NEP-2020 Aligned Curriculum for

Three Year (Six Semester) Diploma Programme in COMMUNICATION AND COMPUTER NETWORKING For the State of Uttar Pradesh

Prepared by:

Curriculum Development Centre

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PREFACE

An important issue generally debated amongst the planners and educator's 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 have created an environment for free flow of information and technology through fast and efficient means. This has led to the shrinking of the world, bringing people from different culture and environments 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 open economy in the last few decades. 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 Technical Education, UP to revise the existing curricula of diploma programmes as per the needs of the industry and making them NEP-2020 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

Director

Institute of Research Development &Training.

Kanpur

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6. All the participants from industry/field organizations, engineering colleges, polytechnics, and other technical institutions for their professional inputs during curriculum workshops.

Coordinator

Institute of Research Development & Training,

Kanpur, U.P.

1. SALIENT FEATURES

1)	Name of the Programme	:	Diploma Programme in Communication and Computer Networking
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	As Prescribed by State Board of Technical Education, UP
4)	Intake	:	As prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	Ratio between theory and Practice	:	40 : 60 (Approx.)

2. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN COMMUNICATION AND COMPUTER NETWORKING

Diploma holders in Communication and Computer Networking can find employment in 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) Tele-Communication Engineering and related Departments

(23) AIR, Doordarshan

(24) Radar and Wireless domain

(25) Defence Services, Para-military Forces

(26)   Civil Aviation

(27)   Electricity Boards and Corporations etc.

(28)   PCB Design and Fabrication Industry

(29)   Consumer Electronics Industry

(30)   Electronic   Components and Devices   Manufacturing
         and   Installation Organizations

(31)   Computer Assembling and Computer Peripheral Industry;

(32)   Instrumentation and Control Industries

(33)   Internet Server Providers

(34)   Mobile Phone assembly Industries

While in employment, the following areas of activity in different organizations (industry and service sector) are visualized for diploma holders in Communication and Computer Networking

- Assembly and installation of computer systems, peripherals and software
- Programming customer based applications including web page designing
- Testing and maintenance of computer systems
- Marketing of software and hardware
- Teaching and training at educational institutions
- Self-employment – call centres, BPO, EPO etc.
- Network installation and maintenance
- Cyber Cafés
- Marketing and Sales (Distributors - whole sale and retailers)
- Service Sector(repair and Maintenance; job work)
- Cable laying and jointing DBs etc.
- Preparing Simulated Models

Various Designations for Diploma Holders in Communication and Computer Networking

(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 activity
(3)   Data entry operator, computer operator, DTP operator, technician
(4)   Technical Assistant/junior engineer in quality control and testing activities of 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 to help in maintaining computers and networks

(7) Test engineers in process industry

PROGRAM OUTCOMES (POs)

PO1: Basics and Discipline specific Knowledge

Assimilate knowledge of basic mathematics, science, engineering fundamentals, and electronics and communication engineering.

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. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

THIRD SEMESTER

Sr. No.	SUBJECTS	Course Type	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External	Evaluation Type
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
3.1	Analog and Digital Electronics	Theory	3	0	0	3	40	-	40	60	3	-	-	60	100	Theory
3.2	Computer Architecture	Theory	3	0	0	3	40	-	40	60	3	-	-	60	100	Theory
3.3	Analog and Digital Electronics Lab	Practical/Lab	0	0	4	2	-	60	60	-	-	40	3	40	100	Practical
3.4	Computer Programming using Python	Practicum	1	0	4	3	-	60	60	-	-	40	3	40	100	Practical
3.5	Electronics Devices and Circuits	Practicum	1	0	4	3	-	60	60	-	-	40	3	40	100	Practical
3.6	PC & Peripheral Architecture	Practicum	1	0	4	3	-	60	60	-	-	40	3	40	100	Practical
3.7	Open Elective-I ^	Open Elective	2	0	0	2	50	-	50							Qualifying
	Advance Skill Development		-	-	-		-	-	-	-	-	-	-	-	-	Certification
3.8	Industrial training (Summer Internship-I)	Internship	-	-	-	1	-	50	50	-	-	-	-	-	50	-
	# Student Centred Activities		-	-	8	-	-	50	50	-	-	-	-	-	50	-
Total			12	-	24	20	80	340	420	120	-	160	-	280	700	

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

List of Subjects for Open Elective-I (Any One)

SR. NO.	SUBJECT NAME
1	Project Management
2	Energy Conservation & Audit
3	Any Course Of Minimum 02 Credit From (Advance Skill Development) • NPTEL • MOOCS THROUGH SWAYAM • AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES • C-DAC • CERTIFICATES CONDUCTED BY THE INSTITUTE OF NATIONAL IMPORTANCE (IIT, NIT, IIT ETC.) • ISRO E-LEARNING • COURSES OFFERED BY TATA TECHNOLOGY (Annexure-1) OR OTHER REPUTED ORGNISATION.

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.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

FOURTH SEMESTER

Sr. No.	SUBJECTS	Course Type	STUDY SCHEME Periods/Week			Credits	INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					Total Marks of Internal & External	Evaluation Type
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
4.1	Principles of Communication Engineering	Theory	4	0	0	4	40	-	40	60	3	-	-	60	100	Theory
4.2	Computer Networks	Theory	4	0	0	4	40	-	40	60	3	-	-	60	100	Theory
4.3	Network Lab	Practical / Lab	0	0	4	2	-	60	60	-	-	40	3	40	100	Practical
4.4	System Administration lab	Practical / Lab	0	0	4	2	-	60	60	-	-	40	3	40	100	Practical
4.5	Data Structure Using Python	Theory	4	0	0	4	40	-	40	60	3	-	-	60	100	Theory
4.6	Data Structure Using Python (LAB)	Practical / Lab	0	0	4	2	-	60	60	-	-	40	3	40	100	Practical
4.7	Open Elective-II ^	Open Elective	2	0	0	2	50	-	50	-	-	-	-	-	-	Qualifying
	Advance Skill Development		-	-	-		-	-	-	-	-	-	-	-	-	Certification
4.8	**Essence of Indian Knowledge and Tradition	AUDIT Course	2	-	0	-	50	-	50	-	-	-	-	-	-	Qualifying
	#Student Centred Activities (SCA)		-	-	8	-	-	50	50	-	-	-	-	-	50	-
Total			**16**	**-**	**20**	**20**	**120**	**230**	**350**	**180**	**-**	**120**	**-**	**300**	**650**	**-**

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

- **Industrial training of 4 weeks duration to be organized after 4th semester exams**

List of Subjects for Open Elective-II (Any One)

SR. NO.	SUBJECT NAME
1	Product Design
2	Disaster Management
3	Any Course Of Minimum 02 Credit From (Advance Skill Development) • NPTEL • MOOCS THROUGH SWAYAM • AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES • C-DAC • CERTIFICATES CONDUCTED BY THE INSTITUTE OF NATIONAL IMPORTANCE (IIT, NIT, IIT ETC.) • ISRO E-LEARNING • COURSES OFFERED BY TATA TECHNOLOGY (Annexure-1) OR OTHER REPUTED ORGNISATION.

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.

4. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

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

i.   10 Marks for general behaviour and discipline
        (by HODs in consultation with all the teachers of the department)
ii.   10 Marks for attendance as per following:
        (by HODs in consultation with all the teachers of the department)
        a)   75 - 80%   8 Marks
        b)   80 - 85%   9 Marks
        c)   Above 85%   10 Marks
iii.   30 Marks maximum for Sports/ NCC/ Cultural/ Co-curricular/ NSS
        activities as per following:
        (by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
        a)   30   -   State/National Level participation
        b)   25   -   Participation in two of above activities
        c)   15   -   Inter-Polytechnic level participation

3.1	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
THEORY		3	0	0	3

Introduction

Analog and Digital Electronics is playing vital role in all engineering applications. The course has been designed to introduce fundamental principles of analog and digital electronics. The students completing this course will understand basic analog and digital electronics including operational amplifiers, analog to digital and digital to conversion techniques, combinational and sequential logic circuits and various special function ICs. The basic concepts studied in this subject will be very useful for understanding of higher level subjects in further study.

Course Outcomes

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

CO1: Describe the functioning and implementation of Op-Amp in practical applications.

CO2: Select and use appropriate ADC and DAC for real world applications. CO3: Understand the basics of digital circuits and logic circuits

CO4: Design and implement Combinational and Sequential logic circuits.

CO5: Understand the working of various types of memories.

	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
THEORY		3	0	0	3
Unit I	OPERATIONAL AMPLIFIERS				
Operational Amplifier: Ideal Op-Amp – Block diagram and Characteristics – Op-Amp Parameters – CMRR – Slew rate – Concept of Virtual ground – Equivalent circuit of Op-Amp. **Applications of OP-AMP:** Inverting Amplifier — Summing Amplifier — Non Inverting Amplifier — Voltage Follower – Comparator – Zero Crossing Detector – Integrator – Differentiator. **OP-AMP Specifications:**Op-Amp 741 – Pin diagram – Specifications.			9		

Unit II	A/D and D/A Converters, Special Function ICs	
A/D Converter Sampling and Quantization — Analog to digital conversion using Parallel comparator method – Successive approximation method – Ramp type method – Dual slope method – Specifications of A/D converter – Examples of A/D converter ICs. **D/A Converter** Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specifications of D/A Converter – Examples of D/A converter ICs. **Special Function ICs:** IC 555 Timer – Pin diagram – Functional block diagram, characteristics and applications. IC 565 PLL – Pin diagram – Functional block diagram – PLL applications. IC 566 VCO – Pin diagram – Functional block diagram – Applications.		9
Unit III	Boolean Algebra and Arithmetic Operations	
Number Systems: Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic Laws – Demorgan's Theorem. **Basic Logic Gates and Universal Logic Gates:** Not gate – Or gate – And Gate – Nor gate – Nand gate – Exor gate – Exnor gate. **Karnaugh Map:** K-map – structure for 2, 3 and 4 variables – Pairs – Quads – Octets – Simplification of Boolean expression using karnaugh map (up to 4 variable) **Arithmetic Operations:** Binary addition – Binary Subtraction – 1's Compliment and 2's Compliment **Arithmetic Circuits:** Half Adder – Full Adder – Half Subtractor – Full Subtractor		9
Unit IV	Combinational and Sequential Logic Circuits	
Combinational Logic Circuits: Parity Generator and checker — Multiplexer and De-multiplexer — Encoder and Decoder **Sequential Logic Circuits:** Latches – SR flip flop – JK flip flop – T flip flop – D flip flop Counters — Types — Mod N counter — 4 bit Asynchronous counter — 4 bit synchronous counter. Shift Registers – Types – Serial in Serial out.		9
Unit V	Memories	

Classification of Memories **RAM:** RAM Organization – Address Lines and Memory Size – Read/write operations – Static RAM – Bipolar RAM cell – Dynamic RAM – SD RAM – DDR RAM. **ROM:** ROM Organization – Expanding memory – PROM – EPROM – EEPROM – Flash memory – Antifuse Technology.	9
TOTAL PERIODS	**45**

Text for Reference:

- Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
- Thomas L. Floyd, Digital Fundamentals, 11th edition, Pearson Education, 2015.
- Malvino, Albert Paul, Donald P. Leach, and G. Saha. "Digital Principles and Applications, 8th edition, McGraw Hill Education, 2014.

Web-based/Online Resources:

1. NPTEL - https://onlinecourses.nptel.ac.in/
2. Swayam- https://swayam.gov.in/

3.2	COMPUTER ARCHITECTURE	L	T	P	C
THEORY		3	0	0	3

Introduction

Fundamental knowledge of Computer Architecture is essential for all the Engineers. It explores how machines are designed, constructed, and working. Knowing what's inside the computer and how it works will help the students to design, develop, and implement applications better, faster, more efficient, and easier to use. It also helps to know the background of internal communication of computer components and allows the programmers to write the application programs according to the Computer operation.

Course Outcomes

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

CO1: State the fundamentals of computers, their operations and analyse the execution of an Instruction.

CO2: Identify the characteristics of various types of I/O communication.

CO3: Understand the characteristics and working of various memory systems. CO4: Analyze different types of control design and identify hazards

CO5: Analyze and apply the concepts of advanced processors and their architectures.

	COMPUTER ARCHITECTURE	L	T	P	C
THEORY		3	0	0	3
Unit I	**Fundamentals and Processing Unit**				

Fundamentals of Computer	
Functional Units of a Digital Computer– Von Neumann Architecture - Instruction Set Architecture – Styles and features- bus structures.	3
Central processing unit	
Components of CPU- General register organization- memory stack organization - stack limits- Processor Organization - Instruction formats - Addressing modes- Instruction execution (Phases of instruction cycle) - RISC and CISC Architecture, Characteristics.	4
Control unit	

Structure of control unit– Instruction Execution - Fetch cycle, Indirect cycle, Execute cycle, Interrupt cycle, Instruction cycle - Types of control unit — Hardwired, Micro-programmed control	3

Unit II	**I/O Organization**	
Asynchronous data transfer		3
Need for I/O Interface - Strobe control, Handshaking, Asynchronous serial transfer, Asynchronous communication interface.		
Modes of transfer		3
Programmed I/O, Interrupt initiated I/O-vectored interrupt, non-vectored interrupt, Priority interrupt, Interrupt controller, DMA –DMA controller, DMA transfer.		
I/O Processor		2
CPU-IOP communication, Data Communication Processor - Serial and Parallel communication		

Unit III	**Memory Organization**	
Memory Organization		3
Memory Hierarchy — Characteristics, Design, and Advantages -RAM: SRAM, DRAM — ROM: Types of ROM — Chip Design: RAM, ROM - Memory address map, Memory connection to CPU.		
Cache Memory		2
Need for cache memory - Operational principle – Cache coherence - Different mapping techniques – cache write policies		
Virtual Memory		4
Virtual memory Concept- Address space and Memory Space - Memory table for mapping a virtual address, Address mapping using pages - Page replacement techniques - Segmented-Page mapping.		

UNIT IV	**Microprocessors and Pipelining**	
Microprocessor		4
Introduction - Block diagram of 8086 - segment registers - flag registers — address - and application of microprocessor.		
Parallel Processing		2
Definition - Types of parallel processing systems (Flynn's Classification)		
Pipe Lining		3
Introduction – Space-time diagram – Types - Instruction pipeline, Arithmetic pipeline –		

Introduction to Pipeline hazards.		
UNIT V	**Advanced Processors**	
Multiprocessors		4
Definition - Shared Memory Multiprocessors — UMA and NUMA — Distributed Memory — Cluster configurations.		
Hardware Multithreading		2
Introduction — Types of Multithreading — Fine-grained, Coarse-grained and Simultaneous Multithreading.		
Multi-Core		
Introduction — General Multicore Architecture - Intel Multicore (Intel Core i7) - Advantages and disadvantages of multicore processing.		3
TOTAL PERIODS		**45**

Textbooks for Reference:

1. M.Morris Mano, "Computer System Architecture", Revised Third Edition, Prentice – Hall of India Pvt Limited, 2017.

2. William Stallings, "Computer Organization and Architecture — Designing for Performance", Eighth Edition, Pearson Education, 2011.

3. David A. Patterson, John L. Hennessy, "Computer Organization and Design, the Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

Web-based/Online Resources

- **https://archive.nptel.ac.in/courses/106/105/106105163/**
- **https://www.digimat.in/nptel/courses/video/106105163/L01.html**
- **https://www.cse.iitd.ac.in/~srsarangi/archbooksoft.html**

https://www.digimat.in/nptel/courses/video/106103180/L01.html

3.3	ANALOG AND DIGITAL ELECTRONICS LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction

Every Electronic Engineer should have sound knowledge about the ICs used in Electronics Industry. This is vital in R&D Department for Chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Analog and Digital Electronics Practical. By doing practical experience in this, they will be skilled in handling all types of ICs and able to apply the skill in electronic system design and the designing of PCBs.

1. **Course Outcomes**

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

CO1: Test the truth tables of logic gates.

CO2: Build combinational logic circuits and validate their truth tables. CO3: Construct sequential logic circuits and verify their truth tables.

CO4: Analyze, comprehend and design of analog electronic circuits involving OP-AMP CO5: Analyze, comprehend and design of analog electronic circuits involving timer 555

	ANALOG AND DIGITAL ELECTRONICS LAB	L	T	P	C
PRACTICAL		0	0	4	2
Part - A	**Combinational and Sequential Logic Circuits**				
Symbol, truth table and pin diagram of Logic gates ICs, Implementation of Combinational circuits using Logic gates, Flip Flop ICs, Multiplexer and Demultiplexer ICs, precautions of using Digital ICs.					
Ex. No	**Name of the Experiment**				
1	Verify the truth tables of any 3 gates NOT, AND, OR, NAND, NOR, XOR using IC's.				

2	Test the performance of Full Adder.	
3	Test the performance of Full Subtractor.	
4	Test the performance of JK flip-flops.	30
5	Test the performance of Demultiplexer.	
Part - B	**OP-AMP Applications and IC Voltage Regulators**	
	Constructing Parity Generator and Parity Checker Circuits using Logic Gates — Implementation of OP-AMP applications using IC 741 — Designing Astable Multivibrator circuit using IC 555 - Testing IC voltage regulators.	
Ex. No	**Name of the Experiment**	
6	Test the performance of 3-bit Parity Generator and 4-bit Parity Checker using basic logic gates with an even parity bit.	
7	Test the performance of Inverting Amplifier and Non inverting Amplifier using Op-amp IC 741.	
8	Test the performance of Integrator and Differentiator using Op-amp IC 741.	30
9	Test the performance of Astable multivibrator using IC 555.	
10	Test the performance of IC Voltage Regulator Power supplies using IC 7805, IC 7912.	
	TOTAL PERIODS	**60**

Text Book for Reference

- Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
- Thomas L. Floyd, Digital Fundamentals, 11th edition, Pearson Education, 2015.
- Malvino, Albert Paul, Donald P. Leach, and G. Saha. "Digital Principles and Applications, 8th edition, McGraw Hill Education, 2014.

Web-based/Online Resources

- https://onlinecourses.nptel.ac.in/
- https://www.edx.org/

- https://swayam.gov.in/
- https://www.circuitlogix.com
- http://www.vlab.co.in
- http://www.allaboutcircuits.com

Equipment / Facilities required to conduct the Practical Course

Hardware Requirement:

- Digital Trainer Kit.
- Logic Gates: Basic logic gate ICs like 7400, 7402, 7404, 7408, 7432 and 7486.
- Flip-flops: Flip-flop ICs like 7474 (D flip-flop), 7476 (JK flip-flop), and 7473 (Dual JK flip-flop).
- Multiplexer and Demultiplexer: IC 4051
- Op-amp: IC 741.
- Timer IC: IC 555.
- 1MHz, Oscilloscope
- Power Supply (0-30V).
- Signal Generator.
- Regulator ICs: IC 7805, IC 7912.
- Resistors, capacitors, diodes, LEDs.
- Breadboard, power supply, wires, and other necessary components for circuit construction and testing.

3.4	COMPUTER PROGRAMMING USING PYTHON	L	T	P	C
		1		4	4

RATIONALE

This course introduces to the students the Python language. Upon completion of this course, the student will be able to write non trivial Python programs dealing with a wide variety of subject matter domains. Topics include language components, the IDLE/IDE environment, control flow constructs, strings, I/O, collections, classes, modules, and regular expressions.

LEARNING OUTCOMES

After undergoing the course, the students will be able to:

- Execute Python code in a variety of environments
- Use correct Python syntax in Python programs
- Use the correct Python control flow construct
- Write Python programs using various collection data types
- Write home grown Python functions
- Use standard Python modules such as os, sys, math, and time
- Trap various errors via the Python Exception Handling model
- Use the IO model in Python to read and write disk files
- Create their own classes and use existing Python classes.
- Understand and use the Object Oriented paradigm in Python programs
- Use the Python Regular Expression capabilities for data verification

DETAILED CONTENTS

1. Introduction   **(04 Periods)**

    - Brief History of Python
    - Python Versions
    - Installing Python
    - Environment Variables
    - Executing Python from the Command Line
    - IDLE
    - Editing Python Files
    - Python Documentation
    - Getting Help
    - Dynamic Types
    - Python Reserved Words
    - Naming Conventions

2. Basic Python Syntax   **(04 Periods)**

    - Basic Syntax
    - Comments
    - String Values
    - String Methods

- The format Method
- String Operators
- Numeric Data Types
- Conversion Functions
- Simple Output
- Simple Input
- The % Method
- The print Function

3.   Language Components   **(06 Periods)**

- Indenting Requirements
- The if Statement
- Relational and Logical Operators
- Bit Wise Operators
- The while Loop
- break and continue
- The for Loop

4.   Collections   **(10 Periods)**

- Introduction
- Lists
- Tuples
- Sets
- Dictionaries
- Sorting Dictionaries
- Copying Collections
- Summary

5.   Functions   **(08 Periods)**

- Introduction
- Defining Your Own Functions
- Parameters
- Function Documentation
- Keyword and Optional Parameters
- Passing Collections to a Function
- Variable Number of Arguments
- Scope
- Functions - "First Class Citizens"
- Passing Functions to a Function
- map
- filter
- Mapping Functions in a Dictionary
- Lambda
- Inner Functions
- Closures

6.   Modules   **(04 Periods)**

- Modules
- Standard Modules - sys
- Standard Modules - math
- Standard Modules - time
- The dir Function

7.   Exceptions   **(04 Periods)**

- Errors
- Runtime Errors
- The Exception Model
- Exception Hierarchy
- Handling Multiple Exceptions
- Raise
- assert

8.   Input and Output   **(04 Periods)**

- Introduction
- Data Streams
- Creating Your Own Data Streams
- Access Modes
- Writing Data to a File
- Reading Data From a File
- Additional File Methods
- Using Pipes as Data Streams
- Handling IO Exceptions

9.   Classes in Python   **(06 Periods)**

- Classes in Python
- Principles of Object Orientation
- Creating Classes
- Instance Methods
- File Organization
- Special Methods
- Class Variables
- Inheritance
- Polymorphism

10. Regular Expressions   **(06 Periods)**

- Introduction
- Simple Character Matches
- Special Characters

- Character Classes
- Quantifiers
- The Dot Character
- Greedy Matches
- Grouping
- Matching at Beginning or End
- Match Objects
- Substituting
- Splitting a String
- Compiling Regular Expressions
- Flags

                                       TOTAL   **56**

LIST OF PRACTICALS

1. Getting started with Python and IDLE in interactive and batch modes
2. What do the following string methods do?
   - lower
   - count
   - replace
3. Write instructions to perform each of the steps below
   - (a) Create a string containing at least five words and store it in a variable.
   - (b) Print out the string.
   - (c) Convert the string to a list of words using the string split method.
   - (d) Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir(list) or help(list) to find appropriate methods).
   - (e) Print out the sorted, reversed list of words.
4. Write a program that determines whether the number is prime.
   What is your favorite number? 24
   24 is not prime
   What is your favorite number? 31
   31 is prime
5. Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500?
6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.
7. Find the largest of n numbers, using a user defined function largest().
8. Write a function myReverse() which receives a string as an input and returns the reverse of the string.
9. Check if a given string is palindrome or not.
10. WAP to convert Celsius to Fahrenheit
11. Find the ASCII value of charades
12. WAP for simple calculator

INSTRUCTIONAL STRATEGY

Teachers should put emphasis on practicals and experts from industries may be invited to deliver lectures and share experiences with the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Software installation, operation, development
- Actual laboratory and practical work exercises
- Viva-voce

RECOMMENDED BOOKS

1. Learning Python by Mark Lutz; Pratham Books, Bangalore
2. Foundations of Python Network Programming by John Goerzen and Brandeu Rhodes; Apress-eBook distributed by Springer Science and Business Media, New York
3. Dive Into Python by Mark Pilgrim; Pratham Books, Bangalore
4. Think Python by Allen B. Downey; O'Reily Media
5. Python Programming For Beginners: A Must Read Introduction to Python Programming by Robert Richards; Pratham Books, Bangalore
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
   http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	04	06
2.	04	06
3.	06	10
4.	10	20
5.	08	14
6.	04	06
7.	04	06
8.	04	08
9.	06	12
10.	06	12
Total	**56**	**100**

3.5	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
Practicum		1	0	4	3

Introduction:

This subject is fundamental, and all circuit branch engineers must have a basic understanding of electronic devices like diodes,

transistors. **Course Objectives:**

*   The objective of this course is to enable the student
*   To learn the construction and operation of PN junction diode.
*   To study the VI characteristics of PN junction diode.
*   To understand Zener diode as a special case of PN junction diode.
*   To understand the operation of BJT, FET, Oscillators.
*   To understand the feedback concept.
*   To analyse the operation of wave shaping

circuits. **Course Outcomes:**

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

CO1: Describe intrinsic, N-type and P-type semiconductors.

CO2: Apply the characteristics of PN junction diode and Zener diode in various applications.

CO3: Analyze the input and output characteristics of CE amplifier.

CO4: Design amplifier and oscillator circuits using simulation tool.

CO5: Construct an astable multivibrator and clipper and clamper circuits.

	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
PRACTICUM		1	0	4	3
UNIT I - PN JUNCTION DIODE, ZENER DIODE, FILTERS, RECTIFIERS					

Basics of semiconductor physics: Energy band structure of insulator, conductor, semiconductor, electronic properties of Si, Ge atoms- Semiconductor types-Intrinsic, P-type and N-type semiconductors. PN junction diode: Construction, working of PN junction diode (Forward and Reverse bias) and its V-I characteristics. Carrier transport: Diffusion current- Drift current- mobility -conductivity-resistivity. Zener diode: Construction, working of Zener diode and its V-I characteristics, Comparison between Avalanche and Zener breakdown- Zener diode as a voltage regulator. LED, Photo diode: Construction- working-Characteristics-Applications, Solar cell. Filters: Definition-Types of Filters-Application. Rectifiers: Introduction-Half wave(HW), Full wave(FW) &Bridge Rectifiers(BR).	10

1. Plot the V-I characteristics of a PN junction diode (Si) with an experimental setup. Find its cut-in voltage. 2. Construct a circuit to test forward and reverse bias characteristics of Zener diode and note its breakdown voltage. 3. Construct a center tapped transformer FWR circuit. Draw the input &output signal Use different values of Capacitor and what do you infer by observing the output 4. Construct a Bridge Rectifier; Compare its output with FWR output. Which one gives better output	20

UNIT II - BJT, FET,FEEDBACK AMPLIFIERS, OSCILLATORS AND WAVE SHAPING CIRCUITS AND OSCILLATORS

Bipolar Junction Transistor (BJT): Construction, working of NPN & PNP transistor, Transistor configurations-CB,CE,CC. Input & output characteristics of CE,CB,CC configurations. Transistor -as an amplifier, as a switch Biasing circuits - Need for biasing, types, Self-bias circuit. Field Effect Transistor (FET): Construction, working principle, classification, Drain and Transfer Characteristics, FET as an amplifier. MOSFET- Construction, types. Compare BJT, FET. Feed Back Amplifiers: Feed Back - Definition, Types, Derivation of Expression for	20

Gain of Amplifier with Feed Back. Effect of feedback (negative) on gain, stability, distortion, impedance and bandwidth of an amplifier. RC coupled amplifier with emitter bypass capacitor. **OSCILLATORS:** Barkhausen criterion for oscillations, tank circuits, Different oscillator circuits-Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation). **WAVE SHAPING CIRCUITS:** Clipper and Clamper Circuit: Clipper- Definition, positive and negative Clipper circuits. Clamper- Definition, positive and negative Clamper circuits. Multivibrator Circuits- Definition, Basics of astable, monostable, bistable, Construction & working of astable.	
5. Construct a circuit to test input and output characteristics of CE configuration. 6. Construct a circuit to plot drain and transfer characteristics of FET. 7. Design and verify RC coupled amplifier(2-stage) using simulation tool like Multisim/PSpice. 8. Design a Hartley and RC phase shift Oscillator circuit and plot the output waveform and also find frequency of oscillation. Use Multisim/PSpice. 9. Construct clippers and clampers circuits to analyse their outputs. 10. Construct an astable multivibrator circuit to generate a square wave using two set of resistors, capacitors values and calculate their frequency. **Note: At least Four experiments should be done using bread board**	40
Total	**90**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field

Text Book for Reference

1. Robert L. Boylestad; Louis Nashelsky; Franz Monssen "Electronic Devices and Circuit Theory" Pearson Education, Limited, 2008.
2. S Salivahanan, N Suresh Kumar ,"Electronic Devices And Circuits" Mc Graw Hill

5th Edition

3. Jacob Millman Christos C Halkias , "Millman's Electronic Devices and Circuits (SIE)" ,   4th Edition, McGraw Hill Education.

Web-based/Online

Resources:

https://nptel.ac.in/

Equipment / Facilities required to conduct the Practical

Course List of Equipments:

1. DC Regulated power supply (0-30V,1A)
2. Signal Generator   (1MHz)
3. Dual trace CRO   (20MHz/30MHz)
4. Digital Multimeter
5. DC Voltmeter   (Analog/Digital)
6. DC Ammeter   (Analog/Digital)
7. Desktop Computer
8. Simulation Tool – Multisim/ PSpice Software.

PRACTICAL

PART A

1. Plot the V-I characteristics of a PN junction diode (Si) with an experimental setup. Find its cut-in voltage.
2. Construct a circuit to test forward and reverse bias characteristics of Zener diode and note its breakdown voltage.
3. Construct a centre tapped transformer FWR circuit. Draw the input &output signal .Use different values of Capacitor and what do you infer by observing the output
4. Construct a Bridge Rectifier, Compare its output with FWR output. Which one gives better output.
5. Construct a circuit to test input and output characteristics of CE configuration.

PART B

6. Construct a circuit to plot drain and transfer characteristics of FET.
7. Design and verify RC coupled amplifier (2-stage) using simulation tool like Multisim / PSpice.
8. Design a Hartley and RC phase shift Oscillator circuit and plot the output waveform and also find frequency of oscillation. Use Multisim/PSpice.

9. Construct clippers and clampers circuits to analyse their outputs.
10. Construct an astable multivibrator circuit to generate a square wave using two set of resistors, capacitors values and calculate their frequency.

3.6	PC & PERIPHERAL ARCHITECTURE	L	T	P	C
Practicum		1	0	4	3

RATIONALE

The aim of the subject is to teach the basic working of the computer motherboard, peripherals and add-on cards. The subject helps the students to do the maintenance of the Computer, peripherals and its add-on cards. The students will be able to select the proper peripheral as per their specification and requirement. This is the core technology subject. The subject is practical oriented and will develop the debugging skills in the students.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
- Assemble Computer System & it's peripherals
- Repair & Maintenance of Computer System & it's peripherals
- Understanding of various components of a computer system

DETAILED CONTENTS

1. Basic building blocks of a computer system: **(03 Periods)**
   Block diagram of a computer, Input & Output devices, CPU, Arithmetic & Logical Unit, Memory & it's Types.

2. The concept of hardware & the software : **(03 Periods)**
   Main components of a computer system, data & information, importance of information flow & its impact on growth & productivity.

3. Study of PC-AT/ATX System and Processor- **(05 Periods)**
   Basics of Processor and CPU Clock , Motherboards, Chipset and Controllers, BIOS and the Boot Process.

4. IDE and SATA Devices: **(12 Periods)**
   Hard Disk Drive, its construction, basic principle of operation, disk drive types, installation, formatting and managing hard disk drive, CD/DVDs Drives, SCSI Devices, Floppy Disk, Flash Drive, Solid State Drives, types of Solid State Drives (NVMe SSD, M.2 SSD, U.2 SSD, External and Enterprise/Data Center SSD) and their applications, Backup Drive, Expansion Cards- LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video Cards, USB Card, Fire-Wire Cards, Internal Ports, Cables and Connector Types.

5. Switch Mode Power Supply: **(04 Periods)**

Discrete components, principle of operation SMPS, converter topologies, PWM IC's and case study.

6. Monitors: **(05 Periods)**
   Monitors: - CRT, LCD and LED, Touch Screen Displays, CRT construction and working, 9 pin input type-monitor, block diagram of color monitor.

7. **Printer:** **(07 Periods)**
   Types & components of printers, printer interface with computer, principle of operation of Laser and Inkjet printers, various mechanical sub-assemblies, general maintenance aspects.

LIST OF PRACTICALS

1. Study various mother boards- non-integrated, semi-integrated, integrated
2. Understand the mother board component
3. Familiarize the different types of expansion slot (ISA, EISA, PCI, AMR, PCI-E).
4. Study the expansion cards namely add-on-cards (audio, graphics, i/o, tv tuner, etc.).
5. Study different types of switch mode power supply – AT, ATX, NLX
6. Understand the power requirements for various components in a computer system
7. Study the different connectors and ports of a PC
8. Understand the various cables in a computer system
9. Familiarize the different types of memory modules: DDR1, DDR2, DDR3, DDR4.
10. Study various secondary storage- Hard disk, Flash drive, CD/DVD, SSD,
11. Understand the procedure of assembling a computer system.
12. Study the various techniques for formatting/partitioning.
13. Familiarize the hard disk partitioning using different tools.
14. Familiarize the interfacing of printers and installing driver software
15. Understand the interfacing, installation, working of various device such as Scanner, Projector, etc.
16. Understand the system Maintenance and trouble shooting.
17. Wi-Fi Concepts/Bluetooth concepts
18. Microprocessor socket types

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the various components of computer system and it's peripherals to students while doing practical exercises. The students should be made familiar with the various components of computer system and it's peripherals.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests

- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Electronics and Radio Engineering M.L. Gupta Dhanpat rai & Sons, New Delhi
2. Computer System Architecture, M. Morris Mano, Pearson.
3. PC And Clones Hardware, Troubleshooting and Maintenance B. Govinda rajalu, Tata Mc-graw-Hill Publication
4. PC Troubleshooting and Repair Stephen J. Bigelow Dream tech Press, New Delhi
5. Computer Installation & Servicing, D. Balasubramanian, Tata McGraw Hill
6. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://swayam.gov.in
2. http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	3	5
2	3	10
3	5	15
4	12	20
5	4	20
6	5	15
7	4	15
Total	**42**	**100**

3.7	Open Elective-I/ Advance Skill Development	L	T	P	C
		2	0	0	2

3.7.1 PROJECT MANAGEMENT

Course Learning 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.

Content:

UNIT-I: Concept of a project: 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: 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: 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: 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: 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 softwares.

Reference Books:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – 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

3.7	Open Elective-I/ Advance Skill Development	L	T	P	C
		2	0	0	2

3.7.2 Energy Conservation & Audit

Course Learning Objectives:

• To Identify demand supply gaps in present scenario.

• To understand conservations approaches to an industry.

• To draw the energy flow diagram of an industry.

• To identify energy wastage and suggest alternative methods.

• To understand the concepts energy audit.

Course Content:

UNIT-I: Introduction: General energy problem, Sector wise Energy consumption, demand supply gap, Scope for energy conservation and its benefits; Energy Efficiency Principle – Maximum energy efficiency, Maximum cost effectiveness; Mandatory provisions of EC act; Features of EC act-Standards and labeling, designated consumers, Energy Conservation Building Codes (ECBC);

Unit-II: Energy Conservation Approaches In Industries: Methods and techniques of energy conservation

in ventilation and air conditioners- compressors pumps, fans and blowers - Area Sealing, Insulating the Heating / cooling fluid pipes, automatic door closing- Air curtain, Thermostat / Control;

Energy conservation in electric furnaces, ovens and boilers.

Unit-III: Energy Conservation Option: New equipment, technology, staffing, training; Calculation and costing of energy conservation project; Depreciation cost, sinking fund method. Cost evaluation by Return On Investment(ROI) and pay back method etc.

Unit-IV: Performance improvement of existing power plant: cogeneration, small hydro, DG Set;

Demand side management; Load response programmes; Types of tariff and restructuring of electric

tariff Technical measures to optimize T and D losses.

Unit-V: Energy Audit: Energy audit and its benefits; Energy flow diagram; Preliminary, Detailed energy audit; Methodology of -preliminary energy audit and Detailed energy audit – Phase I, Pre audit,

Phase II- Audit and Phase III- Post audit; Energy audit report; Electrical Measuring Instruments

- Power Analyzer.

Reference Books:

1. Electric Energy Generation, Utilisation and Conservation Sivaganaraju, S Pearson, New Delhi, 2012

2. Project Management, Prasanna Chandra, Tata Mcgraw Hill, New Delhi

3. O.P. Jakhar, Energy Conservations in Buildings, Khanna Publishing House, New Delhi

4. Financial Management, Prasanna Chandra Tata Mcgraw Hill, New Delhi.

5. Energy management Handbook, Prasanna Chandra, Tata Mcgraw Hill, New Delhi.

6. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ed. 2018)

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.

3.8	Summer Internship-I (4 weeks) after IInd Sem	L	T	P	C
		0	0	0	1

RATIONALE

It is needless to emphasize further the importance of Industrial/summer Training of students during their 3 years of studies at Polytechnics. It is industrial training, 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.

DETAILED CONTENT

This document includes guided and supervised industrial/summer training of 4 weeks duration to be organised 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 a training schedule may be drawn for each student before starting of the training in consultation with the training 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 training 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 Internal assessment of 50 marks has been provided in the study and evaluation scheme of 3th Semester. Evaluation of summer training report through viva-voce/presentation aims at assessing students understanding of 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 2nd semester for further details.

The teacher along with field supervisors 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%

4.1	PRINCIPLE OF COMMUNICATION ENGINEERING	L	T	P	C
THEORY		4	0	0	4

Introduction:

This subject is aimed at offering a basic understanding of communication principles and their applications in communication systems. This is helpful for a beginner who wants to acquire knowledge on the communication systems.

Course Objectives:

The objective of this course is to enable the students

to To know the Basic parts of Communication system

- To know the electromagnetic spectrum
- To understand the modulation process
- To understand the analog communication modulation technique
- To study AM, FM receivers.
- To study about various types of wave propagation method
- To learn the basic terms of antenna
- To study various types of antennas.
- To have a basic knowledge on information theory.
- To understand the various multiplexing technique.

Course Outcomes:

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

CO1: Understand the basics of communication & need for modulation concept

CO2: Understand the Various analog modulation techniques.

CO3: Understand the working of radio

receivers. CO4: Analyze various types of

antennas.

CO5: Understand the source coding techniques& multiplexing techniques.

		L	T	P	C
Theory	**PRINCIPLES OF COMMUNICATION ENGINEERING**	4	-	-	4

UNIT I	BASICS OF COMMUNICATION SYSTEM	
Communication: Definition, types, compare analog & digital Communication, block diagram of Communication system, Definition of message signal, carrier signal, modulated signal. Relation between wavelength& frequency. Electromagnetic frequency spectrum and their applications. Fourier transform: Introduction, power spectral density. Modulation: Definition, need for modulation, types of Modulation, advantage of modulation. Sampling: Concept of sampling, Sampling theorems, Nyquist criterion and aliasing effect. Quantization: Concept of quantization & its types . Filters: Definition, first order RC LPF, RC HPF. Second order RC BPF and BSF- Cut off frequency, their ideal characteristics.		10
Unit II	CONTINUOUS WAVE MODULATION TECHNIQUES	
Amplitude modulation**:** Derivation of AM wave equation, Modulation index for sinusoidal AM, Frequency spectrum for sinusoidal AM (DSB-FC, DSB-SC, SSB-SC), Total power in AM wave. AM transmitter: Low level modulated &High-level modulated AM transmitter. AM Receivers: Superheterodyne Receiver, Receiver characteristics: sensitivity, selectivity, fidelity, double spotting, image frequency & its rejection. Frequency Modulation: Definition, frequency deviation, modulation index, Frequency spectrum of FM, Narrow band FM-generation, Wide band FM, performance comparison of Wide band, Narrow band FM. FM Transmitter: Indirect FM transmitter, Stereophonic FM transmitter. FM Receiver: Stereophonic FM Receiver, AFC, Compare AM, FM.		13
Unit III	ANTENNAS	

Principle of radiation, Resonant and non resonant antennas, Radiation Pattern of λ/2, λ and 3λ/2 dipoles, Radiation pattern of grounded λ/4, λ/2, and λ dipole. Radiation resistance, total resistance, efficiency, beam width, gain, aperture area of an antenna. (no derivation) , Antenna Array - Principle of Pattern Multiplication, Broad Side array, End Frire array , Folded dipole and Rhombic antenna, Yagi antenna and parasitic elements , Log Periodic and Loop antenna, Parabolic antennas and Horn antenna.		13
Unit IV	**EM WAVE PROPAGATION**	
Ground Wave propagation and effect of curvature of the earth, Space Wave Propagation, Line of sight distance, Sky Wave Propagation, Ionospheric and its characteristics, Critical frequency . Effect of the Earth's magnetic field on ionospheric propagation, MUF and Skip distance, Ionospheric absorption and disturbances. Atmospheric noise. Scatter propagation.		12
Unit V	**INFORMATION THEORY, MULTIPLEXING AND MULTIPLE ACCESS SCHEME**	
Measure of information, Entropy, Source coding theorem- Shannon–Fano coding, Huffman Coding, Channel capacity, Shannon-Hartley law. Concept of multiplexing: FDM and TDM. Multiple Access: FDMA, TDMA and CDMA – Application to Mobile communication and Satellite communication.		12
TOTAL HOURS		**60**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

Text Books for Reference:

1. George Kennady, Bernard Davis, S R M Prasanna , "Electronic communication

systems", McGraw Hill Education

2. Louis E. Frenzel, "Principles of Electronic Communication Systems", McGraw Hill Education (india) Pvt. Ltd.

3. Wayne Tomasi, "Electronic communication systems", Pearson Education

Web-based/Online Resources:

1. https://nptel.ac.in/

4.2	COMPUTER NETWORKS	L	T	P	C
THEORY		4	0	0	4

Introduction

This course aims at teaching students the importance of networks in all aspects of life. This course introduces the basic concepts of networks like network classification, network topologies and devices, transmission media, network models and concept of TCP/IP. Imparting this knowledge will help students to understand current network technologies and will also help them to pursue specialized programs leading to a professional career in the Networking and Communication Industry.

Course Objectives

The objective of this course is to enable the student to

- Build knowledge of the fundamental concepts of computer networking.
- Realize the benefits and applications of computer network.
- Familiarize the students with basic terminologies in computer networking.
- Use various network devices efficiently.
- Administer and maintain a computer network.
- Preparing the students for Advanced courses in computer networking.

Course Outcomes

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

CO1: Identify and compare different network topologies, communication media and network devices.

CO2: Define Network models, compare OSI reference model &TCP/IP model.

CO3: Describe the functions of Network Layer i.e. addressing, subnetting & routing and design a network with a router connecting different subnets.

CO4: Explain different Transport Layer functions i.e. Port addressing, Error control and Flow control mechanism

CO5: Explain the different protocols used at application layer.

	COMPUTER NETWORKS	L	T	P	C
THEORY		4	0	0	
Unit I	**INTRODUCTION TO DATA COMMUNICATION AND NETWORK**				
Components of a data communication - Data flow in communication: Simplex, Half duplex, Full duplex - Introduction to Networks - Elements of a Network - Types of Connections: Point to point, Multipoint					3
Types of Networks: Classification based on Geography: LAN, MAN, WAN – Classification by their component: Client-Server, Peer to Peer – Internet, Intranet, Wi-Fi, Bluetooth, Mobile Network.					3
Network Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.					3
Unit II	**MEDIA AND NETWORK DEVICES**				
Transmission Media: Classification of transmission media – Guided media: Twisted pair, Coaxial, Fibre optics – Unguided media: Radio waves, Microwaves, Infrared.					4
Cable wiring standards - Straight through Cable, Crossover Cable, Connectors, Jacks, Patch Panels					3
Network devices: NIC, Repeaters, Hub and its types, Bridges and their types, Switches, Routers, (Wired and Wireless) –Gateways, Modems					3
Unit III					
Network Models: OSI Model – Layered architecture – OSI Reference model, TCP/IP protocol suite - Comparison of OSI and TCP/IP **Physical Layer:** Overview of Physical Layer					7
UNIT IV	**DATA LINK AND NETWORK LAYER**				
Data Link Layer: Data Link sub layers: MAC Sub-layer, LLC - Addressing: Physical Address - **802.X Protocols:** Concepts CSMA/CD (802.3) – Token bus (802.4) –Token ring (802.5) – Comparison between 802.3, 802.4 and 802.5 - **Ethernet** - Types of Ethernet (Fast Ethernet, gigabit Ethernet, High speed Ethernet 10GE to 800GE) - **Switching:** Definition **–** Circuit switching – Packet switching .					10

Network Layer: IP Address: Dotted Decimal Notation – Ipv4 Address classes – Basics of Subnetting – Subnet Masking - VLSM Technique – IPv6 concept only - Role of Network layer: Introduction to routing	5

UNIT V	HIGHER LAYERS OF OSI MODEL	
Transport Layer Protocols: Transport Layer overview - Connection Oriented and Connectionless Services – Port number, Sockets – TCP & UDP.		5
Presentation and Session Layer: Session layer function and protocols - Presentation layer function and Protocols		4
Application Layer: Introduction to Application Layer Protocols and their role - DNS, Electronic Mail, the World Wide Web, DHCP, FTP, Telnet		4
TOTAL HOURS		**56**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- A fun physical activity where students would create a network topology. This enables students to analyze the problem statement, brainstorm and form a network topology .

Textbook for Reference:

1. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw-Hill, 2007.
2. Andrew S. Tanenbaum "Computer Networks", Fifth Edition, Pearson Prentice Hall Edition, 2011.
3. William Stallings, "Data and Computer Communications", Eighth Edition, Pearson Education, 2011.

Web-based/Online Resources

1. https://www.pynetlabs.com/network-devices-and-its-various-types/
2. https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket -services
3. https://portswigger.net/research/top-10-web-hacking-techniques-of-2021

4.3	NETWORK LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

This course will help the students to understand the function of networks and get exposure to different existing and upcoming communication technologies. The students will be able to create and manage networks and enable communication among devices. This course also gives the knowledge and competency to diagnose the problems in computer networks and connecting devices and also gives the knowledge for troubleshooting for systematic repair and maintenance of computer networks.

Course Objectives

The objective of this course is

1. To enable the students to perform different cabling in a network
2. To enable students to Configure Internet connection and use utilities to debug the network issues.
3. To provide the students with hands-on experience in networking the computers using various networking devices.
4. Students can configure routers for any kind of topology.
5. To develop students' skills in designing and troubleshooting computer networks through practical experimentation.

Course Outcomes

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

CO1: Know the concepts of Computer Networking, routing, and addressing, and also configure several types of cables and connectors.

CO2: Assemble and configure various networking devices - NIC, Hub, Router, Switch, etc.,

CO3: Setup simple computer networks and also basic wireless networks.

CO4: Discover and assign IP address and also locate the MAC address of a computer.

CO5: Diagnose & solve network problems and issues remotely.

	NETWORK LAB	L	T	P	C
PRACTICAL		0	0	4	2

Part - A	**Tools and Devices for Networking**	
Need for Crimping tool – Use of Cable Tester – Clamping tool – Study of installation and configuration of connecting devices – Modem – Hub – Switch – Router.		
Ex.No	**Name of the Experiment**	
1	Do the following cabling works in a network a) Cable Crimpling b) Test the Crimped cable using a Cable tester.	
2	Implement the cross-wired cable and straight-through cable using the clamping tool.	
3	Installation and configuration of Network Devices: Modem, HUB, Switch, and Routers.	
4	Establish Peer to Peer network connection between two systems using Switch and Router in a LAN.	30
5	Creation of a simple network with two PCs using a hub. a. Identify the proper cable to connect the PCs to the hub b. Configure workstation IP address information. c. Test connectivity using the Ping command	
6	Creation of various network topologies using network devices, cables, and computers.	
Part - B	**Networking commands and Subnetting**	
Study of basic networking commands in Windows and Linux – Study of Subnetting and IP Address configuration – DHCP – Firewall.		
Ex.No	**Name of the Experiment**	
7	Configuration of Internet connection and use IPCONFIG, PING/Tracert, and Netstat utilities to debug the Network issues.	
8	Learn to use commands like tcpdump, netstat, nslookup, and traceroute in Windows. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	30

9	Learn to use commands like ping, nslookup, traceroute, host, netstat, ARP, Dig, Route, Ethtool, Hostname, and ifconfig in Linux.	
10	Create a subnet with 5 systems and configure Host IP, Subnet Mask, Default Gateway, and DNS for the systems in that subnet. (TCP/IP Configuration).	
11	Configure a DHCP server and firewall.	
12	Transfer of files between systems in LAN.	
TOTAL HOURS		**60**

Suggested List of Students Activity

1. Actively involve themselves in designing network topologies as a team/individual.
2. Investigate and compare the specifications, availability, and costs of two different topologies and also analyze their features and suitability for various networks.
3. Presentation/Seminars by students on any recent technological developments based on the course.
4. Participate in group discussion about the issues faced in creating networks using various devices.

Text Book for Reference:

- Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP Protocol Suite", Sixth Edition TMH, 2022.
- Tami Evanson, "Network+ Lab manual", BPB Publications.
- James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Eighth Edition, Pearson Education, 2021.

Web-based/Online Resources

- https://nptel.ac.in/
- http://swayam.gov.in/
- https://www.wikihow.com/Set-up-an-FTP-Between-Two-Computers
- https://www.networkstraining.com/windows-ip-commands/
- http://swayam.gov.in/
- https://www.wikihow.com/Set-up-an-FTP-Between-Two-Computers

- https://www.networkstraining.com/windows-ip-commands/
- https://www.studocu.com/en-us

Equipment / Facilities required to conduct the Practical Course:

Software Requirement:

- Windows /Linux OS
- Windows Server/Linux Server
- Packet Tracer

Hardware

Requirement:

- Desktop Systems
- Network Cables (Coaxial Cable, UTP, STP, OFC cable)
- RJ 45 connectors, RJ-11, BNC, SCST
- Crimping Tool
- Screwdriver set
- Wires / Wire cutters
- Cable tester
- Modem
- NIC
- Switch
- Hub
- Router

4.4	SYSTEM ADMINISTRATION LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

System administration involves managing allocation of user names and passwords, monitoring disk space and other resource use, performing backups, monitoring security configuration, and setting up new hardware and software. Students will learn how to install, configure, manage, and troubleshoot various operating systems, networks, and services commonly used in enterprise environments.

Course Objectives

The objective of this course is

- To acquire an appreciation for issues relevant to network server administration
- To understand Windows server administration and various services
- To understand LINUX administration and various services
- To describe the administration concepts for managing, debugging and securing the networks.
- To learn various networking commands of LINUX system.

Course Outcomes

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

CO1:   Install and configure Windows server administration and various services.

CO2:   Demonstrate the Linux commands with appropriate options for various networking and administration scenarios.

CO3:   Install and configure Linux administration and various services.

CO4:   Use the essential Windows/Linux administration concepts for given problem.

	SYSTEM ADMINISTRATION LAB	L	T	P	C
PRACTICAL		0	0	4	2

Part - A	Windows Administration	
Ex.No	**Name of the Experiment**	
1	Installation and configuration of Windows 2008/2012 Server operating system	
2	Installation and configuration of DHCP Server in Windows.	
3	Installation and configuration of Mail Server.	
4	Installing & configuring a Virtual Machine.	30
5	Installation and configuration of DNS Server.	
6	Transfer files between systems in LAN using FTP Configuration.	
Part - B	**Linux Administration**	
Ex.No	**Name of the Experiment**	
7	Installation & configuration of Linux OS.	
8	Creating and managing user & group accounts in LINUX.	
9	Illustrate the various Linux networking commands.	
10	Setting up FTP Server and configure httpd Web Server.	30
11	Demonstrate remote desktop access in Linux.	
12	Configuring an NFS Server & Client.	
TOTAL PERIODS		**60**

Suggested List of Students Activity

1. Actively involve themselves in designing network topologies as a team/individual.

2. Investigate and compare the specifications, availability, and costs of two different topologies and also analyze their features and suitability for various networks.

3. Presentation/Seminars by students on any recent technological developments based on the course.

4. Participate in group discussion about the issues faced in creating networks using various devices.

Textbooks for Reference:

- Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, UNIX and Linux System Administration Handbook, 4th edition, Prentice Hall; 2010.
- Richard Petersen, The Complete Reference Linux, 6th Edition, Tata Mcgraw Hill, 2008.
- Orin Thomas, Administering Windows Server 2012 – Training guide, O Reilly Media, 2013.

Web-based/Online Resources

- https://nptel.ac.in/
- http://swayam.gov.in/
- https://www.tutorialspoint.com/linux_admin/index.htm
- https://www.linode.com/docs/guides/linux-system-administration-basics/

Equipment / Facilities required to conduct the Practical Course

Software Requirement:

- Windows /Linux OS
- Windows Server/Linux

Server **Hardware Requirement:**

- Desktop Systems
- LAN cable
- Router

4.5	DATA STRUCTURE USING PYTHON	L	T	P	C
PRACTICAL		4	0	4	4

RATIONALE

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of Python language and data structures will be reinforced by practical exercises during the course of study. This course will help students to develop the capability of selecting a particular data structure.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify the best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

1. Data Structures: Data Structures in Python, Introduction to Built-in Data Structures, Introduction to User-defined Data Structures, Algorithms, Elements of a Good Algorithm, Basic algorithmic analysis: input size, asymptotic complexity, O() notation

(08 Periods)

2. Strings: Working with series of characters that can represent plaintext messages, passwords, and more, including all the complexities of combining human language with programming code. **(06 Periods)**

3.List-Based Collections: definitions and examples of list-based data structures, arrays, linked lists, stacks, queues, Examine the efficiency of common list methods, Arrays vs lists

(08 Periods)

4. Searching and Sorting: search and sort with list-based data structures, binary search and insertion sort, bubble sort, merge sort, quick sort, use of recursion in searching and sorting.

(08 Periods)

5. Maps and Hashing: concepts of sets, maps (dictionaries), hashing, common problems and approaches to hashing, hash tables and hash maps.

(08 Periods)

6. Trees: concepts and terminology associated with tree data structures, common tree types, binary search trees, heaps, self-balancing trees, efficiency of traversals and common tree functions. **(10 Periods)**

7. Graph: concept of a graph and understand common graph terms, coded representations, properties, traversals and paths.

(08 Periods)

MEANS OF ASSESSMENT

− Assignments and quiz/class tests, mid-term and end-term written tests
− Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Data Structures and Algorithms in Python, Publisher(s): Wiley
2. Programming and Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill.
3. Problem Solving with Algorithms and Data Structures Using Python By Bradley N. Miller, David L. Ranum
4. Data Structures and Algorithms with Python by Kent D. Lee, Steve Hubbard
5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
- http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	15
2	06	10
3	08	15
4	08	20
5	08	15
6	10	15
7	08	10
Total	**56**	**100**

4.6	DATA STRUCTURE USING PYTHON [LAB]	L	T	P	C
PRACTICAL		0	0	4	2

RATIONALE

The **Data Structure Using Python Lab** is designed to help diploma students understand and implement fundamental data structures using the Python programming language. Through practical exercises, students will develop hands-on experience with linear and non-linear data structures, including arrays, linked lists, stacks, queues, trees, and graphs. By working with Python, students will also learn how to apply these data structures in real-world scenarios, enhancing their problem-solving and programming skills.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify the best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

Experiments

1. Write a Python program to create an array contains six integers. Also print all the members of the array
2. Given a two list. Create a third list by picking an odd-index element from the first list and even index elements from second.
3. Given an input list removes the element at index 4 and add it to the 2nd position and also, at the end of the list
4. Given a list iterate it and count the occurrence of each element and create a dictionary to show the count of each element
5. Given a two list of equal size create a set such that it shows the element from both lists in the pair
6. Given a following two sets find the intersection and remove those elements from the first set
7. Iterate a given list and Check if a given element already exists in a dictionary as a key's value if not delete it from the list
8. Remove duplicate from a list and create a tuple and find the minimum and maximum number
9. Swapping of two tuples.
10. Perform Insertion sort
11. Exercise based on Bubble sort
12. Binary Search exercise
13. Exercise based on merge & quick sort
14. Use of recursion in sorting

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15. Use of recursion in searching
16. Write a Python program to triple all numbers of a given list of integers. Use Python map
17. Write a Python program to square the elements of a list using map() function.
18. Write a Python program to compute the square of first N Fibonacci numbers, using map function and generate a list of the numbers.
19. Using two Arrays of equal length, create a Hash object where the elements from one array (the keys) are associated with the elements of the other (the values)
20. Exercise based on Build in Hash Functions
21. Write a Python program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.
22. Write a Python program to check whether a given a binary tree is a valid binary search tree (BST) or not.
23. Write a Python program to convert a given array elements to a height balanced Binary Search Tree (BST).
24. Exercise based on graph traversal

MEANS OF ASSESSMENT

− Assignments and quiz/class tests, mid-term and end-term written tests
− Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Data Structures and Algorithms in Python, Publisher(s): Wiley
2. Programming and Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill.
3. Problem Solving with Algorithms and Data Structures Using Python By Bradley N. Miller, David L. Ranum
4. Data Structures and Algorithms with Python by Kent D. Lee, Steve Hubbard
5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
- http://swayam.gov.in

4.7		L	T	P	C
PRACTICAL	**OPEN ELECTIVE-II/ SKILL CERTIFICATION**	2	0	0	2

4.7.1 Product Design

Course Learning Objectives:
- To acquire the basic concepts of product design and development process
- To understand the engineering and scientific process in executing a design from concept to
- finished product
- To study the key reasons for design or redesign.

Course Content:

UNIT-I: Definition of a product; Types of product; Levels of product; Product-market mix; New product development (NPD) process; Idea generation methods; Creativity; Creative attitude; Creative design process; Morphological analysis; Analysis of interconnected decision areas; Brain storming.

Unit-II: Product life cycle; The challenges of Product development; Product analysis; Product characteristics; Economic considerations; Production and Marketing aspects; Characteristics of successful Product development; Phases of a generic product development process; Customer need identification; Product development practices and industry-product strategies.

Unit-III: Product design; Design by evolution; Design by innovation; Design by imitation; Factors affecting product design; Standards of performance and environmental factors; Decision making and iteration; Morphology of design (different phases); Role of aesthetics in design.

Unit-IV: Introduction to optimization in design; Economic factors in design; Design for safety and reliability; Role of computers in design; Modeling and Simulation; The role of models in engineering design; Mathematical modeling; Similitude and scale models; Concurrent design; Six sigma and design for six sigma; Introduction to optimization in design; Economic factors and financial feasibility in design; Design for manufacturing; Rapid Prototyping (RP); Application of RP in product design;Product Development versus Design.

Unit-V: Design of simple products dealing with various aspects of product development; Design starting from need till the manufacture of the product.

Reference Books:

1. Product Design and Development, Karl T. Ulrich and Steven D. Eppinger, Tata McGraw–Hill edition.
2. Engineering Design –George E. Dieter.
3. An Introduction to Engineering Design methods Vijay Gupta.
4. Merie Crawford : New Product management, McGraw-Hill Irwin.
5. Chitale A K and Gupta R C, "Product Design and Manufacturing", Prentice Hall of India, 2005.

6. Kevin Otto and Kristin Wood, Product Design, Techniques in Reverse Engineering and New Product Development, Pearson education.

4.7.2 Disaster Management

Course Learning Objectives:

Following are the objectives of this course:

• To learn about various types of natural and man-made disasters.

• To know pre- and post-disaster management for some of the disasters.

• To know about various information and organisations in disaster management in India.

• To get exposed to technological tools and their role in disaster management.

Course Content:

Unit – I: Understanding Disaster
Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity
– Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters
Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters(floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);
Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Disaster Management Cycle and Framework
Disaster Management Cycle – Paradigm Shift in Disaster Management.
Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Framework of Action.

Unit– IV: Disaster Management in India
Disaster Profile of India – Mega Disasters of India and Lessons Learnt.
Disaster Management Act 2005 – Institutional and Financial Mechanism,
National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter Governmental Agencies

Unit– V: Applications of Science and Technology for Disaster Management
Geo-informatics in Disaster Management (RS, GIS, GPS and RS).
Disaster Communication System (Early Warning and Its Dissemination).
Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions,

Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and
Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries,
Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

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.

4.8	ESSENCE OF INDIAN KNOWLEDGE AND TRADITION (Q)	L	T	P	C
PRACTICAL		2	0	0	0

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.

LEARNING OUTCOMES:
Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:
- Overview, importance, and relevance of the Indian Knowledge System, including Vedas, Upavedas, Vedangas, and Upangas.
- Relevance of science and spirituality, and contributions of ancient Indian science and technology.
- Basic principles of Yoga, benefits of holistic healthcare, and integration with modern healthcare.
- Practical applications and case studies of the Indian Knowledge System's relevance today.

COURSE CONTENTS

Unit 1: Introduction to Indian Knowledge System   (16 Periods)
Overview of Indian Knowledge System
  - Importance and relevance
  - Introduction to the Vedas
  - Upavedas
  - Vedangas
  - Upangas

Unit 2: Modern Science and Indian Knowledge System   (06 Periods)
- Relevance of Science and Spirituality,
- Science and Technology in Ancient India,

Unit 3: Yoga and Holistic Healthcare   (04 Periods)
- Basic principles of Yoga
- Benefits of holistic healthcare practices
- Integration with modern healthcare

Unit 4: Case Studies / Assignment   (02 Periods)
- Practical Applications / Case studies demonstrating the relevance of Indian Knowledge System in modern times

Assessment
Viva -Voce Exam

INDUSTRIAL TRAINING

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, 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 industrial training of 4 weeks duration to be organised during the semester break starting after second year i.e. after 4th 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 a training schedule may be drawn for each student before starting of the training in consultation with the training 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 training 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 5th Semester. Evaluation of professional industrial training 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 4th semester for further details.

The teacher along with field supervisors 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%

10. RESOURCE REQUIREMENT

10.1 Physical Resources

10.1.1 Space Requirement:

Norms and standards laid down by All India Council for Technical Education (AICTE) may be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

10.1.2 Laboratoires/Shops

- Communication Skill Lab/Language Lab

- Applied Physics Lab

- Applied Chemistry Lab

- Technical Drawing

- Electrical Engineering Lab

- Carpentry Shop

- Painting and Polishing Shop

- Fitting and Plumbing Shop

- Sheet Metal Shop

- Programming Lab

- Hardware and Networking Lab

- Internet of Things (IoT) Lab

- Environment Engineering Lab

- Energy Conservation Lab

- Electronics Devices and circuits Lab

- Electronic Instruments and Measurement Lab

- Electronic Communication Lab

- Microprocessor Lab

-

LIST OF EQUIPMENT FOR COMPUTER SCIENCE AND ENGINEERING

Sr. No.	Description	Qty	Total Price (Rs)
COMMUNICATION LABORATORY/Language Lab (As per the DTE Specification)			
1.	Computer Server	01	1,28,000
2.	Headphone With Mic	01	
3.	Webcam: HD	01	
4.	Server OS; Windows/Linux	01	
5.	Monitor	01	
6.	Desktop Computer	30	13,20,000
7.	UPS 5KVA Online (At Least 30 Min. backup)	01	1,25,000
8.	Computer Chair and Table	30	2,40,000
9.	AC	02	80,000
10.	Laser Printer	01	10,000
11.	LAN Setup	-	20,000
12.	Language lab Software License/ Open Source	01	1,00,000
13.	Misc. Items	-	10,000
APPLIED PHYSICS LABORATORY			
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800

Sr. No.	Description	Qty	Total Price (Rs)
17	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4.000
23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000
25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	5,00
30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000
APPLIED CHEMISTRY LABORATORY			
1.	Digital Balance	1	80,000
2.	Burette 50ml	30	3,000
3.	Pipette 25ml	60	4,000
4.	Beakers 100ml	60	4,000
5.	Burette stand	30	30,000
6.	Glazed tile	30	1,000
7.	Conical flask 50ml (Titration flask)	60	4,000
8.	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
9.	Able's Flash Point apparatus	2	10,000
10.	(1/10)°C thermometer	06	6,000
11.	Candles	20	100
12.	Crucible with lid	06	2,000
13.	Muffle furnace	1	18,000

Sr. No.	Description	Qty	Total Price (Rs)
14.	Decicators	06	8,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	2,000
16.	Chemicals - EDTA-1 kg - Eriochrome Black-T(solochrome black T)-200g - Buffer solution (NH_3 - 2.5 ltr, NH_4Cl – 1 kg) - Zinc sulphate- 500g - H_2SO_4- 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement) - Charcoal (as per requirement) - Kerosene- 1 ltr	LS	20,000
17.	Miscellaneous	LS	2,000
TECHNICAL DRAWING			
1.	Drawing Boards (700 x 500mm)	60	25,000
2.	Draughtsman Tables	60	1,80,000
3.	Draughtsman Stools	60	40,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooder joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000
ELECTRICAL ENGINEERING LABORTORY			
1.	Voltmeter	5	7,500
2.	Ammeter	5	10,000
3.	CRO	1	15,000
4.	Wattmeter	5	10,000
5.	Multimeter	1	4,000
6.	Resistive load	1	4,000
7.	Regulated supply	1	8,000
8.	Signal generator	1	5,000

9.	Rheostat	2	2,500
10.	Lead acid battery	1	4,000
11.	Cables, Coils, Lamp (as per requirements)	LS	1,500
12.	Resistance, Inductor, Capacitor (as per requirements)	LS	1,500
13.	Miscellaneous	LS	1,500

CARPENTRY SHOP

Sr. No.	Description	Qty	Total Price (Rs)
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000
7.	Wood Planner	1	20,000
8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500

PAINTING AND POLISHING SHOP

1.	Spray gun with hose pipe	1	1,000
2.	Paint brushes	20	2,000
3.	Paint/Varnish	LS	2,000
4.	Air Compressor with 2 hp motor	1 set	10,000
5.	Miscellaneous	LS	2,000

FITTING AND PLUMBING SHOP

1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribers	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribers	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chiesels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2"	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500

SHEET METAL

1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00

Sr. No.	Description	Qty	Total Price (Rs)
4.	Shearing Machine	1	20,000
5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminium)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Miscellaneous	LS	1,000
PROGRAMMING LAB			
1.	Computer Server (Quad core, intel processor 32 GB RAM)	1	5,00,000/-
2.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
3.	Switch with 24 port speed 10/100/1000 (Manageable)	3	1,50,000/-
4.	Multifunctional Laser/Ink tank Printer	3	90,000/-
5.	Multifunctional Printer, A3 size	1	40,000/-
6.	Plotter	1	80,000/-
7.	Scanner	1	65,000/-
8.	Laptop	1	75,000/-
9.	Online UPS, 6KVA	2	2,00,000/-
10.	Digital Camera, HD quality	1	30,000/-
11.	Handy Cam	1	25,000/-
12.	Internet Connectivity	60 Nodes	3,00,000/-
13.	LCD/DLP Projector with Screen	1	25,000/-
14.	Linux Operating System (Open Source)	-	-
15.	Visual Studio Community Edition (Freeware, Open Source)	-	-
16.	Visual Studio Code (Open Source)	-	-
17.	Multimedia Tools – Software - Blender (Freeware) - Gimp Animation Tool (Freeware)	-	-
18.	Mongo DB (Freeware)	-	-
19.	Python IDE (PyCharm/Eclipse with PyDev/VS Code etc) – Freeware	-	-
20.	HTML & CSS, Java Script, Ajax (Open Source)	-	-
21.	PHP IDE XAMPP/WAMPP/VS Code (Freeware)	-	-
22.	Word press (Open Source)	-	-
23.	Oracle XE (Freeware)/MySql (Open Source)	-	-
24.	Corel Draw latest version or equivalent FOSS	10 User	2,00,000/-

Sr. No.	Description	Qty	Total Price (Rs)
25.	Adobe Creative Suite	10 User	2,50,000/- Per year
26.	Rstudio (Open Source)	-	-
27.	Macromedia Director latest version or equivalent FOSS	4 User	2,00,000/-
28.	Multimedia authoring Tools	LS	1,00,000/- Per year
29.	Java for Internet Environment (latest version) – software	-	-
30.	MS Office latest or equivalent FOSS	1	20,000/- Per year
	- Libre Office/Open Office (Freeware)	-	-
31.	Compiler Turbo C, C++ or equivalent FOSS	1	10,000/-
32.	Web camera, Mike and speakers	LS	20,000/-
33.	Air Conditioner 2 ton	2	70,000/-
34.	STARUML (Open Source)	-	-
35.	J-Meter (Performance Testing)- Open Source	-	-
36.	Lucid Chart (Developing DFD Model)- Open Source	-	-
37.	Selenium (functional Testing and Web Application)- Open Source	-	-
38.	J Unit (Java Testing) Open Source	-	-
39.	Cross browser Testing (Compatibility Testing) - Open Source	-	-
40.	Gantt Project (Project Plan)- Open Source	-	-
41.	Video Editing Tools (Open Source)	-	-
42.	- Eclipse IDE for Java programming/JDK (Open Source)	-	-
	- Apache Tomcat Web Server for Advanced Java Web Applications	-	-
43.	Antivirus Software	5 Users	10,000/-
44.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
HARDWARE AND NETWORKING LAB			
1.	Computer Server (Quad core, intel processor 32 GB RAM)	1	5,00,000/-
2.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	21	16,00,000/-
3.	Online UPS, 6KVA	1	1,00,000/-
4.	Switch with 24 port speed 10/100/1000 (Manageable)	1	50,000/-
5.	Connectors (RJ-45, RJ-11, BNC, SC, ST)	LS	10,000/-

Sr. No.	Description	Qty	Total Price (Rs)
6.	Cables: (UTP,STP,OFC) - 25 m each	LS	10,000/-
7.	Multifunctional Laser/Ink tank Printer	1	30,000/-
8.	Router	1	40,000/-
9.	Modem cum Router	2	10,000/-
10.	Compact Disk/DVD R/W	100	2000/-
11.	Hardware kit (for computer Assembling/de-assembling)	8	1,50,000/-
12.	External Hard Disk	4	30,000/-
13.	Networking Printer	1	1,25,000/-
14.	Internet Connectivity	21 Nodes	1,00,000/-
15.	Computer System Demonstration Kit	1	1,50,000/-
16.	Printer Demonstration Kit	1	1,00,000/-
17.	SMPS Demonstration Kit	1	20,000/-
18.	LAN Trainer	4	10.000/-
19.	Antivirus Software	5 Users	10,000/-
20.	Unmanaged Switch	4	60,000/-
21.	Hub	2	20,000/-
22.	Air Conditioner 2 ton	2	70,000/-
23.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
INTERNET OF THINGS (IoT) LAB (For IoT, Android and Major/Minor Project)			
1.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
2.	Switch with 24 port speed 10/100/1000 (Manageable)	1	50,000/-
3.	Multifunctional Laser/Ink tank Printer	1	30,000/-
4.	Online UPS, 6KVA	2	2,00,000/-
5.	Touch screen, 60 inch	1	5,00,000/-
6.	Laptop	1	75,000/-
7.	Internet Connectivity	60 Nodes	3,00,000/-
8.	Photocopier Compatible with Computer System: Colour/Mono Photo-copier	1	1,50,000/-
9.	LCD/DLP Projector with Screen	1	25,000/-
10.	Video Conferencing System	1	2,00,000/-
11.	Android Studio (Open Source)	-	-
12.	Antivirus Software	5 Users	10,000/-

Sr. No.	Description	Qty	Total Price (Rs)
13.	Windows Latest or equivalent FOSS	1	10,000/-
14.	SciLab (Open Source)	-	-
15.	Microsoft Azure/AWS/EC2 (Open Source)	-	-
16.	Own Cloud (Open Source)	-	-
17.	CloudSim (Open Source)	-	-
18.	Digital Board	1	30,000/-
19.	Air Conditioner 2 ton	2	70,000/-
20.	Arduino Uno IDE with built in Wifi	20	20,000/-
21.	Raspberry pi	2	6,000/-
22.	Sensor Kits (e.g. MQ135, DHT11 etc.)	10	1,00,000/-
23.	Bluetooth module HC05	10	3,500/-
24.	Display Screen	5	1,000/-
25.	Relay Module	5	5,000/-
26.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-

Electronic Devices and Circuit Lab

1	CRO	2	40000
2	Zener Diode Kit	2	8000
3	Digital Multimeter	3	6900
4	Function Generator	2	28000
5	Set of Resistors (Multiple Values)	2 set	500
6	Set of Capacitor (Multiple Values)	2set	600
7	Set of Inductor	1 set	300
8	Set of Diode (PN , Zener)	2 set	600
9	Set of BJT (BC107 , SL100)	2 set	500
10	Set of JFET (2N547 ,MPF102)	1 set	250

11	Set of MOS (IRF540 , AO4620)	10 pc	500
12	OP-AMP (741 IC)	8 pc	400
13	555 Timer IC	10pc	500
14	Breadboard	6	1800
15	Operational Amplifier as Adder and Subtractor kit	5	20000
16	Pushpull amplifier kit	2	8000
17	Wein bridge oscillator and phase shift oscillator	2	10000
18	Hartley and colpitts oscillator	2	8000
19	Clipper clamper kit	3	15000
20	Logic Gate IC(AND,OR,NOR.NAND,EXOR,EXNOR)	10 EACH	500
21	Logic gate kit	1	4000
23	Flip Flop kit	2	8000
24	MUX-DEMUX kit	1	5000
25	Encoder and Decoder kit	1	4800
26	CMOS and TTL transfer characteristics kit	1	4900
27	Breadboard	6	1800
Electronic Instruments and Measurement Lab			
1	DSO	1	35000
2	CRO	2	40000
3	Wheat stone bridge	2	7000
4	RLC bridge	1	6000
5	Maxwell bridge	1	4500
Electronic Communication Lab			
1	CRO	2	40000
2	AM MODULATOR	1	4500
3	FM MODULATOR	1	5500

4	Sampling and reconstruction kit	1	4400
5	PPM &PWM KIT	1	5500
6	ASK,FSK,DPSK KIT	1	6000
7	PSPICE SOFTWARE		
8	GSM TRAINER KIT WITH GSM MOBILE	1	20000
9	Transmitting antenna measurement kit	1	5000
Microprocessor Lab			
1	8085 MP kit	8	80000
2	8086 mp kit	2	20000

NOTE

In addition to above laboratories, computer centre will be required for effective implementation of the course.

10.1.3 **Furniture Requirement**

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

- Furniture for laboratories/Computer Centre   15 lacs

10.2   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. The website www.aicte.ernet.in may be referred for downloading current norms and standards pertaining to technician courses.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be accessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A.   Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

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Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B.   Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C.   Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D.   Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

11.3 ASPECTS OF QUESTION PAPER SETTING

Validity and reliability are the most important considerations in the selection and construction of evaluation procedures. First and foremost are the evaluation tools to measure the specific outcomes for which they are intended to measure. Next in importance is reliability, and following that is a host of practical features that can be classified under the heading of usability.

For weightage of marks assigned to formative (internal) and summative (external) evaluation and duration of evaluation has been given in the study and evaluation scheme of the curriculum document. Teachers/Paper-setters/Examiners may use Manual for Students' Evaluation developed by IRDT Kanpur to bring objectivity in the evaluation system. The working group found it very difficult to detail out precisely the contents of subject on **languages** and therefore teachers may send guidelines to respective examiners for paper setting to maintain objectivity in evaluation.

12.   RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action (POA) and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every course teacher to read them carefully, comprehend and start using them.

(A)   Broad Suggestions:

1.   Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2.   Punjab State Board of Technical Education (PSBTE) may make the academic plan available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics in turn are supposed to prepare institutional academic plan by referring state level PSBTE plan.

3.   HOD of every Programme Department along with HODs and incharges of other departments viz. English, Maths, Physics, Chemistry etc. are required to prepare academic plan at department level referring institutional academic plan.

4.   All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B)   Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of 16 weeks which is made available to them in the academic plan at PSBTE level. With the amount of time to their credit, it is essential for them to use it judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available, course to be taught, different learning experiences required to be developed etc.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of content to be covered, learning material (transparencies, VCDs, Models etc.) for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcome and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The tutorial, assignment and seminar can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits with appropriate releases (day-block) may be planned and executed for such content of course which otherwise is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive explicit feed back to every student. It has to be planned properly; otherwise very purpose of the same is lost.

8. The co-curricular activities like camp, social gathering, study tour, hobby club etc. may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. While imparting instructions, emphasis may be laid on the development of cognitive, psychomotor, reactive and interactive skills in the students.

11. Teachers may take working drawings from the industry/field and provide practices in reading these drawings.

12. Considerable emphasis should be laid in discipline specific contracting and repair and maintenance of machines, tools and installations.

13.   Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

14.   Case studies and assignments may be given to students for understanding of Enterprise Resource Management (ERM).

15.   Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

16.   Students may be given relevant and well thought out minor and major project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment (wage and self).

17.   A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, Research Institutes and other relevant field organizations in the state.

13. LIST OF PARTICIPANTS

The following experts have participated in workshop for Developing the Curricula Structure and Contents of Diploma in Communication and Computer Networking for UP State at IRDT U.P. Kanpur:

1. Dr. Vijay Yadav, Lecturer IT, Government Girls Polytechnic Charkhari Mahoba.

2. Priyanka Shukla, Lecturer Web Designing, Government Polytechnic, Kanpur

3. Saurabh Sachan, Lecturer Computer, Government Polytechnic, Deeh Unnao

4. Mudresh Mohan Tripathi, Lecturer Computer Hardware & Networking, Government Polytechnic, Kanpur

5. Komal, Lecturer, Computer Hardware & Networking, Government Polytechnic, Lucknow

6. Anurag Singh, Lecturer Web Designing, Government Polytechnic, Kanpur

7. Gaurav Kishor Kanaujiya, Assistant Professor IRDT U.P. Kanpur

Annexure: 1

Proposed Courses by TATA Technology   (Advance Skill Certification)

S. No.	Course Name
1	Fundamentals of Innovation and Design Thinking
2	Product Design and Development
3	Product Verification and Analysis
4	Advanced Automobile
5	Electric Vehicle
6	Internet of Things
7	Advanced Manufacturing
8	Advanced Welding & Painting using Simulator
9	Industrial Automation and MES
10	Industrial Robotics
11	Inspection and Quality Control
12	Advanced Plumbing
13	AI and ML