Velliarnd, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices by RN Jha Vidyanidhi Prakasham, Delhi, 2016