NEP-2020 Aligned Curriculum for

Three Year (Six Semesters) Diploma Programme in

COMPUTER SCIENCE AND ENGINEERING

For the State of Uttar Pradesh

(3rd to 4th Semester)

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Semester System

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Prepared By:

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THIRD SEMESTER

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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of 42 diploma programmes as per the needs of the industry and making them NEP-2020/AICTE compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

F.R. Khan
Director
Institute of Research Development & Training
Kanpur

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3. All the participants from industries, Polytechnics and other technical institutions for their professional inputs during curriculum workshops.

4. CDC Officer and other concerning staff of IRDT for their support and assistance in conducting curriculum workshops.

5. In the last but not least would like to thanks management of the industries who spare not only their precious time but also allowed the visit of their industries to the team making the curriculum.

Shyam Lal
Text Book Officer/Course Coordinator
IRDT Kanpur

SALIENT FEATURES

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1)	Name of the Programme	:	Diploma in Computer Science and Engineering
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent NEP-2020/NSQF Level-4 as Prescribed by State Board of Technical Education, U.P.
4)	Pattern of the Programme	:	Semester Pattern
5)	NSQF Level	:	Level - 5
6)	Ratio between Theory and Practical	:	40: 60 (Approx.)

1) **Industrial Training**

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6^{th} Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

2) **Ecology and Environment**

As per Govt. of India directives a subject on Environmental Science has been incorporated in the curriculum.

3) **Entrepreneurship and Start-ups**

A full subject Entrepreneurship & Start-ups has been incorporated in the curriculum.

4) **Student Centred Activities**

A provision of Minimum 4 hrs per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self-study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS, library and other cultural activities.

5) **Project work**

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2- PROGRAM OUTCOMES (POs)

PO1: Basics and Discipline specific Knowledge
Assimilate knowledge of basic mathematics, science, engineering fundamentals.

PO2: Problem's Analysis and solution
Identify, analyse and solve problems using standard methods and established techniques.

PO3: Design and Development
Design solutions for technical problems.
Assist in designing components, systems, or processes to meet specific requirements.

PO4: Engineering Tools, Experimentation, and Testing
Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

PO5: Socio/ Economic /Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

PO6: Project Management and Communication
Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

PO7: Lifelong Learning
Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

3- **EMPLOYMENT OPPORTUNITIES –**

Diploma holders in Computer Science and Engineering can find employment in the following divisions:

1. Service Division (IT-enabled services, maintenance service, and installation of computer services)
2. Assembly and Quality Control Division
3. Software Development and Testing Industries
4. Web Development Industries
5. Mobile Applications Development
6. Junior Level Data Analytics
7. Industry Automation
8. E-Commerce Support Engineer
9. News and Newspaper Agencies, Magazines
10. Data Entry and MIS/ERP Operator
11. Lab Assistant/Technician
12. Hospitals/Healthcare Institutions/Schools
13. Cloud Services Support Engineer
14. Publishing Industry
15. Animation Industry
16. Data Processing Industry
17. Marketing Division (Corporate Handling, SME, Institutional Segment, Government Tender Business)
18. Telecommunication Sector
19. Teaching Organizations (Polytechnics, Vocational Institutions, etc.)
20. Networking (LAN, WAN, etc.)
21. Defence Services, Police Services, Cyber Services, Forensic Services
22. Call Centres, BPO, etc.

While in employment, diploma holders in Computer Science and Engineering can engage in the following areas of activity across various organizations (industry and service sector):

- Assembly and installation of computer systems, peripherals, and software
- Programming customer-based applications, including webpage design
- Testing and maintenance of computer systems
- Marketing of software and hardware
- Teaching and training at educational institutions
- Self-employment opportunities in call centers, BPO, EPO, etc.
- Network installation and maintenance
- Cyber Cafés

Various Designations for Diploma Holders in Computer Science and Engineering

1. Service Engineer / Customer Support Engineer / Maintenance Engineer in installation, maintenance, and service of computer systems and networking
2. Assembly Supervisor in manufacturing and production activities
3. Data Entry Operator / Computer Operator / DTP Operator / Technician
4. Technical Assistant / Junior Engineer in quality control and testing activities for computer systems manufacturing
5. Junior Marketing Executive / Junior Sales Executive / Sales Engineer in marketing activities
6. Junior/Senior Technical Assistant in R&D laboratories and educational institutions, assisting in maintaining computers and networks
7. Test Engineer in process industries

4- Learning Outcomes

After undergoing this programme, students will be able to:

1. To enable Communicate effectively in English.
2. Apply basic principles of mathematics and physics to solve engineering problems.
3. Use cutting tools, equipment, and tools for fabrication of jobs by following safe practices at the workplace.
4. Fundamentals of Artificial Intelligence.
5. Work on different software for word processing, PowerPoint presentations, spreadsheets, and communicate ideas electronically.
6. Use electronic instruments to measure various engineering parameters.
7. Assemble, troubleshoot, and maintain computers and peripherals; install various software.
8. Use appropriate procedures for energy conservation and for preventing environmental pollution.
9. Design page layouts for digital and electronic publications by combining different media elements.
10. Write, compile, and debug programs using different programming constructs.
11. Identify the software process model for specific software applications and interpret different phases of the software development lifecycle.
12. Create, manage, and secure databases.
13. Design multimedia graphics and create scripts for multimedia animations using authoring tools.
14. Design, develop, and host websites using internet technologies.
15. Plan and execute given tasks and projects as a team member or leader.
16. Manage resources (NIS/ERP) effectively at the workplace.
17. Implement OOP concepts and data structure concepts.
18. Use various functions and components of different operating systems.
19. Set up, diagnose problems, troubleshoot computer networks, and maintain security of the networks.
20. Write and debug simple as well as complex programs in Python, PHP, or R.
21. Use various mobile technologies and their applications in different scenarios.
22. Use and implement various services on cloud such as SaaS, PaaS, and IaaS.
23. Apply acquired knowledge and skills in solving live problems in the computer and IT industry.
24. Demonstrate appropriate values and attitude.
25. Apply statistical tools for data analysis and report generation.
26. Maintain hardware and software.
27. Perform data backups.
28. Develop mobile applications.
29. Use open-source tools and software.
30. Manage cloud applications.
31. Set up and troubleshoot networks.
32. Handle malware and viruses.
33. Install and manage operating systems and application software.
34. Perform network cable and fiber optic troubleshooting.
35. Set up IoT devices and wireless networking.
36. Use digital marketing tools.

5- ABSTRACT OF CURRICULUM AREAS

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

- *Communication Skills in English*
- *Sports and Yoga*
- *Entrepreneurship and Start-ups*

BASIC SCIENCES COURSE [BS]

- *Mathematics*
- *Applied Physics*
- *Applied Chemistry*

ENGINEERING SCIENCE COURSES [ES]

- *Engineering Graphics*
- *Engineering Workshop Practice*
- *Introduction to IT Systems*
- *Fundamentals of Electrical & Electronics Engineering*
- *Engineering Mechanics*

PROGRAM CORE COURSES [PC]

- Operating Systems
- Data base Management System
- Computer Network
- Web Technologies
- Computer Programming Using C
- Data Structures using C
- Software Engineering
- Introduction to e- Governance
- Scripting Languages (Python)
- Object Oriented Programming using Java
- Internet of Things

PROGRAM ELECTIVE COURSES [PE]

Program Elective -1

- Computer System Organization
- Free and Open Source Systems (FOSS)

Program Elective-2

- Mobile App Development
- Multimedia Technologies

OPEN ELECTIVE COURSES [OE]

Open Elective -1

- Project Management
- Industrial Robotics

Open Elective-2

- Product Design
- Engineering Economics & Accountancy
- Artificial Intelligence and Machine Learning

- **Open Elective-3**
- Disaster Management
- Renewable Energy Technology
- Industrial Automation and Manufacturing System

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

- Summer Internship – I (3-4 weeks) after IInd Sem
- Summer Internship – II (4-6 weeks) after IVth Sem
- Major Project(In-House) / Internship / Industrial Training

AUDIT COURSES [AU]

- Environmental Science
- Essence of Indian Knowledge and Tradition
- Indian Constitution

6- STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMMEIN COMPUTER SCIENCE AND ENGINEERING

NOTE: I & II Sem. is common to all engineering & technology branches and implemented from the session 2024-2025

THIRD SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	Category & Course Type	STUDY SCHEME Periods /Week			Credits(C) (L+T)+P = C	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	Operating Systems	Prog Core (Theory)	3	-	-	3+0=3	40	-	**40**	60	03	-	-	**60**	**100**
3.2	Data base Management System	Prog Core (Theory)	3	-	-	3+0=3	40	-	**40**	60	03	-	-	**60**	**100**
3.3	Computer Network	Prog Core (Practicum)	2	-	4	3+1=4	40	-	**40**	60	03	-	-	**60**	**100**
3.4	Web Technologies	Prog Core (Practicum)	1	-	4	1+2=3	-	60	**60**	-	-	40	03	**40**	**100**
3.5	Operating Systems (Lab)	Prog Core (Practical)	-	-	2	0+1=1	-	60	**60**	-	-	40	03	**40**	**100**
3.6	Data base Management System (Lab)	Prog Core (Practical)	-	-	4	0+2=2	-	60	**60**	-	-	40	03	**40**	**100**
3.7	Computer Programming Using C	Prog Core (Practicum)	1	-	4	1+2=3	-	60	**60**	-	-	40	03	**40**	**100**
3.8	**Summer Internship -I (4 Weeks after 2nd Sem.)		-	-	-	2	-	50	**50**	-	-	-	-	**-**	**50**
# Student Centred Activities (SCA)			-	-	8	-	-	50	50	**-**	-	-	-	**-**	**50**
TOTAL			**10**	**-**	**26**	**21**	**120**	**340**	**460**	**180**		**160**		**340**	**800**

** SUMMER INTERNSHIP (4-6 WEEKS) duration to be organized after second semester exam. Evaluation will be in third semester.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, library, Cultural Activities and self-study etc.

1) Each period will be 60 minutes duration.

2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.

FOURTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr.No.	SUBJECTS	Category & Course Type	STUDY SCHEME Periods/Week			Credits(C) (L+T)+P = C	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	Data Structures using C	Prog Core (Theory)	3	-	-	3+0=3	40	-	**40**	60	03	-	-	**60**	**100**
4.2	Software Engineering	Prog Core (Practicum)	2	-	4	3+1=4	40	-	**40**	60	03	-	-	**60**	**100**
4.3	Introduction to E-Governance	Prog Core (Theory)	2	-	-	2+0=2	40	-	**40**	60	03	-	-	**60**	**100**
4.4	Program Elective -1	Prog Elective (Theory)	3	-	-	3+0=3	40	-	**40**	60	03	-	-	**60**	**100**
4.5	(Q) Open Elective -1 **OR**	Open Elective (Theory)	2	-	-	2	50*	-	-	-	-	-	-	-	-
	*Advance Skill Development	Open Elective Certification Course	-	-	-		-	-	-	-	-	-	-	-	-
4.6	Data Structures using C	Prog Core (Practical)	-	-	4	0+2=2	-	60	**60**	-	-	40	03	**40**	**100**
4.7	Scripting Languages (Python)	Prog Core (Practicum)	1	-	4	1+2=3	-	60	**60**	-	-	40	03	**40**	**100**
4.8	(Q) Essence of Indian Knowledge and Tradition	Audit Courses (Qualifying)	4	-	-	-	50*	-	-	-	-	-	-	-	-
Student Centred Activities (SCA)			-	-	7	-	-	50	**50**	-	-	-	-	-	**50**
TOTAL			**17**	-	**19**	**19**	**160**	**170**	**330**	**240**	-	**80**	-	**320**	**650**

Note -(Q) - It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

Advance Skill Development:-

To fulfill the requirements for Advanced Skill Development, a minimum of 20 hours of skill certification is necessary. This certification must be obtained from a recognized national or international agency or institute. The assessment and certification process will be conducted by the respective agency or institute. Students must present their certificate to earn 02 credits for this subject.

** SUMMER INTERNSHIP (4-6 WEEKS) duration to be organized after fourth semester exam. Evaluation will be in fifth semester.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, library, Cultural Activities and self-study etc

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LIST OF PROGRAM ELECTIVE COURSES (PE-1)

Sr No	Course Title	L	T	P	C
1	Computer System Organization	3	-	-	3
2	FOSS (Free and Open Source Software)	3	-	-	3

LIST OF PROGRAM ELECTIVE COURSES (PE-2)

Sr No	Course Title	L	T	P	C
1	Mobile App Development	3	-	4	5
2	Multimedia Technologies	3	-	4	5

LIST OF OPEN ELECTIVE COURSES(OE-1)

Sr No	Course Title	L	T	P	C
1	Project Management	2	-	-	2
2	Industrial Robotics	2	-	-	2

LIST OF OPEN ELECTIVE COURSES(OE-2)

Sr No	Course Title	L	T	P	C
1	Product Design	2	-	-	2
2	Engineering Economics & Accountancy	2	-	-	2
3	Artificial Intelligence and Machine Learning (TATA)	2	-	-	2

OR

OPEN ELECTIVE-1

SR.NO.	CERTIFICATE COURSES
1.	COURSES CONDUCTED BY CENTRE OF EXCELLENCE (ESTABLISHED BY THIRD PARTY AS: - TATA TECHNOLOGIES. etc)
2.	COURSES CONDUCTED BY INFOSYS PRINGBOARD
3.	COURSES CONDUCTED BY TCS ION
4.	COURSES CONDUCTED BY OTHER RELEVANT GOVERNMENT, INTERNATIONAL/NATIONAL ORGANIZATION OR PLATFORMS OF REPUTE
5.	COURSES CONDUCTED BY AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES
6.	COURSES CONDUCTED BY C-DAC
7.	COURSES CONDUCTED BY NEILIT

7- DETAILED CONTENTS

THIRD SEMESTER

THEORY	3.1 OPERATING SYSTEMS	L	T	P
		3	-	-

COURSE OBJECTIVES

A general introduction to various ideas in implementation of operating systems, particularly introduction to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Understand functional architecture of an operating system.

CO2: Understand process management and distinguish CPU scheduling algorithms.

CO3: Understand the concept of memory management.

CO4: Understand I/O System and distinguish Disk scheduling algorithms

CO5: Classify File System and directory implementations.

COURSE CONTENT

UNIT 1: Overview of Operating System (6 Periods)

Introduction, Different types of OS, Functions & Services of OS, UNIX/LINUX Architecture, Kernel, Services and systems calls, System programs.

UNIT 2: Process Management: (10 Periods)

Process concepts, Operations on processes, CPU Scheduling, Scheduling Algorithms, IPC, Process synchronization, critical section, Deadlock, Condition, Avoidance & Prevention.

UNIT 3: Memory Management: **(10 Periods)**

Memory allocation, First Fit, Best fit & Worst Fit, Swapping, Paging and Segmentation, Page faults, Page Replacement Algorithm, Fragmentation & Compaction, Concept of virtual Memory.

UNIT 4: I/O System: **(8 Periods)**

Mass storage structure - Overview, Disk structure, Disk attachment, Disk scheduling algorithms, swap space management, RAID types.

UNIT 5: File management: **(8 Periods)**

Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free- space management, efficiency and performance. Different types of file systems.

Reference Books:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited

2. UNIX Concepts and Applications, Sumitbha 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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted** **(Periods)**	**Marks Allocation** **(%)**
1.	06	14
2.	10	25

3.	10	25
4.	08	18
5.	08	18
Total	**42**	**100**

THEORY	3.2 DATA BASE MANAGEMENT SYSTEM	L	T	P
		3	-	-

COURSE OBJECTIVES

It covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Describe fundamentals of DBMS, its installation and working.

CO2: Understand the concept of keys and various data model.

CO3: Understand relational model and relational algebraic operations.

CO4: Designing a Relational Database

CO5: Apply SQL commands to create, insert, retrieve, update, delete data from the Relational databases.

COURSE CONTENT

UNIT 1: Introduction (6 Periods)

Database System Concepts and Architecture, Components of DBMS, Table Structure, Schema definition, ,Three views of Data (External View, Conceptual View, Internal View).

UNIT2: Data Model and Keys: (8 Periods)

Define data model, Data Models : Network Model Hierarchical Model, E-R Model, Advantage & Disadvantages of each Data Model, Concept of Keys (Primary, Candidate, Super, Foreign**),** Constraints, Strong Entity Set and Weak Entity Set.

UNIT 3: Relational Model: **(10 Periods)**

The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model mapping; Relational Algebra and Relational Calculus, Relations algebra (Basic operation: Union intersection difference and Cartesian product), Additional Relational Algebraic Operations (Projection, Selection rows, Division, rename and join)

UNIT 4: Relational Database Design : **(10 Periods)**

Functional dependencies and normalization for relational databases, Types of Normalization (1NF, 2NF, 3NF, multivalued dependencies and BCNF, Forth Normal Form, Fifth Normal Form).

UNIT 5: SQL/MySQL: **(8 Periods)**

MySQL data types – Data Definition Commands – Data Manipulation Commands – Data Retrieval Commands, Types of operators – Arithmetic, Comparison and Logical Operators

Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)

1.	06	10
2.	08	25
3.	10	25
4.	10	25
5.	08	15
Total	**42**	**100**

		L	T	P
PRACTICUM	**3.3 COMPUTER NETWORKS**	**3**	**-**	**2**

COURSE OBJECTIVES

Understand functioning of computer networks and popular networking protocols

COURSE OUTCOMES:

CO1: Explain the fundamental concepts of data communication.

CO2: Describe the functionalities of the physical layer and Data Link

CO3: Understanding the concept of IP address and key protocols of the Network Layer

CO4: Describe the functionalities of the transport layer.

CO5: Recognize various network devices and network management system.

COURSE CONTENT:

UNIT 1: Introduction : **(06 Periods)**

Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model;

Practical Exercise

1. Study of any Network simulation tool (Wireshark, Cisco Packet Tracer, NS-2, GNS3 etc)
2. To understand and practically observe how the data travels through OSI layers using network tools (Wireshark, Cisco Packet Tracer, NS-2, GNS3 etc)

UNIT 2: Data Communication and Communication Methodologies : **(10 Periods)**

Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer – design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques

(Circuit, Packet, Message)

Practical Exercise

1. Showing various types of networking cables and connectors, identifying them clearly
2. Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3. Making patch cords using different types of cables and connectors - crimping, splicing, etc
4. Demonstration of different type of cable testers, using them for testing patch cords pre- pared by the students in Lab and standard cables prepared by professionals

UNIT 3: Network Layer : **(10 Periods)**

Network Layer – design issues, example protocols (IPv4); Concept of IPV6, Routing principles / issues, algorithms (Distance - vector, Link-state) and protocols (RIP, OSPF);

Practical Exercise

1. Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc

UNIT 4: Transport Layer: **(08 Periods)**

Transport Layer – design issues, example protocols (TCP/UDP); Application Layer Protocols (SMTP, DNS)

Practical Exercise

1. TCP communication between two devices

UNIT 5: Network Devices **(08 Periods)**

Functioning of Network Devices – NIC, Hub, Bridge, Switch, Router, WiFi Devices; Network Management System and example protocol (SNMP).

Practical Exercise

1. Showing various networking devices – NICs, Hub, Bridge, Switch, Router, Gateway, WiFi access point, etc.
2. Looking at specifications of various networking devices various companies on Internet, find out differences.

REFERENCE BOOKS:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addision Wesley
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. Behrouz A Forouzan, Data Communications and Networking , Mc Graw Hill Publications.
7. Data Communication & Networking by Behrouz A. Forouzan 5th Edition
8. Cisco press books on CCNA
9. User manual of networking devices available in the lab
10. Wiki pages on networking devices

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	06	12
2.	10	25
3.	10	25
4.	08	25
5.	08	13
Total	**42**	**100**

PRACTICUM	3.4 WEB TECHNOLOGIES	L	T	P
		1	-	4

COURSE OBJECTIVES

This course will enable the students to understand and develop competency amongst the students to design professional database backed dynamic and feature based web sites. The course covers the use of programming with PHP applications. The main objective for this course is to motivate student's interest in learning Web-app development by giving them an insight into its possibilities through practical applications. In addition, the course also provides a sufficiently broad but practical introduction to Server-side web technologies.

COURSE OUTCOMES

At the end of the course students will be able to
CO1: Analyze a webpage and identify its elements and attributes.

CO2: Create webpages using HTML

CO3: Using Cascading Style Sheets to create webpages.

CO4: Build dynamic webpages using JavaScript (Client-side programming).

CO4: Build dynamic webpages using PHP (Server-side programming).

COURSE CONTENT

Unit 1: Web Development Introduction (2 Periods)

WWW, Internet, Browser, Search engine Client Server Model, URL, Web Pages, Website and Web Services, Types of Websites (Static, Dynamic and Responsive), Developer options of Browser (View page source, Developer Tools, Inspect Element etc)

Practical Exercise:

1. Install, configure and start using developer tools /Code Editor/Browser.
2. *Pick any three websites and categorize them as Static, Dynamic, or Responsive with reasons for your classification*
3. *List the 5 web browser and search engine .*
4. *Open any website using Chrome Developer Tools. Modify the text and background color of a paragraph and take a screenshot.*

Unit 2: HTML Basics (3 Periods)

HTML Document, Basic Structure of HTML, Syntax, HTML Tags and Attributes, Types of HTML Tags, Rules of nesting, Basic Tags (HTML Tag. Head Tag, Title Tag, Body Tags).

Page Formatting: Adding a new Paragraph, Adding a line break, Inserting a blank space, changing page background, Div and Span tags

Text Formatting: Html Headings, Formatting elements (<b> Bold text, Important text,<i> Italic text, Emphasized text, <mark> Marked text, <small> Small text, <del> Deleted text, <ins>

Inserted text, <sub> Subscript text, <sup> Superscript text), Comments, Horizontal Lines

Creating Lists: Ordered List, Unordered Lists, Definition Lists Others: Images, Text Links, Image Links, opening a page in New Window or Tab, Linking to an area of same page, Introduction to Table Tags, Frames & I frame, HTML Forms

Practical Exercise:

1. Create an HTML file that contains your name, a brief bio, an image, and a list of hobbies.
2. Design an HTML table listing five products with their names, prices, and descriptions. Add proper column headers and styling.
3. Build an HTML form with fields for name, email, message, radio buttons for gender, a checkbox for subscribing to newsletters, and a submit button.

Unit 3: Cascading Style Sheets (3 Periods)

Introduction, Benefits of CSS, CSS Syntax, CSS Implementation (inline, internal and external), CSS Selectors (ID Selectors, Class Selectors, Grouping Selectors, Universal Selectors, CSS Pseudo-classes), CSS properties (background-color, background-image, border-style, height, width, color, text-align, font-family, font-style, font-size, font- weight), Box Model in CSS (margin, border, padding)

Practical Exercise:

1. Create an HTML file and use CSS to style elements using element selectors, class selectors, ID selectors, and pseudo-classes.
2. Create a navigation bar using Flexbox. The navigation bar should contain a logo and several navigation links, evenly spaced and aligned.
3. Create a webpage layout using CSS Grid. The layout should have a header, a sidebar, a main content area, and a footer..

Unit 4: Java Scripts (3 Periods)

Java Script Introduction , variables , data types , operators, control flow (if-else, for loop, while loop, do-while loop), Declaring Functions, Calling functions with parameters, Adding JavaScript to Web Documents, JavaScript Objects, Document Object Models, HTML Events and calling Java Script functions on Events.

Practical Exercise:

1. Write a JavaScript program that checks a user's input password and categorizes it as Weak, Medium, or Strong based on length.
2. Validate a form to ensure that the user has entered a valid email and password (minimum 8 characters, at least one number).

Unit 5: PHP (3 Periods)

Server side scripting, Arrays, function and forms, advance PHP Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table-names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs.

Practical Exercise:

1. Practicing PHP: Basics
2. Practicing PHP: Web Development Application
3. Practicing PHP: MySqL
4. Installation of WAMP/XAMPP Server

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	02	10
2.	03	25
3.	03	15
4.	03	25
5.	03	25
Total	**14**	**100**

PRACTICAL	3.5 OPERATING SYSTEMS (Lab)	L	T	P
		-	-	2

COURSE OBJECTIVES

A general introduction to various ideas in implementation of operating systems, Introduction to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Understand installation of operating system.

CO2: Understand process management and distinguish CPU scheduling algorithms.

CO3: Understand the concept of memory management.

CO4: Understand I/O System and distinguish Disk scheduling algorithms

CO5: Classify File System and directory implementations.

S.No. **NAME OF EXPERIMENT**

1. Practice of various Linux/ Unix commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir, etc.

   Format and Install Windows Operating System.

2.

Use Task Manager to monitor and terminate processes.
Understand process priorities.

3.

4. Simulate the following CPU scheduling algorithms.
   a) FCFS b) SJF c) Round Robin d) Priority.

5. Simulate the concept of Dining-philosophers problem.

6. Simulate Bankers Algorithm for Deadlock Avoidance

7. Simulate Bankers Algorithm for Deadlock Prevention

8. Write a program to simulate the following contiguous memory allocation Techniques
   a) Worst fit b) Best fit c) First fit.

9. Simulate all page replacement algorithms
   a)FIFO b) LRU c) OPTIMAL

10. Write a program to simulate disk scheduling algorithms.
    a) FCFS b) SCAN c) C-SCAN

11. Simulate all File Organization Techniques
    a) Single level directory b) Two level directory

12. Simulate all file allocation strategies
    a) Sequential b) Indexed c) Linked.

PRACTICAL	3.6 DATA BASE MANAGEMENT SYSTEM (Lab)	L	T	P
		-	-	4

COURSE OBJECTIVES

It covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Installation of database system.

CO2: Creating an database.

CO3: Record handling in a database.

CO4: Retrieving data from a database

CO5: Handle various operations of a database through case studies

S.No.	NAME OF EXPERIMENT
1.	Install and configure a database system (MySQL through XAMPP Server, MySQL, PostgreSQL, or SQLite)

Design an ER Model for a Library Management System

2.

Study of the different properties present in an ER Model

3.

Creating Database

4.
Creating a database
Creating a table
Specifying relational data types
Specifying constraints
Creating indexes

Table and Record Handling

5.
INSERT statement
Using SELECT and INSERT together
DELETE, UPDATE, TRUNCATE Statement.
DROP, ALTER statement

Retrieving Data From a Database The SELECT statement

6.
Using the WHERE clause
Using Logical Operators in the WHERE clause
Using In, BETWEEN, LIKE, ORDER BY, GROUP BY & HAVING clause
Using Aggregate Functions
Combining Tables Using JOINS

Case Study 1: SQL -_Library Management System

Scenario:

7. An institute manges a Library Management System with following column BookID, Title, Author_Name, Year_of_publication, Publisher_name, Subject, MemberID, (You may add other fields also)

Task:

Design and implement a database for a library management system.
The library wants to track information about its books, members, authors, and publishers.

1. Retrieve the names of all books with specific author “A”
2. Retrieve the names of books of particular subject “X”
3. Decrease the book count by 1 from the table for BookID =”101”
4. Add a new member in the database

Case Study 2: SQL – Employee Database

8.
Scenario:
An organization maintains an employee database with the following columns: EmployeeID,

FirstName, LastName, Department, Salary, JoiningDate.

Task:

1. Retrieve the names of all employees in the "Sales" department.
2. Find all employees who joined after January 1, 2020.
3. Update the salary of employee EmployeeID = 102 by 10%.
4. Delete an employee record where EmployeeID = 105.

Case Study 3: SQL – Bookstore Inventory

Scenario :

9. **A bookstore stores information about books in the following columns: BookID, Title, Author, Price, Genre, StockCount.**

Task:

1. List all books in the "Science Fiction" genre.
2. Find all books priced greater than 200.
3. Increase stock count by 5 for all books authored by "John Doe".
4. Remove a book from inventory with BookID = 201

Case Study 4: SQL – Student Grades Database

10. **Scenario:**
A school database stores students' grades with columns: StudentID, FirstName, LastName, Subject, Grade.

Task:

1. Retrieve the names of all students with an "A" grade in the subject "Math".
2. Find the average grade of all students in the "English" subject.
3. Update the grade for StudentID = 103 in "History" to "B+".
4. Delete all records for students who have failed in "Science" (Grade: "F").

		L	T	P
PRACTICUM	**3.7 COMPUTER PROGRAMMING USING- C**	**1**	**-**	**4**

COURSE OBJECTIVES

To enable student, develop structured solutions to problems and implementing them using computers. This involves two parts: i) Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine-readable form or a programming language. For the second part, we will learn the common units of programming languages. The first part can only be learned through the repeated practice of solving problems.

COURSE OUTCOMES

At the end of the course, students will be able

CO1: Demonstrate knowledge on C Programming concepts.

CO2: Develop simple programs in C using basic constructs.

CO3: Develop C programs using conditional and looping concepts

CO4: Understand the concept of multi-dimensional array and strings.

CO5: Design modular C programs with reusable functions and pointers to improve code readability and maintainability.

COURSE CONTENT

UNIT 1: Introduction to Problem Solving: (2 Periods)

Computational way of thinking, Flowchart and Algorithm, Variable, constant and Representation, Data Types,

Keywords, Identifier.

Practical Exercise:

1. *Installation of C Compiler*
2. Familiarization with programming environment and options/menu of the installed compiler.
3. *Draw a Flowchart using MS Word (or any other editor or online tools like Draw.io etc.)*

UNIT 2: Operators & Expression: (3 Periods)

Arithmetic, Relational, Logical and Bitwise Operators, Input, Output, Expressions, Data Type Casting

Practical Exercise:

1. Programs using I/O statements and various operators

    a. *WAP to print your name*
    b. *WAP to perform various arithmetic and logical operators.*
    c. *WAP to swap two numbers with and without using third variable*

2. Programs using expression evaluation and precedence

    a. *WAP using unary and tertiary operators*
    b. *WAP using post and pre - increment operators*

UNIT 3: Conditional & Looping Statements: (3 Periods)

if, if-else, if-else ladder, switch–case, break and continue, Loops: for, while and Do-while and Nested Loops.

Practical Exercise:

1. Programs using decision making statements and branching statements

   a. *WAP to check whether the given number is odd or even*
   b. *WAP to check whether a given number is Prime or not.*
   c. *WAP to find the largest among the given three numbers*

2. Programs using loop statements

   a. *WAP to find the factorial of a given number*
   b. *WAP to print table of a given number*
   c. *WAP to to print all prime numbers from 1 to 100*
   d. *WAP to print Fibonacci series till a given number n*
   e. *WAP to print different star patterns*

UNIT 4: Arrays & String: (3 Periods)

Introduction to Arrays, Array Declaration, Length of array, Manipulating array elements, Single and Multidimensional Array, Arrays of characters, Introduction of Strings, String declaration and definition, String Related function i.e. strlen, strcpy, strcmp,.

Practical Exercise:

1. Programs to demonstrate applications of n dimensional arrays

    a. *WAP to print 3 x 3 matrix.*
    b. *WAP to print the transpose of a 3 x 3 matrix.*
    c. *WAP to add two matrices.*

2. Programs to demonstrate use of string manipulation functions

    a. *WAP to find the length of a given string*
    b. *WAP to concatenate two strings*
    c. *WAP to check whether the given string/number is palindrome or not*

UNIT 5: **Function & Pointer:** (3 Periods)

Introduction to functions, Global and Local Variables, Function Declaration, Function Call and Return, Types of Functions, Standard functions, Introduction to Pointer, Parameters and Parameter Passing, Call-by value/reference, recursive function, I/O and Formatting

Practical Exercise:

1. Programs to demonstrate parameter passing mechanism
    a. *Create a user defined function to add two numbers.*
    b. *WAP to implement call by value*
    c. *WAP to implement call by reference*
2. Programs to demonstrate recursion
    a. *WAP to print the factorial of a given number using recursion.*
3. Programs to demonstrate use of pointers
    a. *WAP to print the address of variable using pointer*
    b. *WAP to swap the contents of two variable using pointer.*

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.
7. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	02	20
2.	03	20
3.	03	20
4.	03	20
5.	03	20
Total	**14**	**100**

3.8 SUMMER INTERNSHIP –I (4 weeks after 2nd Sem.)

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is Summer Internship, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised Summer Internship of 4 weeks duration to be organized during the semester break starting after first year i.e. after 2nd semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that an internship schedule may be drawn for each student before starting of the internship in consultation with the internship providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization. Equally important with the guidance is supervision of students internship in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on. An external assessment of **50 marks** has been provided in the study and evaluation scheme of 3rd Semester. Evaluation of professional Summer Internship report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. Teachers and students are requested to see the footnote below the study and evaluation scheme of 3rd semester for further details.

The teacher will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 15%

b) Initiative in learning new things 15%

c) Presentation and VIVA 15%

d) Industrial training report 55%

FOURTH SEMESTER

		L	T	P
THEORY	**4.1 DATA STRUCTURES USING C**	**3**	**-**	**-**

COURSE OBJECTIVES

To provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Understand the fundamental data structures

CO2: Apply the operations of stack and queue

CO3: Understand the concepts of linked lists

CO4: Implement various sorting and searching techniques

CO5: Illustrate tree and graph traversal techniques

COURSE CONTENT

UNIT 1: Introduction to Data Structures: (6 Periods)

Basic Terminology, Classification of Data Structures, Operations on Data Structures.

UNIT 2: Linear Data Structures- Stacks (10 Periods)

: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Applications of Stacks- Infix-to-Postfix Transformation, evaluating Postfix Expressions.

Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues- DeQueue, Circular Queue, Applications of Queues.

UNIT 3: Linked Lists: (07 Periods)

Singly Linked List, Representation in Memory, Operations on a Single Linked List, Circular Linked Lists, Doubly Linked Lists

UNIT 4: Sorting : (07 Periods)

Introduction to different sorting techniques - Bubble sort, Insertion sort, Quick sort and Merge Sort **Searching:** Symbol Tables, Linear Search, Binary Search, Hash Tables.

UNIT 5: Trees: (12 Periods)

Basic Terminologies, Definition and Concepts of Binary Trees, Representations of a Binary Tree using Arrays and Linked Lists, Operations on a Binary Tree-Insertion, Deletion, Traversals, Types of Binary Trees, binary tree traversals: in-order, pre-order, post-order. Various operations of Binary Search Tree, B Tree and AVL Tree.

Graph: Graph Terminologies, Representation of Graphs- Adjacency List, Adjacency Matrix, Graph Traversals.

REFERENCE BOOKS:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi

2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education,India

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted** **(Periods)**	**Marks Allocation** **(%)**
1.	06	15
2.	10	20
3.	07	20

4.	07	20
5.	12	25
Total	**42**	**100**

		L	T	P
THEORY	**4.2 SOFTWARE ENGINEERING**	**3**	**-**	**2**

COURSE OBJECTIVES

The system analysis and design is the backbone of Application software development. After studying the subject the students will be able to develop and design the system according to given requirements. It involves various steps in analysis and design of the system. It includes the knowledge of preparing project systematically. It is important to know about various aspects of the system analysis and design so that the students will be able to understand the responsibilities while designing and implementing the project.

COURSE OUTCOMES

After successful completion of this course, the student will be able to

CO1: Understand the basic concepts of software development.

CO2: Classify life cycle models and their comparison

CO3: Will be able to write the SRS for the given problem and project planning estimation techniques.

CO4: Explain various software design strategies

CO5: Explain about different testing methods, need for testing.

COURSE CONTENT

Unit 1: Introduction to Software Engineering **(8 Periods)**

System Concepts: Types of systems : (open, closed, static and dynamic systems), Basics of Software Engineering : Need for Software Engineering – Definition, Programs v/s Software Products, Software Characteristics.

Unit 2: Software Life Cycle Models (8 Periods)

Requirement of Life Cycle Model, Classic Waterfall Model, Prototyping Model, Evolutionary Model, Spiral Model, Introduction to agile methodology.

Practical Exercise:

1-Perform comparative analysis of various Models

Unit 3: Software Planning, Requirement Analysis and Specification (10 Periods)

Requirement gathering and Analysis, Software Requirement Specifications(SRS), Characteristics of good SRS., Metrics for Project Size Estimation- LOC(Lines of Code), Function Point Metric, Project estimation Techniques- Using COCOMO Model, Responsibilities of Software Project Manager.

Practical Exercise:

1. Develop a SRS on a given topic/project/problem.

Unit 4: Software Design and Implementation (8 Periods)

Characteristics and features of good Software Design Cohesion and Coupling, Software design Approaches- Function Oriented Design (Data flow diagrams, Data dictionary, Decision Trees and tables), Object Oriented Design, Structured Coding Techniques, Coding Styles, and documentation

Practical Exercise:

1-Develop DFD Model (level 0 and level 1 DFD) of the problem.

Unit 5: Software Testing and Maintenance (8 Periods)

Concept of Testing, Unit Testing, Black Box Testing, White Box Testing, alpha , beta testing, Integration testing, System testing, Testing type cycle (V-Model), Verification v/s Validations, Configuration management, Overview of test cases.

Practical Exercise:

1- Use of testing tools such as J-meter, Canoo Web Test
2. Write test cases for any known application

RECOMMENDED BOOKS

1. Software Engineering by Rajib Mall, PHI Publishers, New Delhi
2. An Integrated Approach to Software Engineering by Pankaj alote, Narosa Publishing House Pvt Ltd, Darya Ganj, New Delhi 110002
3. Software Engineering, Sangeeta Sabharwal, New Age International, Delhi
4. Software Engineering by KK Aggarwal and Yogesh Singh

5. Software Engineering – A Practitioner's Approach by RS Pressman, Tata McGraw Hill Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	08	20
2.	08	20

3.	10	20
4.	08	20
5.	08	20
Total	42	100

		L	T	P
THEORY	**4.3 INTRODUCTION TO e-GOVERNANCE**	**2**	**-**	**-**

COURSE OBJECTIVES

To cover the concepts of e-Governance and to understand how technologies and business models shape the

contours of government for improving citizen services and bringing in transparency.

COURSE OUTCOME:

CO1: Exposure to various e-Governance lifecycle.

CO2: Introductory ideas of and practices followed in e-Governance initiatives in India.

CO3: Understanding the architecture and various models of e-governance

CO4: Introduction to various e-government projects.

CO5: Analysis and evaluation of various e-governance projects.

COURSE CONTENT

UNIT 1: Introduction: (4 Periods)

Exposure to emerging trends in ICT for development; Understanding of design and implementation of e-Government projects, e-governance lifecycle.

UNIT 2: Government Process: (5 Periods)

Need for Government Process Re-engineering (GPR); National e-Governance Plan(NeGP) for India; SMART Governments & Thumb Rules

UNIT 3: Architecture and models of e-Governance (7 Periods)

Architecture and models of e-Governance, including Public Private Partnership (PPP); Need for In- novation and Change Management in e- Governance; Critical Success Factors; Major issue including corruption, resistance for change, e-Security and Cyber laws

UNIT 4: e-Governance projects: (7 Periods)

Focusing on Indian initiatives and their impact on citizens; Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context. Visits to local e-governance sites (CSC, eSeva, Post Office, Passport Seva Kendra, etc) as part of Tutorials.

UNIT 5: Mini Projects: (5 Periods)

Mini Projects by students in groups – primarily evaluation of various e-governance projects.

Reference Books:

Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
http://www.csi-sigegov.org/publications.php
https://negd.gov.in
https://www.nisg.org/case-studies-on-e-governance-in-india

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted** **(Periods)**	**Marks Allocation** **(%)**
1.	04	18
2.	05	18

3.	07	25
4.	07	25
5.	05	14
Total	**28**	**100**

4.4 PROGRAM ELECTIVE-1

		L	T	P
THEORY	**(a) COMPUTER SYSTEM ORGANIZATION**	**3**	**-**	**-**

COURSE OBJECTIVES

To understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of computers. To identify the elements of modern instructions sets and their impact on processor design. To explain the function of each element of a memory hierarchy. To identify and compare different methods for computer I/O.

COURSE OUTCOMES:

CO1: Understand the basic architecture of computer and number systems.
CO2: Understand concept of Logic Gates and Boolean Algebra.
CO3: Introduction to different combinational circuits.
CO4: Introduction to assembly language programming and microprocessor
CO5: Understanding Memory and Digital Interfacing

COURSE CONTENT

UNIT 1: Structure of Computers: **(8** Periods**)**

Computer Functional units, Von-Neumann architecture, Bus structures, Basic Operational Concepts Number System: Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa, Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction, Error detecting codes.

UNIT2: Logic Gates and Simplification: **(9** Periods**)**

Concept of negative and positive logic, Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates, SSI, MSI, LSI, VLSI (Definition), Propagation delay, Noise Margin, Fan in, Fan out, Power dissipation, Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates, Karnaugh map (upto 4 variables).

UNIT 3: Introduction to combinational circuit: **(9** Periods**)**

Multiplexer, De-multiplexer, Encoder, Decoder block diagram and Circuit, 7 segment decoder, BCD Encoder Circuit, Half adder and Full adder circuit, design and implementation, Half subtractor and Full subtractor or Circuit, design and implementation.

UNIT 4: Introduction to Microprocessor Architecture: **(8** Periods**)**

Instruction Set Architecture design principles from programmer's perspective. One example microprocessor (Intel, ARM, etc).

Assembly Language Programming: Simple programs, Assembly language programs involving logical,

branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT 5: Memory and Digital Interfacing: **(8** Periods**)**

Addressing and address decoding, interfacing RAM, ROM, EPROM, programmable peripheral interface, various modes of operation and interfacing to processor, inter- facing keyboard, displays, etc.

Reference Books:

1.1. Computer System Architecture, M. Moris Mano, Pearson/PHI, India.

1.2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.

1.3. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw-Hill

1.4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing, A.K.Ray, K.M.Bhurchandi, Tata McGraw-Hill, New Delhi, India.

1.5. Computer Organization and Design: A Hardwar/Software Interface (MIPS Etion) by Patterson and Hennessy

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	08	20
2.	09	20
3.	09	20
4.	08	20
5.	08	20
Total	42	100

4.4 PROGRAM ELECTIVE-1

		L	T	P
THEORY	(b) FOSS (FREE AND OPEN SOURCE SOFTWARE)	3	-	-

COURSE OBJECTIVES

The Free and Open Source Software (FOSS) course is designed to familiarize students with the development process using free and open source software, which includes Linux operating system, service configuration management, application software, and development tools.

COURSE OUTCOME

CO1: Understanding basic introductory concept of Open-Source Software
CO2: Hands on with Linux Operating System
CO3: Working with Different Open Source Software.
CO4: Understanding Mobile Programming and Project Management Tools.

COURSE CONTENT

UNIT 1: **Introduction:** (12 Periods)
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

UNIT 2: **Basics of LINUX**: (10 Periods)
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)

UNIT 3: **Programming Tools and Techniques**: (12 Periods)
Libreoffice Tools; Samba: Cross platform; Introduction about LAMP; Brief Introduction to Programming using languages like Java /Python / Perl; Database 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

UNIT 4: **FOSS CASE STUDIES**: (8 Periods)
Some example case studies of FOSS implementation

Reference Books:

1. Linux in a Nutshell, by Ellen Siever
2. Philosophy of GNU URL: http://www.gnu.org/philosophy/.
3. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-madeeasy/.
4. Version control system URL: http://git-scm.com/.
5. Samba: URL : http://www.samba.org/.
6. Libre office: http://www.libreoffice.org/.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	12	20
2.	10	20
3.	12	20
4.	08	20
Total	42	100

4.5 OPEN ELECTIVE -1

		L	T	P
THEORY	**a. PROJECT MANAGEMENT**	**2**	**-**	**-**

COURSE OBJECTIVES

To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved. To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES

CO 1: Understand the Project Management Principles.

CO 2: Able to prepare project plans.

CO 3: Able to estimate effective cost of a project.

CO 4: Create risk report and cost benefit analysis.

CO 5: Prepare project scheduling through time-cost trade off.

COURSE CONTENT

UNIT-I: **Concept of a project:** (5 Periods)

Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time) project priority matrix- work break down structure.

UNIT-II: **Capital budgeting process:** (6 Periods)

Planning- Analysis-Selection-Financing-Implementation-Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis

UNIT-III: **Financial estimates and projections:** (5 Periods)

Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

UNIT-IV: **Basic techniques in capital budgeting:** (6 Periods)

Non discounting and discounting methods- payback period- Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

UNIT-V: **Project administration**: (6 Periods)

Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off. Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management software's.

Reference Books:

1. Project planning, analysis, selection, implementation and review – Prasanna Chandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson - McGraw Hill
3. Project management - David I Cleland - McGraw Hill International Edition, 1999
4. Project Management – Gopala Krishnan – McMillan India Ltd.
5. Project Management-Harry-Maylor-Peason Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted** **(Periods)**	**Marks Allocation** **(%)**
1.	05	14

2.	06	14
3.	05	24
4.	06	24
5.	06	24
Total	28	100

4.5 OPEN ELECTIVE -1

THEORY	b. **INDUSTRIAL ROBOTICS**	L	T	P
		2	-	-

1. COURSE OBJECTIVES

This course aims to equip students with foundational and advanced knowledge of industrial robotics, including robot anatomy, programming, kinematics, and control systems. Students will learn to design, simulate, and operate robotic systems used in manufacturing. Emphasis is placed on automation integration, safety protocols, and real-world applications, preparing learners for careers in robotics engineering, industrial automation, and smart manufacturing environments.

2. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that **Students will be able to**

CO1• Comprehend and adhere to industry health and safety guidelines while working with robots' vehicles to mitigate hazards.

CO2• Differentiate coordinate systems and define the custom or user-defined coordinate frames.

CO3• Develop simple robot programs that incorporate various types of movements along with their respective parameters.

CO4• Integrate robot with different automation components i.e., PLC HMI, conveyor etc.

CO5• Create variety of innovative ideas and develop creative approaches to problem-solving.

4. CONTENT

UNIT 1- INTRODUCTION TO INDUSTRIAL SAFETY PRACTICES AND INTRODUCTION TO INDUSTRIAL ROBOTICS (08 Periods)

Fire Extinguishers & its Types, safely handling Tools & Equipment, Use of proper Tools & Equipment & its maintenance, OSH & practices to be observed as a precaution.

Introduction of Robots and their Importance in Manufacturing and Production, Applications of robots in manufacturing and assembly for which they can be efficiently utilized, Role of robots and automation systems in boosting the safety at dangerous manufacturing tasks, Structure and functions of robot System (Basic Package) and additional Equipment, Major Applications of Robots-Pick and Place, Arc Welding, Ultrasonic welding, Part Transfer, Packing, Palletizing. Type of End of arm tools and differences between them: Handling tools - Pneumatic Gripper, Vacuum Gripper, Hydraulic Gripper, Hydraulic Gripper, and Servo-Electric Gripper. Welding guns – Arc Welding guns, Spot welding guns. Robotic cell and its various components. Cycle time and its importance. Operator job in robotic cell. Safety procedure for Programmer and an Operator.

UNIT 2- JOGGING OF ROBOT (04 Periods)

Turn ON /OFF Steps of Robot, Checking Robotic cell Health, Introduction to Teach pendent and key functions, Industrial robot Coordinate system, Different coordinate systems in Robots, Defining X, Y, Z co-

ordinate system, Jogging Robot using Teach pendant in different Modes of coordinate systems: Joint co-ordinate system, rectangular co-ordinate system, and User or object co-ordinate system, Tool co-ordinate system, TCP (Tool centre point definition) i.e., TCP File. , Creating user defined work objects i.e., user coordinate frame File.(Box, circle, triangle work object definition)

UNIT 3- PROGRAMMING OF A OF ROBOT USING TEACH PENDANT (06 Periods)

Robot Program Structure, Different Motion Types used in Programming (PTP, Linear, Circular, Spline): Move J (PTP) , Move L (Linear) , Move C (Circular) , Move S (Spline) ; Different Motion Parameters used in Program Point Recording, Basic Program creation using Motion types and parameters, Path optimization for smooth robot movement and cycle time, Safety instructions to be followed while loading and unloading of parts.

UNIT 4- ROBOT INTEGRATION WITH PLC, HMI AND OTHER EQUIPMENT (06 Periods)

PLC and robot communication and HMI, Conveyor system and its communication with PLC, Methods to create fencing and safety equipment's, Steps to work with two different types of Robots at same project, Tool mounting on Robot Flange, Different connections of grippers (Electric, Pneumatic etc.).

UNIT 5- ROBOT PROGRAMMING WITH ADVANCE LEVEL INSTRUCTIONS (04 Periods)

Loop control instructions, Arithmetic and Logical instructions, Shift instructions, Interfacing End of arm tools to Robot using robot I/O, establishing communication between Robot I/O and PLC modules, Function Keys in Pendant for Arc welding and Material Handling robot, MIG welding Instructions in Robot, MIG welding Program and how to optimize it, Material Handling Program and how to optimize it.

* Case studies and Mini Project should be carried out throughout the semester.

5. TEXT BOOKS/REFERNCE BOOKS

1. **Modern Robotics: Mechanics, Planning, and Control**
   Authors: Kevin M. Lynch, Frank C. Park
   Publisher*:* Cambridge University Press
2. **Robot Modelling and Control**
   Authors: Mark W. Spong, Francesco Bullo
   Publisher*:* Wiley
3. **Springer Handbook of Robotics**
   Editors: Bruno Siciliano, Oussama Khatib
   Publisher: Springer
4. **Robotics for Engineers**
   Author: Yoram Koren
   Publisher: McGraw-Hill
5. **Robotic Engineering: An Integrated Approach**
   Author: Richard D. Klafter, Thomas A. Chmielewski, Michael Negin
   Publisher: Prentice Hall

6. INSTRUCTIONAL STRATEGY

Combine theoretical instruction with hands-on training using robotic arms and simulation software. Use lectures, demonstrations, and lab sessions to teach robot programming, kinematics, and control. Incorporate project-based learning, real-world case studies, and industry visits. Assess through practical tasks, quizzes, and group projects to reinforce industrial robotics applications.

7.SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	8	30
2	4	15
3	6	20
4	6	20
5	4	15
Total	28	100

PRACTICAL	4.6 DATA STRUCTURES USING C (Lab)	L	T	P
		-	-	4

COURSE OBJECTIVES

To provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Understand the fundamental data structures

CO2: Apply the operations of stack and queue

CO3: Understand the concepts of linked lists

CO4: Implement various sorting and searching techniques

CO5: Illustrate tree and graph traversal techniques

LIST OF PRACTICALS

S.No.	NAME OF EXPERIMENT
1.	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique
2.	Write a program to implement Array

3. Write a program to implement different operations in Array

4. Write a program to implement different Stack operations

5. Write a program to implement different Queue operations

6. Write a program to implement single linked list

7. Write a program to implement double linked list

8. Write a program to implement circular linked list

9. Write a program to implement Linear and Binary Search

10. Write a program to implement different Sorting Algorithms

11. Write a program to implement Depth First Search and Breadth First Search

12. Write a program to implement Binary Search Tree.

PRACTICUM	4.7 SCRIPTING LANGUAGES (PYTHON)	L	T	P
		1	-	4

COURSE OBJECTIVES

The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language. Learning Outcomes: Problem solving and programming capability.

COURSE OUTCOMES

At the end of the course students will be able to -

CO1: Understand the basic programming constructs of Python.

CO2: Develop Python programs using conditional statements and loops.

CO3: Understanding concepts of reusable functions, python packages and modules.

CO4: File handling in Python and understanding regular expression.

CO5: Applying OOP concept to solve different problem.

COURSE CONTENT

UNIT 1: Introduction, Variables and Data Types **(2** Periods**)**

History, Features, Setting up path, Installation and Working with Python, Basic Syntax

Understanding Python variables, Numeric data types, Using string data type and string operations, Basic Operators, Understanding coding blocks, Defining list and list slicing, Other Data Types (Tuples, List, Dictionary, Set)

Practical Exercise

1. Write and execute scripts based on data types
2. Write and execute scripts based on collections

UNIT 2: Control Structures **(3** Periods**)**

Conditional blocks using if, else and elif, For loops and iterations, while loops, Loop manipulation using continue, break.

Practical Exercise

1. Write and execute Python scripts with conditional blocks
2. Write and execute Python scripts with loops

UNIT 3: Functions, Modules, Packages and Exception Handling **(3** Periods**)**

Organizing codes using functions, Organizing projects into modules, Importing own module as well as external modules, Understanding Packages, Exception Handling.

Practical Exercise

1. Write and execute Scripts based on Functions and Modules
2. Write and execute Scripts based on Packages
3. Write a program which uses exception handling

UNIT 4: File I/O, Text Processing, Regular Expressions **(3** Periods**)**

Understanding read functions, Understanding write functions, Programming using file operations, Pattern matching and searching, Pattern searching using regex

Practical Exercise

1. Write and execute Regular Expressions
2. File Processing scripts

UNIT 5: Classes in Python **(3** Periods**)**

Principles of Object –Oriented Programming, Concept of Classes, Class Variables, Creating Classes, Instances, Methods, File Organization

Practical Exercise

1. Develop a program to implement the concept of class.
2. Develop a program using Inheritance concept.
3. Develop a program using Polymorphism concept.

REFERENCE BOOKS:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pramatic Bookshelf.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	02	15
2.	03	15
3.	03	20
4.	03	25
5.	03	25

Total	14	100

Audit Course	4.8 ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	L	T	P
		2	-	-

COURSE OBJECTIVE:

Understand the fundamental aspects of the Indian Knowledge System, its integration with modern science, principles of Yoga and holistic healthcare, and practical applications in contemporary contexts.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

CO1: Overview, importance, and relevance of the Indian Knowledge System, including Vedas, Upavedas, Vedangas, and Upangas.

CO2: Relevance of science and spirituality, and contributions of ancient Indian science and technology.

CO3: Basic principles of Yoga, benefits of holistic healthcare, and integration with modern healthcare.

CO4: Practical applications and case studies of the Indian Knowledge System's relevance today.

COURSE CONTENTS

Unit 1: Introduction to Indian Knowledge System (07 Periods)

Overview of Indian Knowledge System

- Importance and relevance
- Introduction to the Vedas
- Upavedas
- Vedangas
- Upangas

Unit 2: Modern Science and Indian Knowledge System (07 Periods)

- Relevance of Science and Spirituality,

- Science and Technology in Ancient India,

Unit 3: Yoga and Holistic Healthcare **(07 Periods)**

- Basic principles of Yoga
- Benefits of holistic healthcare practices
- Integration with modern healthcare

Unit 4: Case Studies / Assignment **(07 Periods)**

- Practical Applications / Case studies demonstrating the relevance of Indian Knowledge System in modern times

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	07	40

2.	07	30
3.	07	15
4.	07	15
Total	28	100

8- GUIDELINES FOR ASSESSMENT OF STUDENT-CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows-

15 Marks for general behaviour and discipline

(by HODs in consultation with all the teachers of the department)

10 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

a) 75 - 80% 06 Marks

b) 80 - 85% 08 Marks

c) Above 85% 10 Marks

25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a) 25 - State/National Level participation

b) 20 - Participation in two of above activities

c) 15 - Inter-Polytechnic level participation

9- RESOURCE REQUIREMENT

A : Laboratory

1. Computer Center

S.No.	Description	QTY	Total Price
A	**B**	**C**	**D**
1.	Computer Desktop (i7,8th Generation, 1TB Hard disk/500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
2.	Computer Table and Chair	60	9,00,000/-
3.	Working Bench with power Supply + 40 Stools	04	100000/-
4.	Component Storage Rack	05	100000/-
5.	Online UPS, 6KVA	2	2,00,000/-
6.	Printer	1	25000/-
7.	Switch with 24 port speed 10/100/1000 (Manageable)	03	1,50,000/-
8.	Smart Board interactive panel	01	4,00,000/-
9.	Network Forensic FOSS like The Sleuth Kit, Autopsy, NetworkMiner, Wireshark, Volatility, Jhon the Ripper, Disk Drill, Cryptool, OpenPuff, MailTracker etc.	LS	-
10.	Android Studio or other FOSS like Xamarin	LS	-
11.	Multimedia authoring Tool or Similar FOSS	LS	1,00,000/-
12.	MS Office latest or equivalent FOSS Libre	LS	20,000/-

	Office/Open Office (Freeware		
13.	FOSS CASE tools like Jmeter, Selenium etc	LS	-
14.	Compiler Turbo C, C++ or equivalent FOSS like VS Code	LS	10,000/-
15.	Web camera, Mike and speakers	01	20,000/-
16.	Air Conditioner 2 ton	02	1,40,000/-
17.	Antivirus Software	05 user	10,000/-
18.	Internet connectivity	60 Nodes	3,00,000/-

2. Programming lab

S.No.	Description	QTY	Total Price
A	B	C	D
1.	Computer Desktop (i7,8th Generation, 1TB Hard disk/500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
2.	Computer Table and Chair	60	9,00,000/-
3.	Working Bench with power Supply + 40 Stools	04	100000/-
4.	Component Storage Rack	05	100000/-
5.	Online UPS, 6KVA	2	2,00,000/-
6.	Switch with 24 port speed 10/100/1000 (Manageable)	03	1,50,000/-
7.	Printer	1	25000/-
8.	scanner	01	65,000/-
9.	Laptop	01	70,000/-
10.	Digital camera	01	30,000/-
11.	Handy Cam	01	25,000/-
12.	Smart Board interactive panel	01	4,00,000/-
13.	Network Forensic FOSS like The Sleuth Kit, Autopsy, NetworkMiner, Wireshark, Volatility, Jhon the Ripper, Disk Drill, Cryptool, OpenPuff, MailTracker etc.	LS	-
14.	Android Studio or other FOSS like Xamarin	LS	-
15.	MS Office latest or equivalent FOSS Libre Office/Open Office (Freeware	LS	20,000/-
16.	FOSS CASE tools like Jmeter, Selenium etc	LS	-
17.	Compiler Turbo C, C++ or equivalent FOSS like VS Code	LS	10,000/-
18.	Web camera, Mike and speakers	01	20,000/-
19.	Air Conditioner 2 ton	02	1,40,000/-
20.	Antivirus Software	05 user	10,000/-
21.	Internet connectivity	60 Nodes	3,00,000/-

3. Networking lab/ IoT Lab/Project Lab

S.No.	Description	QTY	Total Price
A	B	C	D
1.	Computer Server (Quad core, intel processor 32 GB RAM)	1	5,00,000/-
2.	Computer Desktop (i7,8th Generation, 1TB Hard disk / 500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty)	20	16,00,000/-
3.	Computer Table and Chair	20	3,00,000/-
4.	Working Bench with power Supply + 40 Stools	04	100000/-
5.	Component Storage Rack	05	100000/-
6.	Online UPS, 6KVA	1	1,00,000/-
7.	Smart Board interactive panel	01	4,00,000/-
8.	Printer	1	25000/-
9.	Switch with 24 port speed 10/100/1000 (Manageable)	1	50,000/-
10.	Connectors (RJ-45, RJ-11, BNC, SC, ST)	LS	10,000/-
11.	Cables: (UTP,STP,OFC) - 25 m each	LS	10,000/-
12.	Router	1	40,000/-
13.	Modem cum Router	2	10,000/-
14.	Networking Printer	1	1,00,000/-
15.	Internet Connectivity	20 Nodes	1,00,000/-
16.	LAN Trainer	4	60,000/-
17.	Antivirus Software	LS	10,000/-
18.	Unmanaged Switch	4	60,000/-
19.	Hub	2	20,000/-
20.	Air Conditioner 2 ton	2	1,40,000/-
21.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
22.	Arduino Uno IDE with built in Wifi	20	20,000/-
23.	Raspberry pi	2	6000/-
24.	Sensor Kits (e.g. MQ135, DHT11 etc.)	20	100000/-
25.	Bluetooth module HC05	20	5000/-
26.	Display Screen	20	5000/-
27.	Relay Module	20	5000/-
28.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30000/-

B - Furniture Requirement

Norms and standards laid down by AICTE -APH (latest) be followed for working out furniture requirement for diploma courses

C- Human Resources:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

10 - List of Participants / Experts

The following experts participated in various workshop for Developing the Curriculum's Structure and Contents of **Computer Science and Engineering** at I.R.D.T. Kanpur.

1- Shri Madan Mishra, HOD Computer, MMIT Santkabir Nagar .
2- Dr. Jokhu Lal, HOD Computer, Govt. Girls Poly. Lucknow.
3- Shri Janmeyjay Kumar, Lecturer Computer, Govt. Poly. Jansath Mujaffarnagar.
4- Smt. Rupali Singh, Lecturer Computer, Govt. Poly. Kanpur .
5- Shri Sunil Kumar, Lecturer Computer, Govt. Poly. Changipur Noorpur, Bijnor .
6- Dr. Vikas Yadav, Lecturer Computer, Govt. Poly. Bighapur Unnav .
7- Shri Shitanshu krishan, Lecturer Computer, Govt. Girls Poly. Amethi .

11 . EVALUATION SCHEME

a. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

b. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

c. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.