PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC501	**Course Title**: **Consumer Electronics**
Semester: 5th	**Credits:** 3
Periods Per Week: 3 (L:0 ,T:0, P: 3)	

COURSE OBJECTIVE: The objective of teaching this subject is to give students an in-depth knowledge of various electronic audio, video devices and other consumer electronic systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, video systems and other items like microwave ovens, photostat machines etc. which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

COURSE CONTENT

I. FUNDAMENTALS OF AUDIO SYSTEMS
   1.1 Basic characteristics of sound signal: Pitch, Loudness, Timbre(Quality)
   1.2 Sources of sound signal:
      Microphones and its types
        i)Dynamic microphone
        ii)Condenser microphone
        iii)Brief mention of other types like ribbon , lavalier, ,Bluetooth microphones, MEMS microphones
   1.3 Audio signal processing:
      Brief knowledge of the stages of amplification ,A/D conversion, encoding, file formats, compression ,transmission, decoding, decompression ,audio crossover etc.

1.4 Speaker and its types: Dynamic moving coil or direct radiating cone and horn type speakers. Brief idea of other classes of speakers like woofers , tweeters, high-fidelity etc.

2. AUDIO SYSTEMS

2.1 Public address amplifier:

a) Schematic or block diagram of a PA amplifier with brief function of i)microphones ii)pre-amplifier mixer iii)amplifier iv)loudspeakers

2.2 Simplified block diagram and working principle of following.

i) Digital audio player(MP3 player)

ii)Vehicle audio systems(Car stereo)

3.TELEVISION SYSTEM BASICS

3.1 Television basics

i) Idea of a frame and a field.

ii)Scanning - progressive scanning and interlaced scanning

iii)Flicker and persistence of vision

iv)Composite video signal

v) Luminance and chrominance

vi) Hue and saturation

vii) Resolution

3.2 Analog television systems

i)Brief features of analog colour television system

ii)Brief description of Analog color TV standards: PAL, NTSC, SECAM

3.3 Digital television systems

i)Basic features of digital television system

ii)Brief description of Digital television standards : ATSC , DVB

iii)Idea of Digital HDTV and HDTV(UHD)

3.4 Broadcast systems and standards

i)Terrestrial television

ii) Cable television

iii) Satellite television

iv)Internet television

4.TELEVISION RECEIVERS AND VIDEO SYSTEMS

4.1 Brief concept of audio, video interfaces /connections like HDMI , RGB,USB-C, DVI.

4.2Simplified block diagram explanation of a PAL color TV receiver.

4.2 Constructional features and a simplified block diagram explanation of the working of a LCD/LED television.

 4.4 Brief description of the salient features of a smart television/digital media player/home theatre system.

 4.5 Description of working of DTH /satellite TV receiver system.

 4.6 Description of working of a modern CCTV system.

5. CONSUMER DEVICES FOR HOME AND OFFFICE USE
    5.1 General constructional features of modern smart electronic gadgets:-
Microcontroller, memory, firmware, display devices and actuators, input devices and sensors, connectivity with other devices/internet.

    5.2 Working principles and simplified block diagram explanation of the following
        1)Microwave oven
        2)Digital camcorder
        3)Smart phones
        4)Semi-automatic /Automatic washing machine
        5)Photocopier

     5.2 Salient features of
        i) Home automation system.
        ii)Home/Office security system.

   COURSE OUTCOME:

After Undergoing the course the student shall be able to

CO1   Have knowledge of various different types of audio systems.

CO2   Analyse the functioning of various audio systems.

CO3   Have understanding of the working of television standards and broadcasting

CO4   Acquire knowledge of various types of LED/LCD television receivers.

CO5   Understand the working of different consumer electronic appliances.

RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi

2. Colour Television-Principles & Practice by R.R Gulati, Wiley Eastern Limited, New Delhi

3. Complete Satellite & cable Television R.R Gulati New Age International Publisher, New Delhi

4. Colour Television Servicing by RC Vijay BPB Publication, New Delhi

5. Colour Television & Video Technology by A.K. Maini CSB Publishers

6. Colour TV by A.Dhake

7. Service Manuals, BPB Publication, New Delhi

UNIT WISE MARKS AND TIME DISTRIBUTION

UNITS	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	10	20
2	10	20
3	12	25
4	10	20
5	6	15
Total	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC502	**Course Title**: Consumer Electronics Lab
Semester: 5th	**Credits:** 1
Periods Per Week: 2 (L:0 ,T:0, P: 2)	

COURSE OBJECTIVES:

This subject is a lab course to be supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

CONTENTS

LIST OF PRACTICALS

1. To plot the frequency response of a Microphone

2. To plot the frequency response of a Loud Speaker

3. To observe the working of a Digital audio player.

4. To understand the working of a colour LED/LCD TV Receiver with observation of signal/voltages and output at different stages/blocks.

5. Demonstration of construction, working and Operation of

   (a) Microwave Oven
   (b) Automatic/Semi-automatic Washing Machine
   (c) Camcorder/Digital camera

6. Understanding the installation of a DTH and observing its working.

7. Comprehension of the working of a CCTV system

8. Demonstration of working of a home automation system.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC503	**Course Title**: WIRELESS AND MOBILE COMMUNICATION
Semester: 5th	**Credits:** 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE: The wireless communication, especially cellular mobile services have revolutionized the world and it is imperative for the student

1. INTRODUCTION
1.1   Basics of wireless communication system
1.2   Advantages of wireless communication
1.3   Electromagnetic waves; Frequency Spectrum used in different wireless   systems

2. OVERVIEW OF CELLULAR SYSTEMS
2.1   Cellular Telephony Concepts – Cell area, Capacity of cell, Frequency reuse, Co-channel and Adjacent channel Interference, Power Control for reducing Interference.

2.2   Improving coverage and capacity in cellular system using
         a)Cell Splitting b) Sectoring c) Repeaters for Range Extension.

3. MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION

3.1   Concept of Multiple Access and its different forms viz., Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and its types- Frequency Hopping spread Spectrum (FHSS),Direct sequence spead spectrum(DSSS)

3.2   Comparison of FDMA/TDMA/CDMA in terms of their advantages and limitations.

4. MOBILE COMMUNICATION SYSTEMS

4.1   Salient features of 2G/2.5G systems.

4.2   Salient features of 3G systems with a brief description of following.
       4.2.1   3G W-CDMA or UMTS
       4.2.2   3G CDMA 2000
       4.2.3   3G TD-SCDMA
4.3   4G systems
       4.3.1   LTE(Long Term Evolution)technology
       4.3.2   Mobile Wi-MAX technology
4.4   5G (Beyond 4G) systems
       Brief idea of Beyond 4G or 5G systems.

5. OTHER WIRELESS SYSTEMS
      5.1   Concept of Wireless Local Loop(WLL)
      5.2   Concept of Wireless LANs/adhoc networs using Wi-Fi (IEEE 802.11 b/g/n)
      5.3   Concept of PAN(personal Area Network) using Bluetooth(or ZigBee).
      5.4   Brief concept of low power wide area (LPWA)wireless network.
      5.5   Concept of RFID

COURSE OUTCOME:
After Undergoing the course the student shall be able to
CO1. Understand basics of wireless communication.
CO2. Concept of cellular communication technology.
CO3. Knowledge of various generations of mobile communication technologies.
CO4. Knowledge of other commonly used wireless standards.

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by ThedoreS.Rappaport.
2. Wireless Communications by Singal, Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Wireless Communications by Misra, Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Introduction to Wireless and Mobile Systems, by Dharma PrakashAgarwal, Qing-Anzeng.
5. Wireless Communications and Networking, by William Stallings.
6. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi
7. Mobile Communication by John Schiller, Prentice Hall of India, New Delhi
8. Wireless Communications by Pahalwan, Pearson Publishers

UNIT WISE MARKS AND TIME DISTRIBUTION

UNITS	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	05	10
2	10	20
3	10	20
4	14	30
5	09	20
TOTAL	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC504	**Course Title**: **WIRELESS AND MOBILE COMMUNICATION LAB**
Semester: 5th	**Credits:** 1
Periods Per Week: 2(L:0 , T:0, P: 2)	

COURSE OBJECTIVES:

This subject is a lab course to be supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

LIST OF PRACTICALS:

Most of the practical work can be undertaken by a visit to a telecommunication service provider.

1. To understand the working of a cellular communication base station.

2.To understand the working of a mobile switching center.

3.To understand the working of a wireless local loop.

4.To understand the working of an adhoc wireless network using hotspot feature on smart phones.

5.To understand the working of a wireless LAN of a network of inter-connected computers devices.

6.To understand the working of a personal area network using Bluetooth.

Course Outcome:

The student will be able to Practically establish the fundamental concepts and techniques learned in the theory.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC505	**Course Title**: INTERNET OF THINGS
Semester: 5th	**Credits:** 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

The course should enable the students to understand the architecture of Internet of Things and connected world, explore use of various hardware and sensing technologies to build IoT applications. It will also Illustrate the real time IoT applications to make smart world and understand the available cloud services and communication API's for developing smart cities.

COURSE CONTENT:

1. Introduction to Internet of Things (IoT)
1.1. Definition and characteristics of IoT
1.2. Physical design of IoT
1.3. IoT Protocols (M2M vs IOT)
1.4. Logical Design of IoT
1.5. Functional blocks of an IoT ecosystem-Sensors, Actuators, Smart Objects.
1.6. IoT communication Models

2.Basics of Arduino Programming
2.1 Introduction to Arduino IDE
2.2 Similarities and differences between the C language and Embedded C language
2.3 Variables: Declaration, initialization.
2.4 Basic Data types: int, float, char, byte, bool
2.5 Basic understanding of the code with operators..
2.6 Conditional Statements: if, else and else if ; Switch Case
2.7 Loops: for, while and do-while; break and continue statement
2.8 Simple code/sketch examples in embedded C for programming a Arduino,

3. Other concepts in Arduino programming

3.1 Brief idea of Functions, Arrays and strings.

3.2 Input/Output

Digital I/O: pinMode(), digitalWrite(), digitalRead()

Analog I/O: analogRead(), analogWrite() (PWM)

Using serial communication: Serial.begin(), Serial.print(), Serial.println(), Serial.read()

3.3 Libraries: Including and using libraries to extend functionality, Overview of commonly used Arduino libraries .

4.Arduino and interfacing

4.1 Brief review of Arduino and its similar/ other flavors like Uno,Mega,LilyPad etc.

4.2Interfacing and reading from sensors: Temperature and humidity sensors, PIR sensor, Button, Joystick, IR sensor, Matrix Keypad.

4.3 Interfacing and controlling actuators: LEDs, Servo motor, Stepper motor, relay, LCD display

4.4 Arduino communication with: Wi Fi Module, Bluetooth module.

4.5 Brief idea of SoCs like ESP8266, ESP32 etc. used in IoT applications.

4.6 Salient features of Raspberry Pi.

5. IoT Platforms and connectivity

5.1Concept of IoT platform.

5.2Concept of cloud, fog and edge in IoT.

5.3 Storing, analyzing, and visualizing sensor data in the cloud.

5.4 Enabling technologies for IoT connectivity like cellular links, RF links, LoRaWAN, Wi-Fi, Bluetooth , Zigbee.

5.4 Design of a home automation systems using any cloud platform.

6. Applications of IOT

6.1. IoT Wearables

6.3. Smart Home Applications

6.4. Health care

6.5. Smart Cities

6.6. Agriculture

6.7. Industrial Automation

COURSE OUTCOME:

After the completion of the course the student will be able to:

1. Under stand the principles and components of IoT systems.
2. Program the Arduino microcontroller to interact with sensors, actuators, and the internet.
3. Design and build IoT devices for real-world applications.
4. Analyze and solve problems related to IoT device connectivity and data exchange.
5. Understand the security implications of IoT devices and how to mitigate common vulnerabilities.

RECOMMENDED BOOKS:

1. Internet of Things – A Hands on Approach, By Arshdeep Bahga and Vijay Madisetti Universities Press
2. Internet of Things by Michael Miller ,Pearson
3. Arduino Programming: The Ultimate Intermediate Guide to Learn Arduino Programming Step by Step, Ryan Turner
4. IOT for Beginners ,Vibha Soni
5. Getting Started with Arduino" by Massimo Banzi, Michael Shiloh
6. The ESP8266 Wi-Fi Module for Dummies" by Cefn Hoile
7. Building the Internet of Things" by Maciej Kranz
8. Arduino Cookbook, 3rd Edition by Michael Margolis, Brian Jepson, Nicholas Robert Weldin, Released April 2020, Publisher(s): O'Reilly Media, Inc.
9. IoT: Building Arduino-Based Projects by Peter Waher , Pradeeka Seneviratne , Brian Russell, Drew Van Duren
10. Internet of Things With Arduino Blueprints: Develop Interactive Arduino-based Internet Projects With Ethernet and Wi-fi, by Pradeeka Seneviratne (Author)

UNIT WISE MARKS AND TIME DISTRIBUTION

UNIT WISE TIME AND MARKS DISTRIBUTION Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	08	20
3	10	10
4	08	20
5	08	15
6	06	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC506	**Course Title**: **INTERNET OF THINGS LAB**
Semester: 5th	**Credits:** 1
Periods Per Week: 2(L:0 , T:0, P: 2)	

COURSE OBJECTIVES:

This subject is a lab course to be supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

.LIST OF PRACTICALS:

1. To Set up an Arduino IDE platform.
2. To Blink an LED using Arduino.
3. To switch an LED ON and OFF with a push button using Arduino IDE.
4. To Interface DHT11 with Arduino.
5. To Interface Matrix Keypad with Arduino.
6. To Interface Stepper motor with Arduino.
7. To Interface Servo motor with Arduino.
8. To Interface LCD with Arduino.
9. To Interface a relay module with Arduino.
10. To Interface Bluetooth Module with Arduino and switch a device ON/OFF using Bluetooth terminal on a smart phone .
11. To Interface Wifi Module with Arduino.
12. Using any cloud platform: To send data collected from sensors to cloud and visualize and control devices from a smart phone or a computer dashboard.

Course Outcome:

The student will be able to Practically establish the fundamental concepts and techniques learned in the theory.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE501	Course Title: VLSI Design (Branch specific Elective)
Semester: 5th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

The VLSI is important in designing integrated circuits, embedding thousand of gates on a single chip which has resulted in electronic circuit design of powerful chips that are used in all aspects of industrial and commercial applications.

DETAILED CONTENTS

1.Overview of VLSI.

1.1 Introduction to Computer-aided design tools for digital systems.

1.2 Hardware-description languages

1.3 Introduction to VHDL.

    1.3.1 Data objects, Classes and data types,

    1.3.2 Operators and operator overloading.

    1.3.3 Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.

2. VHDL Statements.

 2.1 Assignment statements, sequential Statements and process,

 2.2 Conditional statements, Case statements.

 2.3 Concept and use of concurrent statements.

3. Combinational Circuit Design:

    3.1Implementation of Boolean functions in VHDL.

3.2 VHDL models and simulation of combinational circuits such as

i)   Multiplexers,

ii)   Encoders

iii)   Decoders

iv)   Code converters

v)   Comparators

4. Sequential Circuit Design

 VHDL Models and simulation of asynchronous/synchronous sequential circuits such as

i)Flip flops

ii)Shift registers,

ii)Counters etc.

5. Introduction to CPLDs and FPGAs.

5.1 Brief idea of programmable logic devices.

 5.2 CPLDs- description and details of internal block diagram.

5.2 FPGA- architecture and explanation of internal block diagram.

5.3 Description of other programmable logic devices like EPLDs, PLAs,etc.

5.4 Brief idea of reconfigurable computing using programmable logic devices.

COURSE OUTCOME

After undertaking the course the student is expected to

1)Understand the basics of VHDL language.
2)Devise programs for making simple sequential and combinatorial circuits.
3)Understand the basics of reconfigurable computing.

RECOMMENDED BOOKS:

1. Circuit design using VHDL by Volini Pedroni,MIT Press, Prentice Halll of India.

2. VLSI Technologies by Sze, Tata McGraw Hill Education Pvt Ltd , New Delhi

3. IEEE Standard VHDL Language Reference Manual.

4. "Digital System Design using VHDL":Charles. H. Roth; PHI

5. VHDL-latest Edition by Perry, Tata McGraw Hill Education Pvt Ltd , New Delhi

6. VLSI Design for Analog Design by Geiger, Tata McGraw Hill Education Pvt Ltd , New Delhi

UNIT WISE MARKS AND TIME DISTRIBUTION

UNIT	Time Allotted (Hrs)	Marks Allotted
1.Overview of VLSI	08	20
2.VHDL Statements	08	15
3.Combinational Circuit Design	12	25
4.Sequential Circuit Design	12	25
5.Introduction to CPLDs and FPGAs	08	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE502	Course Title: VLSI Design Lab (Branch specific Elective Lab)
Semester: 5th	Credits: 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

 COURSE OBJECTIVES:

This subject is a lab course to be supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

LIST OF PRACTICALS
Design Exercises using VHDL

1.   Design of Gates

2.   Design of XOR gate using other basic gates

3.   Design of 2:1 Mux using other basic gates

4.   Design of 2 to 4 Decoder

5.   Design of Half-Adder, Full Adder, Half Substractor, Full Substractor

6.   Design of 3:8 Decoder

7.   Design of 8:3 Priority Encoder

8.   Design of 4 Bit Binary to Grey code Converter

9   Design of shift register.

10.   Design of up counter.

11.   Design of a decade counter

12.   Design of Synchronous 8-bit Johnson Counter

13.   Design of ALU (Additional, subtraction, Multiplication, Division)

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE503	Course Title: Industrial Automation (Branch specific Elective)
Semester: 5th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE:

Understand automation technologies and identify advantages, limitations and applications of the same. Develop ability to recognize, articulate and solve industrial problems using automation technologies.

Course Content

Unit – I Introduction to Industrial Automation

1.1 Automation: Need and benefits.
1.2 Types of automation system: Fixed, Programmable, Flexible.
1.3 Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives.

Unit – II PLC Fundamentals

2.1 Building blocks of PLC: CPU, Memory organization, Input- output modules (discrete and analog), Special I/O Modules, Power supply
2.2 Fixed and Modular PLC and their types, Redundancy in PLC module.

Unit– III PLC Programming and Applications

3.1 Ladder logic Programming: Rung in a ladder logic program, Program Execution Sequence in ladder logic, Rung Conditions.

3.2 Role of Instructions in Ladder Diagram Programming.

3.3 PLC programming Instructions**:** Relay type instructions, Timer instructions (On delay, off delay, retentive),Counter instructions(Up, Down), Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions.

3.4. Ladder Diagram Programs based on basic instructions, timer, and comparison instructions.

3.5 Functional Block Diagram (FBD) programming and Structured text Language programming for PLC .

3.6 Simple Programming examples using ladder logic based on relay, timer counter, logical, comparison, arithmetic and data handling instructions.

3.7 PLC Based Applications: Motor sequence control, Traffic light control, Elevator control, Tank Level control, Conveyor system, Stepper motor control.

Unit– IV Supervisory Control and Data Acquisition System (SCADA) and HMI

4.1 Introduction to SCADA: Typical SCADA architecture/block diagram,
4.2 Applications of SCADA
4.3 Interfacing SCADA system with PLC.
4.4 Applications of SCADA: Traffic light control, water distribution, pipeline control.
4.5 HMI(Human machine interface) :-Benefit, installation procedure, communication and control
4.6 Functions of HMI with PLC.

Unit-V Distributed Control System (DCS) and Variable Frequency drives (VFD)
5.1 DCS elements and applications.
5.2 Various architectures in DCS.
5.3 Basic concepts of VFD.
5.2 Block diagram of VFD, types of VFD, Speed control in VFD.

References:
1. Dunning, G., Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260
2. Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281
3. Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386
4. Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Del- hi, 2003, ISBN : 9780130607188
5. Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN: 9780130618900

267 of 594

6. Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Auto- mation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174

7. Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978- 1936007097

COURSE OUTCOME:

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

1. Understand the basics of PLC programming.
2. Understand the different parameters of PLC.
3. Design different process control applications through ladder logic.
4. Analyze& explain different functions of PLC.
5. Build and experiment with PLC based SCADA systems for various industrial applications.
6. Implement HMI, distributed control system and Industry standard 4.0

UNIT WISE MARKS AND TIME DISTRIBUTION

UNITS	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	05	10
2	05	10
3	18	40
4	10	20
5	10	20
Total	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE504	Course Title: Industrial Automation Lab (Branch specific Elective)
Semester: 5th	Credits: 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

COURSE OBJECTIVE:

This subject is a lab course to be supplemented by theory subject and aims to develop proficiency and understanding of practical outcomes of the subject taught in theory.

LIST OF PRACTICALS

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using Computer interface
3. To develop ladder logic program for basic boolean functions and implementing in a PLC
4. To develop ladder logic using Timers in a PLC
5. To develop ladder logic using counters in a PLC
6. To develop and implement ladder logic for the timer application
7. To develop and implement ladder logic to control a motor
8. To develop and implement ladder logic using sequencer in a PLC
9. To develop and implement ladder logic to control a conveyor belt
10. To develop and implement ladder logic to control a lift
11. To develop and implement ladder logic to control a water level in a Tank
12. To control a motor using VFD
13. Study of basic SCADA system

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE505	Course Title: Microwave and Radar Engg. (Branch specific Elective)
Semester: 5th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in of assembly, production, installation, repair and maintenance of microwave transmitters and receivers.

DETAILED CONTENTS

1.Introduction to Microwaves   (02 hrs)

1.1 Introduction to microwaves and its applications,

1.2 Classification on the basis of frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, Sub mm bands)

2. Microwave Devices   (10 hrs)

2.1 Basic concepts of thermionic emission and vacuum tubes.

2.2 Effects of inter-electrode capacitance, Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes and steps to extend their high frequency operations.

2.3Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment) -

  i)Multi cavity klystron

- ii)Reflex klystron

- iii)Multi-cavity magnetron

- iv)Traveling wave tube

- v)Gunn diode and Impatt diode

(08 hrs)

3.Wave guides

3.1Rectangular and circular wave guides and their applications.

3.2Modes of wave guide;

3.3 Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation).

3.4 Impossibility of TEM mode in a wave guide.

4.Microwave Components   (08 hrs)

4.1Constructional features, characteristics and application of
i) tees ii) bends iii) matched termination iv) twists v) detector
 mount vi) slotted section, vii)directional coupler viii) fixed and variable attenuator ix)isolator x) circulator and duplex, coaxial to wave guide adapter.

5.Microwave antennas   (04 hrs)

5.1 Structure characteristics and typical applications of Horn and Dish antennas
5.2 Features of a microwave patch antenna.

(08 hrs)

6.Microwave Communication systems
6.1 Block diagram and working principles of microwave communication link.

6.2 Troposcatter Communication: Troposphere and its properties,
   Tropospheric duct formation and propagation, troposcatter propagation.

(08 hrs)

7.Radar Systems

8.1 i) Introduction to radar and its various applications
    ii)Radar range equation (no derivation) and its applications.

8.2 i) Block diagram and operating principles of basic pulse radar.
ii)Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.

8.3 Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.

8.4 Block diagram and operating principles of MTI radar.
8.5 Radar display- Scopes and PPI.

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi
4 Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd , New Delhi

UNIT WISE MARKS AND TIME DISTRIBUTION

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to Microwaves	02	10
2	Microwave Devices	10	20
3	Wave guides	08	15
4	Microwave Components	08	15
5	Microwave antennas	04	10
6	Microwave Communication systems	08	15
7	Radar Systems	08	15
	Total	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE506	Course Title: Microwave and Radar Engg.Lab (Branch specific Elective Lab)
Semester: 5th	Credits: 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

COURSE OBJECTIVES:

This subject is a lab course to be supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

DETAILED CONTENTS

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
6. To verify the properties of magic tee.
7. To carry out installation of a dish antenna.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECOE501	Course Title: Open Elective a)Energy Conservation and Audit
Semester: 5th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experience which among other things includes undertaking energy conservation and energy audit.

COURSE CONTENTS:

UNIT-I: Introduction

1.1   General energy problem.

1.2   Sector wise Energy consumption, demand supply gap.

1.3   Scope for energy conservation and its benefits.

1.4   Energy Efficiency Principle – Maximum energy efficiency, Maximum cost effectiveness; Mandatory provisions of EC act.

1.5   Features of EC Act-Standards and labeling, designated consumers, Energy Conservation Building Codes (ECBC).

Unit-II: Energy Conservation Approaches In Industries

2.1   Methods and techniques of energy conservation in ventilation and air conditioners- compressors pumps, fans and blowers.

2.2   Area Sealing, Insulating the Heating / cooling fluid pipes, automatic door closing, Air curtain, Thermostat / Control.

2.3   Energy conservation in electric furnaces, ovens and boilers.

Unit-II Energy Conservation Approaches In Industries

3.1   New equipment, technology, staffing, training.

3.2   Calculation and costing of energy conservation project; Depreciation cost, sinking fund method.

3.3   Cost evaluation by Return On Investment(ROI) and pay back method etc.

Unit-IV   Performance improvement of existing power plant

4.1   Cogeneration, small hydro, DG Set.

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

4.3   Technical measures to optimize T and D losses.

Unit-V   Energy Audit

5.1   Energy audit and its benefits.

5.2   Energy flow diagram; Preliminary, Detailed energy audit.

5.3   Methodology of preliminary energy audit and Detailed energy audit – Phase I, Pre audit.
Phase II- Audit
Phase III-Post audit.

5.4   Energy audit report.

COURSE OUTCOMES.

CO1 Identify demand supply gaps in the present scenario.
CO2 Understand the conservation approaches for an industry.
CO3 Draw the energy flow diagram of and industry and identify waste stream.
CO4 Identify energy wastage and suggest alternative methods.
CO5 Evaluate the concepts of energy audit.

RECOMMENDED BOOKS.

1.   Electric Energy Generation, Utilisation and Conservation by Sivaganaraju, S Pearson, New Delhi,2012
2.   Project Management by Prasanna Chandra, Tata Mcgraw Hill, New Delhi

3. O.P. Jakhar, Energy Conservations in Buildings by Khanna Publishing House, New Delhi
4. Financial Management by Prasanna Chandra Tata Mcgraw Hill, New Delhi.
5. Energy management Handbook by Prasanna Chandra, Tata Mcgraw Hill, New Delhi.
6. O.P. Gupta, Energy Technology by Khanna Publishing House, New Delhi

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction	08	20
2	Energy Conservation Approaches In Industries	10	20
3	Energy Conservation Approaches In Industries	10	20
4	Performance improvement of existing power plant	10	20
5	Energy Audit	10	20
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECOE502	Course Title: Open Elective b)Disater Management
Semester: 5th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

Unit – I: Understanding Disaster

1.1 Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity

1.2 Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

2.1   Geological Disasters (earthquakes, landslides, tsunami, mining);

2.2   Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves)

2.3   Biological Disasters (epidemics, pest attacks, forest fire);

2.4   Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemi- cals and biological disasters)

2.5   Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Types, Trends, Causes, Consequences and Control of Disasters

3.1   Disaster Management Cycle – Paradigm Shift in Disaster Management.

3.2   Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

3.3   During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

3.4   Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Frame- work of Action.

Unit– IV: Disaster Management in India

4.1   Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

4.2   Disaster Management Act 2005 – Institutional and Financial Mechanism,

4.3   National Policy on Disaster Management, National Guidelines and Plans on Disaster Management;

4.4   Role of Government (local, state and national),Non-Government and Inter Governmental Agencies

Unit– V: Applications of Science and Technology for Disaster Management

5.1   Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

5.2   Disaster Communication System (Early Warning and Its Dissemination).

5.3   Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters

5.4   S&T Institutions for Disaster Management in India

COURSE OUTCOMES.

After competing this course, student will be:

- Acquainted with basic information on various types of disasters

- Knowing the precautions and awareness regarding various disasters

- Decide first action to be taken under various disasters

- Familiarised with organisation in India which are dealing with disasters

RECMMMENDED BOOKS

1.Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management

2. An overview on natural & man-made disasters and their reduction, Bhandani, R. K., CSIR, New Delhi

3. Management of Natural Disasters in developing countries by Srivastava, H. N., and Gupta G. D., , Daya Publishers, Delhi

4. Natural Disasters by Alexander, David, Kluwer Academic London

5.Disaster Management by Ghosh, G. K., , A P H Publishing Corporation

6. Disaster Management: Text & Case Studies by Murthy, D. B. N., , Deep & Deep Pvt. Ltd.

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Understanding Disaster	04	10
2	Types, Trends, Causes, Consequences and Control of Disasters	12	25
3	Types, Trends, Causes, Consequences and Control of Disasters	12	25
4	Disaster Management in India	10	20
5	Applications of Science and Technology for Disaster Management	10	20
	TOTAL	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: SI/PR510	Course Title: Industrial Training
Semester: 5th	Credits: 2
Periods Per Week : 4-6 Weeks at the end of 3rd/4th Semester	

The industrial Training of students during their studies at Polytechnics forms an important part of the studies. 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.

The concerned faculty will guide and help students in arranging appropriate training places relevant to their specific branch as per the availability of relevant industry in a particular field. 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. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

The students are also expected to frame an idea regarding the requisite skills required in the industry and choose to undertake projects in that particular area of interest larter on in 6th Sem.

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. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is ideally recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.