THIRD SEMESTER: ELECTRONICS AND COMMUNICATION ENGINEERING-2018

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	Electronic Instruments and Measurement	3	2	4	25	25	50	100	3	50	3	150	**200**
3.2	Principles of Communication Engineering	3	2	4	25	25	50	100	3	50	3	150	**200**
3.3	**Digital Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
3.4	Electronic Devices and Circuits	3	2	4	25	25	50	100	3	50	3	150	**200**
3.5	Network Filters and Transmission Lines	3	2	4	25	25	50	100	3	50	3	150	**200**
3.6	*Computer Programming using C	3	3	4	25	25	50	100	3	50	3	150	**200**
	Soft Skills -I	-	3	-	-	25	25	-	-	-	-	-	**25**
	Total	**18**	**17**	**24**	**150**	**175**	**325**	**600**	**-**	**300**	**-**	**900**	**1225**

** Common with Computer Engineering

* Only Theory portion is common with Computer Engineering

FOURTH SEMESTER: ELECTRONICS AND COMMUNICATION ENGINEERING -2018

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	Instrumentation	3	3	4	25	25	50	100	3	50	3	150	**200**
4.2	Communication System	3	3	4	25	25	50	100	3	50	3	150	**200**
4.3	Power Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
4.4	*Microprocessor and Peripheral Devices	3	3	4	25	25	50	100	3	50	3	150	**200**
4.5	Troubleshooting of Electronic Equipment	-	3	1	-	50	50	-	-	50+	3	50	**100**
4.6	Medical Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
Soft Skills -II		-	2		-	25	25	-	-	-	-	-	**25**
	Total	**15**	**20**	**21**	**125**	**200**	**325**	**500**	**-**	**300**	**-**	**800**	**1125**

+ **Includes 25 marks for Viva-Voce**

* **Common with Diploma Programme in Computer Engineering**

Industrial Training

After examination of 4th Semester, the students shall go for training in a relevant industry/field organization for a minimum period of 8 weeks and will prepare a diary. It shall be evaluated during 5th semester by his/her teacher Incharge for 100 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 100 marks. This evaluation will be done by HOD and lecturer in charge – training in the presence of one representative from Industry/Sector Skill Council/Training and Placement Officer/Subject Expert from other institution.

FIFTH SEMESTER (ELECTRONICS AND COMMUNICATION ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
Industrial Training		-	-	5	-	100	100	-	-	100	-	100	**200**
5.1	Audio Video Systems	3	3	4	25	25	50	100	3	50	3	150	**200**
5.2	Digital Communication	3	3	4	25	25	50	100	3	50	3	150	**200**
5.3	Optical Fiber Communication	3	3	4	25	25	50	100	3	50	3	150	**200**
5.4	Computer Networks	4	-	4	25	-	25	100	3	-	-	100	**125**
5.5	Microcontrollers	4	3	5	25	25	50	100	3	50	3	150	**200**
5.6	Electronics Design and Simulation Techniques	-	3	1	-	50	50	-	-	50	3	50	**100**
Soft Skills -III		-	3	-	-	25	25	-	-	-	-	-	**25**
	Total	**17**	**18**	**27**	**125**	**275**	**400**	**500**	**-**	**350**	**-**	**850**	**1250**

SIXTH SEMESTER (ELECTRONICS AND COMMUNICATION ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Microwave and Radar Engineering	4	3	5	25	25	50	100	3	50	3	150	**200**
6.2	Wireless and Mobile Communication	4	3	5	25	25	50	100	3	50	3	150	**200**
6.3	*Entrepreneurship Development and Management	3	-	3	25	-	25	100	3	-	-	100	**125**
6.4	+Elective	4	-	4	25	-	25	100	3	-	-	100	**125**
6.5	Project Work	-	12	6	-	50	50	-	-	100	3	100	**150**
	Soft Skills-IV	-	2	-	-	25	25	-	-	-	-	-	**25**
	Total	**15**	**20**	**23**	**100**	**125**	**225**	**400**	**-**	**200**	**-**	**600**	**825**

***** Common with other diploma programmes

+ **Elective-To choose one from the following:**

6.4.1 Embedded Systems 6.4.2 Industrial Automation

THIRD SEMESTER

ELECTRONIC INSTRUMENTS AND MEASUREMENT

L	T	P
3	-	2

RATIONALE

In the real world of work, the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.
- Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO
- Measure the loading effect of a multi-meter
- Describe the limitation of multi-meter for high frequency measurement
- Measure frequency, voltage, time period and phase using CRO and DSO
- Measure rise time and fall time using CRO and DSO
- Demonstrate the working of RF signal generator, pulse generator
- Measure distortion of RF signal generator using Distortion factor Meter
- Measure of Q using Q-meter
- Measure of remittance, capacitance, inductance and usig different bridges
- Use of logic pulser, logic analyzer and signature analyzer

DETAILED CONTENTS

1. Basics of Measurements (04 Periods)

- Measurement, method of measurement, types of instruments
- Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2. Voltage, Current and Resistance Measurement (08 Periods)

- Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments,

3. Cathode Ray Oscilloscope (12 Periods)

- Construction and working of Cathode Ray Tube(CRT)
- Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
- Specifications of CRO and their explanation
- Measurement of current, voltage, frequency, time period and phase using CRO
- Digital storage oscilloscope (DSO) : block diagram and working principle

3 Impedance Bridge Q Meters (08 periods)

- Wheat stone bridge
- AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
- Bock diagram description of laboratory type RLC bridge, specifications of RLC bridge.
- Block diagram and workig principle of Q meter.

4 Signal Generators and Analytical Instruments (08 Periods)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Distortion factor meter
- Instrumentation amplifier: its characteristics, need and working

6. Digital Instruments (08 Periods)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multi-meter
- Specifications of digital multi-meter and their applications
- Limitations of digital multi-meters.
- Working principle of logic probe, logic pulser, logic analyzer and signature analyzer.

LIST OF PRACTICALS

1. Measurement of voltage, resistance, frequency using digital multimeter

2 Measurement of voltage, frequency, time period and phase using CRO
3 Measurement of voltage, frequency, time and phase using DSO
4 Measurement of Q of a coil
5 Measurement of resistance and inductance of coil using RLC Bridge
6. Measurement of impedance using Maxwell Induction Bridge
7 To find the value of unknown resistance using Wheat Stone Bridge
8 Measurement of distortion using Distortion Factor Meter
9 Use of logic pulser and logic pobe

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. 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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Measurement and Instrumentation by Oliver, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
4. Electronics Instrumentation and measurment by Sanjeev Kumar and Yash Pal; North Publications
5. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	04	08
2.	08	18
3.	12	24
4.	08	18
5.	08	16
6.	08	16
Total	**48**	**100**

PRINCIPLES OF COMMUNICATION ENGINEERING

L	T	P
3	-	2

RATIONALE

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems on a comparative a scale and relate to them while studying practical communication systems.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave
- Measure the frequency deviation of FM wave for different modulating signals
- Use different types of modulators and demodulators
- Obtain modulating signal from an AM Detector Circuit
- Obtain modulating signal from a FM Detector
- Use different types of Pulse Modulation Techniques (PAM, PPM, PWM)

DETAILED CONTENTS

1. Introduction (03 Periods)

   - Need for modulation, frequency translation and demodulation in communication systems
   - Basic scheme of a modern communication system.

2. Amplitude modulation (06 Periods)

   - Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.
   - Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications

3. Frequency modulation (06 Periods)

   - Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW of FM signals, Carson's rule.

   - Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.

   - Comparison of FM and AM in communication systems

4. Phase modulation (05 Periods)

- Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of AM Modulators (05 Periods)
Circuit Diagram and working operation of:

a) Collector and Base Modulator
b) Square Low Modulator
c) Balanced Modulator

6. Principles of FM Modulators (06 Periods)

- Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.
- Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (05 Periods)

- Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)

8. Demodulation of FM Waves (06 Periods)

- Basic principles of FM detection using slope detector
- Principle of working of the following FM demodulators
  i. Foster-Seeley discriminator
  ii. Ratio detector
  iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9. Pulse Modulation (06 Periods)

- Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation
- Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

- Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM).

LIST OF PRACTICALS

1. a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
   b) To measure the modulation index of the wave obtained in above practical

2. a) To obtain an AM wave from a square law modulator circuit and observe waveforms
   b) To measure the modulation index of the obtained wave form.

3. To obtain an FM wave and measure the frequency deviation for different modulating signals.

4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.

5. To obtain modulating signal from FM detector.

6. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.

7. To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal

8. To observe PPM and PWM signal and compare it with the analog input signal

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. 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.

MEANS OF ASSESSMENT

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

- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

(1) Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi
(2) Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
(3) Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi
(4) Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
(5) Principles of Communication Engineering by Sanjeev Kumar, Ishan Publications, Ambala
(6) Communication Engineering by A Kumar
(7) Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi
(8) Principles of Communication Engineering by Anokh Singh, S. Chand and Co., New Delhi
(9) Principles of Communication Engineering by Roody , Coolen, Pearson Publisher
(10) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	03	06
2.	06	12
3.	06	12
4.	05	10
5.	05	10
6.	06	14
7.	05	10
8.	06	14
9	06	12
Total	**48**	**100**

DIGITAL ELECTRONICS

L	T	P
3	-	3

RATIONALE

This course has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Explain the importance of digitization.
- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with NAND and NOR gates
- Design half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, demultiplexer, encoder and decoder ICs
- Design and realize different asynchronous and synchronous counters
- Design 4-bit SISO, PISO, SIPO, PIPO shift registers
- Explain the features and applications of different memories.
- Verify performance of different A/D and D/A converters.

DETAILED CONTENTS

1. Introduction (02 Periods)

   a) Distinction between analog and digital signal.
   b) Applications and advantages of digital signals.

2. Number System (03 Periods)

   a) Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   b) Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction.

3. Codes and Parity (03 Periods)

   a) Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code.

   b) Concept of parity, single and double parity and error detection

4. Logic Gates and Families (05 Periods)

   a) Concept of negative and positive logic
   b) Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates.
   (a) Introduction to TTL and CMOS logic families

5. Logic Simplification (04 Periods)

   a) Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates

b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (02 Periods)

a) Half adder and Full adder circuit, design and implementation.
b) 4 bit adder circuit

7. Decoders, Multiplexeres, Multiplexeres and Encoder (04 Periods)

a) Four bit decoder circuits for 7 segment display and decoder/driver ICs.
b) Basic functions and block diagram of MUX and DEMUX with different ICs
c) Basic functions and block diagram of Encoder

8. Latches and flip flops (04 Periods)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
c) Difference between a latch and a flip flop

9. Counters (06 Periods)

a) Introduction to Asynchronous and Synchronous counters
b) Binary counters
c) Divide by N ripple counters, Decade counter, Ring counter

10. Shift Register (06 Periods)

Introduction and basic concepts including shift left and shift right.

a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register

11. A/D and D/A Converters (06 Periods)

- Working principle of A/D and D/A converters
- Brief idea about different techniques of A/D conversion and study of :
    - Stair step Ramp A/D converter
    - Dual Slope A/D converter
    - Successive Approximation A/D Converter
- Detail study of :
    - Binary Weighted D/A converter
    - R/2R ladder D/A converter
- Applications of A/D and D/A converter.

12. Semiconductor Memories (03 periods)

Memory organization, classification of semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), static and dynamic RAM, introduction to 74181 ALU IC

LIST OF PRACTICALS

1. Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates

2. Realisation of logic functions with the help of NAND or NOR gates

3. - To design a half adder using XOR and NAND gates and verification of its operation

- Construction of a full adder circuit using XOR and NAND gates and verify its operation

4. Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).
5 Verification of truth table for encoder and decoder ICs, Mux and DeMux
6. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
7. To design a 4 bit ring counter and verify its operation.
8. Use of Asynchronous Counter ICs (7490 or 7493)

Note: Above experiments may preferably be done on Bread Boards.

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,
4. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar
5. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd,
6. Digital Fundamentals by Thomas Floyds, Universal Book Stall
7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Yashpal and Sanjeev Kumar; North Publication, Ambala City
10. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
11. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
12. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi
13. Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi
14. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	02	04
2.	03	05
3.	03	05
4.	05	10
5.	04	10
6.	02	05
7.	04	10
8.	04	10
9	06	12
10.	06	12
11.	06	12
12	03	05
Total	**48**	**100**

ELECTRONIC DEVICES AND CIRCUITS

L	T	P
3	-	2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Demonstrate the concept of multistage amplifiers and plot the frequency response of the same
- Measure the bandwidth of multistage amplifier
- Describe the operation of large signal amplifiers.
- Demonstrate the concept of negative and positive feedback.
- Measure the gain of emitter follower and push pull amplifiers
- Plot the frequency response of oscillators(Hartley, Colpitt, Wein Bridge)
- Explain the concept of feedback amplifiers
- Plot the frequency response of tuned voltage amplifiers
- Design various wave-shaping circuits (concepts of clipping and clamping)
- Describe the concept of multi-vibrators and operational amplifiers
- Demonstrate the working of operational amplifier as inverter, integrator, differentiator, adder and subtractor.
- Describe the concept of regulated DC supplies.

DETAILED CONTENTS

1. Multistage Amplifiers (05 Periods)

- Need for multistage amplifier
- Gain of multistage amplifier
- Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier (06 Periods)

- Difference between voltage and power amplifiers
- Importance of impedance matching in amplifiers
- Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C
- Single ended power amplifiers, Graphical method of calculation (without derivation) of out put power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier

3. Feedback in Amplifiers (08 Periods)

- Basic principles and types of feedback
- Derivation of expression for gain of an amplifier employing feedback
- Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
- RC coupled amplifier with emitter bypass capacitor
- Emitter follower amplifier and its application

4. Sinusoidal Oscillators (06 Periods)

- Use of positive feedback
- Barkhausen criterion for oscillations
- Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)

5. Tuned Voltage Amplifiers (04 Periods)

- Series and parallel resonant circuits and bandwidth of resonant circuits.
- Single and double tuned voltage amplifiers and their frequency response characteristics

6. Multivibrator Circuits (07 Periods)

- Working principle of transistor as switch
- Concept of multi-vibrator: astable, monostable, and bistable and their applications
- Block diagram of IC555 and its working and applications
- IC555 as monostable and astable multi-vibrator and bistable multivibrator

7. Operational Amplifiers (07 Periods)

- Characteristics of an ideal operational amplifier and its block diagram
- IC-741 and its pin configuration
- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

8. Regulated DC Power Supplies (05 Periods)

- Concept of DC power supply. Line and load regulation
- Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)

LIST OF PRACTICALS

(1) Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
(2) To measure the gain of push-pull amplifier at 1KHz
(3) To measure the voltage gain of emitter follower circuit and plot its frequency response
(4) Plot the frequency response curve of Hartley and Colpitt's Oscillator
(5) Plot the frequency response curve of phase shift and Wein bridge Oscillator
(6) Use of IC 555 as monostable multivibrator and observe the output for different values of RC
(7) Use of IC 555 as astable multivibrator and observe the output at different duty cycles

(8) To use IC 741 (op-amplifier) as
i) Inverter, ii) Adder, iii) Subtractor iv) Integrator

(9) To realize positive and negative fixed voltage DC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

Class Project: Fabricate any simple operational amplifier circuit (Inverter, Adder, Subtractor etc.) and test it.

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises apart from the list provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

(1) Basic Electronics and Linear Circuits by NN Bhargava; Tata McGraw Hill, New Delhi
(2) Electronic Principles by Sahdev; Dhanpat Rai and Sons, New Delhi.
(3) Electronics Devices and Circuits by D.R. Arora, North Publication
(4) Electronics Devices and Circuits by Bhupinderjit Kaur; Modern Publishers, Jalandhar
(5) Electronic Devices and Circuits by BL Theraja; S Chand and Co Ltd. New Delhi
(6) Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
(7) Electronics Devices and Circuits-II by Rajesh Kumar, Eagle Prakashan, Jalandhar
(8) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

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

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allocation
1.	05	10
2.	06	12
3.	08	16
4.	06	12
5.	04	08
6.	07	16
7.	07	16
8.	05	10
Total	**48**	**100**

NETWORK FILTERS AND TRANSMISSION LINES

L	T	P
3	-	2

RATIONALE

The study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes off from principles of A.C. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

LEARNING OUTCOMES

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

- Describe the concept of symmetrical, asymmetrical, balanced, unbalanced, T, PI, ladder, lattice, L and Bridge T networks
- Demonstrate the operation of filters and attenuators.
- Demonstrate the operation of attenuators.
- Design and measure the attenuation of a symmetrical T/ π type attenuator
- Determine the characteristic impedance experimentally and Plot the attenuation characteristic of prototype low pass filter and prototype high pass filter
- Plot the Impedance characteristic and attenuation characteristics of prototype band-pass filter and m-derived filters
- Measure standing wave ratio and characteristic impedance of the line
- Draw the attenuation characteristics of a crystal filter
- Explain the concept of DC transmission

DETAILED CONTENTS

1. Networks (12 Periods)

- Two port (four terminals) network: Basic concepts of the following terms:
  - Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, π network, Ladder network; Lattice network; L-network and Bridge T-network

- Symmetrical Network:
  - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
  - T-network and π Network (No Derivation)

- Asymmetrical Network
  - Concept and significance of iterative impedance, image impedance,
  - The half section (L-section); symmetrical T and π sections into half sections (No Derivation)

2. Attenuators (08 Periods)

- Units of attenuation (Decibels and Nepers): General characteristics of attenuators
- Analysis and design of simple attenuator of following types; Symmetrical T and π type, L type.

3. Filters (14 Periods)

- Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters.
- Prototype Filter Section:
  - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance
  - Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance vs frequency of T and π filters and their significance
  - Simple design problems of prototype low pass section.
- M-Derived Filter Sections
  Limitation of prototype filters, need of m-derived filters
- Crystal Filters
  Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
- Active Filters
  Basic concept of active filters and their comparison with passive filters.

4. Transmission Lines (14 Periods)

- Transmission Lines, their types and applications.
- Distributed constants, T and π representation of transmission line section.
- Concept of infinite line
- Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.
- Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).
- Concept of transmission lines at high frequencies.
- Introduction to stubs. (single, open and short stubs).
- HVDC (High Voltage DC transmission) – Concept and Advantage, Disadvantage and areas of application.

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and π networks
2. To measure the image impedance of a given asymmetrical T and π networks

3. For a prototype low pass filter:

   a) Determine the characteristic impedance experimentally
   b) Plot the attenuation characteristic

4. To design and measure the attenuation of a symmetrical T/ π type attenuator

5. For a prototype high pass filter:

   - Determine the characteristic impedance experimentally
   - To plot the attenuation characteristic

6. a) To plot the Impedance characteristic of a prototype band-pass filter
   b) To plot the attenuation characteristic of a prototype band pass filter

7. a) To plot the impedance characteristic of m- derived low pass filter
   b) To plot the attenuation characteristics of m-derived high pass filter

8. To observe the information of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line

9. Draw the attenuation characteristics of a crystal filter

INSTRUCTIONAL STRATEGY

Stress should be laid on problems in networks/ filler and transmission lines. Practical must be carried out after completion of topic to gain a good know how on the subject students should be given home assignments on various topics, stress on making own circuit models to calculate input/output impedance, characteristic impedance, losses etc. should be carried out by the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; Prentice Hall of India, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication, New Delhi
3. Network Analysis by Van Valkenburg: Prentice Hall of India, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai and Co. Publication, New Delhi
5. Network Theory and Filter Design by Vasudev K. Aatre
6. Network Filters and Transmission line by Umesh Sinha
7. Network Filters and Transmission Line by Yash Pal; Ishan Publications, Ambala City

8. Electrical and Electronics Measuring instrumentation, A.K Sawhney; Dhanpat Rai and Co. Publication, New Delhi
9. Network Analysis by G.K. Mithal
10. Network Filters and Transmission line by Nardeep Goyal, Rajneesh Kumari; Tech. Max Publication, Pune.
11. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	12	25
2	8	15
3	14	30
4	14	30
Total	**48**	**100**

COMPUTER PROGRAMMING USING C

L	T	P
3	-	3

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

LEARNING OUTCOMES

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

- Identify a problem and formulate an algorithm for it.
- Identify various control structures and implement them.
- Identify various types of variables.
- Use pointer in an array and structure.
- Explain the concepts of C programming language
- Implement the language constructs concepts
- Install C software on the system and debug the programme
- Explain and execute member functions of C in the programme
- Implement array concept in C programme
- Execute pointers

DETAILED CONTENTS

1. Algorithm and Programming Development (06 Periods)
   Steps in development of a program
   Flow charts, Algorithm development
   Programme Debugging

2. Program Structure (12 Periods)

   I/O statements, assign statements
   Constants, variables and data types
   Operators and Expressions
   Standards and Formatted IOS
   Data Type Casting

3. Control Structures (12 Periods)

Introduction
Decision making with IF – statement
IF – Else and Nested IF
While and do-while, for loop
Break. Continue, goto and switch statements

4. Pointers (10 Periods)
   - 4.1 Introduction to Pointers
   - 4.2. Address operator and pointers
   - 4.3 Declaring and Initializing pointers,
   - 4.4 Single pointer,

5. Functions (12 Periods)
   - 5.1 Introduction to functions
   - 5.2 Global and Local Variables
   - 5.3 Function Declaration
   - 5.4 Standard functions
   - 5.5 Parameters and Parameter Passing
   - 5.6 Call - by value/reference

6. Arrays (08 Periods)
   - 6.1 Introduction to Arrays
   - 6.2 Array Declaration, Length of array
   - 6.3 Single and Multidimensional Array.
   - 6.4 Arrays of characters
   - 6.5 Passing an array to function
   - 6.6 Pointers to an array

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf and their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while, statement.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.

12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
    (ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs using union.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

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. Let us C by Yashwant Kanetkar
2. Programming in ANSI C by E Balaguruswami, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Problem Solving and Programming in C by RS Salaria, Khanna Book Publishing Co(P) Ltd. New Delhi
4. Programming in C by Reema Thareja; Oxford University Press, New Delhi
5. Computer Programming and Application by Mridula Bassi; North Publications, Ambala City.
6. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
7. Exploring C by Yashwant Kanetkar; BPB Publications, New Delhi
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	12
2	12	20
3	16	20
4	10	16
5	12	20
6	08	12
Total	**64**	**100**

SOFT SKILLS – I

L	T	P
-	-	3

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Identify components of effective verbal communication
- Prepare a report
- Learn the techniques of enhancing memory
- Set goals for overall personality development
- Understand the concept of quality and its implementation in an organisation.

DETAILED CONTENTS

- Soft Skills - Concept and Importance
- Communication Skills- Improving verbal communication
- Report Writing
- Method to enhance memory and concentration
- Component of overall personality- Dressing sense/etiquettes/body language etc.

In addition, the students must participate in the following activities to be organized in the institute.

- Sports
- NCC/NSS
- Camp – Blood donation
- Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.

FOURTH SEMESTER

INSTRUMENTATION

L	P
3	3

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. Electrical supervisor employed for maintenance of electrical equipment/ machinery is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation. Basics of instrumentation has been dealt with in this subject.

LEARNING OUTCOMES

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

- Explain importance of measurement
- Use various transducers
- Measure displacement and Strain
- Measure force and torque
- Measure pressure
- Measure flow
- Measure temperature
- Measurement non electrical quantities

DETAILED CONTENTS

1. Measurements (4 Periods)

   Importance of measurement, basic measuring systems, advantages and limitations of each measuring systems and display devices

2. Transducers (6 Periods)

   Theory, construction and use of various transducers (resistance, inductance, capacitance, electromagnetic, piezo electric type)

3. Measurement of Displacement and Strain (10 Periods)

   Displacement Measuring Devices: wire wound potentiometer, LVDT, strain gauges and their different types such as inductance type, resistive type, wire and foil type etc. Gauge factor, gauge materials and their selections. Use of electrical strain gauges, strain gauge bridges and amplifiers.

4. Force and Torque Measurement (10 Periods)

   Different types of force measuring devices and their principles, load measurements by using elastic transducers and electrical strain gauges. Load cells, measurements of torque by brake, dynamometer, electrical strain gauges, speed measurements; different methods

5. Pressure Measurement (6 Periods)

   Bourdon pressure gauges, electrical pressure pick ups and their principle, construction and applications. Use of pressure cells.

6. Flow Measurement (4 Periods)

Basic principles of magnetic and ultrasonic flow meters

7. Measurement of Temperature (6 Periods)

Bimetallic thermometer, thermoelectric thermometers, resistance thermometers, thermocouple, thermisters and pyrometer. Temperature recorders

8. Measurement of other non electrical quantities such as humidity, pH, level and vibrations (2 Periods)

PRACTICAL EXERCISES

1. To measure temperature using a thermo-couple/PTO/temperature sensor.
2. Study and use of digital temperature controller
3. Use of themistor in ON/OFF transducer
4. Study of variable capacitive transducer/proximity Switches
5. Draw the characteristics of a potentiometer
6. To measure linear displacement using LVDT, Ultrasonic
7. To study the use of electrical strain gauge
8. To study weighing machine using load cell
9. To measure pH/ TPS/DO_2 value of given solution.

INSTRUCTIONAL STRATEGY

The teacher should explain the scope of various measuring devices and their practical applications in the field. The transducers and measuring devices must be shown to the students and they should be trained in the reaction, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work and viva-voce

RECOMMENDED BOOKS

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Electronic Measurement and Instrumentation by JB Gupta, SK Kataria and Sons, New Delhi
3. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
4. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
5. Industrial Instrumentation by Umesh Rathore, SK Kataria and Sons, New Delhi
6. Instrumentation by Sapra & Chadha, Ishan Publication
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Topic	Time Allotted (Periods)	Marks Allocation (%)
1	Measurements	04	06
2	Transducers	06	12
3	Measurement of Displacement and Strain	10	20
4	Force and Torque Measurement	10	20
5	Pressure Measurement	06	12
6	Flow Measurement	04	09
7	Measurement of Temperature	06	12
8	Measurement of other non electrical quantities	02	09
	Total	**48**	**100**

COMMUNICATION SYSTEMS

L	T	P
3	-	3

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of different communication systems.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Classify the transmitters on the basis of modulation, service, frequency and power
- Demonstrate the working of each stage of AM and FM transmitters
- Identify the waveforms at different stages of a Radio Receiver
- Tune AM broadcast radio receiver
- Measure the performance characteristics of a radio receiver(sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio).
- Determine the appropriate value of Intermediate Frequency IF.
- Identify the waveforms at different stages of a FM receiver
- Identify the various types of antennas used in different frequency ranges
- Plot the radiation pattern of directional and omni-directional antenna
- Explain various modes of propagation of waves i.e. Ground Wave, Sky Wave, Space Wave and Duct Propagation.
- Explain satellite communication link and terms related to satellite orbit.
- Plot the variation of field strength of a radiated wave, with distance from a transmitting antenna

DETAILED CONTENTS

1. AM/FM Transmitters (06 Periods)

   - Classification of transmitters on the basis of modulation, service, frequency and power
   - Block diagram of AM transmitters and working of each stage
   - Block diagram and working principles of reactance FET and armstrong FM transmitters

2. AM/FM Radio Receivers (12 Periods)

   - Principle and working with block diagram of super heterodyne AM receiver. Function of each block and typical waveforms at input and output of each block
   - Performance characteristics of a radio receiver: sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure. ISI standards on radio receivers (brief idea)
   - Selection criteria for intermediate frequency (IF). Concepts of simple and delayed AGC
   - Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception
   - Block diagram of communication receivers, differences with respect to broadcast receivers.

3. Antennas: (12 Periods)

- Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
- Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
- Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
- Types of antennas-brief description, characteristics and typical applications of half wave dipole, medium wave (mast) antenna, folded dipole, patch, loop, Ferrite rod, Yagi antenna
- Structure, Characteristics and typical applications of dish antenna.

4. Propagation: (09 Periods)

- Basic idea about different modes of wave propagation and typical areas of application. Ground wave propagation and its characteristics, summer field equation for field strength.

- Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave propagation standard atmosphere

- Duct propagation, sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency, multiple hop propagation.

5. Satellite Communications*:* (10 Periods)

- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee

- Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.
- Introduction to VSAT and its features.

LIST OF PRACTICALS

1. To observe the waveforms at different stages of a AM transmitter
2. To observe the waveforms at different stages of a Radio Receiver
3. To align AM broadcast radio receiver
4. To identify and study the various types of antennas used in different frequency ranges.
5. To plot the radiation pattern of a directional and omni directional antenna
6. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna..
7 To study and rectify different faults in a broadcast radio receiver.

NOTE: Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. 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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Communication Systems by George Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Communication Systems by A.K. Gautam; SK Kataria and Sons, New Delhi.
3. Electronic Communication Systems by K.S. Jamwal; Dhanpat Rai and Sons, New Delhi.
4. Electronic Communication System by Roddy and Coolen; Prentice Hall of India, New Delhi.
5. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi
6. Radio Engineering by G.K Mittal; Khanna Publications, Delhi
7. Communication System by Deepika Chadha; Ishan Publications, Ambala City
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	12
2	12	25
3	12	25
4	09	20
5	09	18
Total	**48**	**100**

POWER ELECTRONICS

L	T	P
3	-	3

RATIONALE

Diploma holders in Electronics and related fields are required to handle a wide variety of power electronic equipment used in process control industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further reinforce the knowledge and skill of the students.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Describe the construction, working principles of SCR, two transistor analogy of SCR, SCR specifications, methods of SCR triggering.
- Plot and explain V-I characteristics of SCR, TRIAC, UJT, DIAC
- Draw and demonstrate different wave forms of UJT relaxation oscillator
- Draw and demonstrate the wave shape of voltage at relevant point of single-phase controlled rectifiers(half wave, full wave) and effect of change of firing angle.
- Draw and demonstrate wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit
- Install UPS system and routine maintenance of batteries
- Demonstrate the concept and working of choppers, inverters, dual converters, and cyclo-conveters.
- Explain basic ideas about electric drives(AC and DC)

DETAILED CONTENTS

1. Introduction to thyristors and other Power Electronics Devices (14 Periods)

- Role of Power electronics
- Construction, working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
- SCR specifications & ratings.

$$\frac{di}{dt} \& \frac{\mathrm{dv}}{dt} \text{ protection of SCR}$$

- Different methods of SCR triggering.
- Different commutation circuits for SCR.
- Construction & working principle of DIAC, TRIAC and their V-I characteristics.
- Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
- Basic idea about the selection of Heat sink for thyristors.
- Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers (06 Periods)

- Single phase half wave controlled rectifier with load (R, R-L)
- Single phase half controlled full wave rectifier (R, R-L)
- Single phase fully controlled full wave bridge rectifier.
- Single phase full wave centre tap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters. (12 Periods)

- Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel, inverters & their applications.
- Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
- Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

4. Thyristorised Control of Electric drives (10 Periods)

a) DC drive control
   - Half wave drives.
   - Full wave drives
   - Chopper drives (Speed control of DC motor using choppers)

b) AC drive control
   - Phase control
   - Constant V/F operation
   - Cycloconverter/Inverter drives.

5. Uninterrupted Power supplies (06 Periods)

- UPS, on-line, off line & its specifications
- Concept of high voltage DC transmission
- Classification of batteries

LIST OF PRACTICALS

1) To plot VI characteristic of an SCR.
2) To plot VI characteristics of TRIAC.
3) To plot VI characteristics of UJT.
4) To plot VI characteristics of DIAC.
5) To study UJT relaxation oscillator and observe different wave forms
6) To observe wave shapes at relevant points of single-phase half wave controlled rectifier and effect of change of firing angle.
7) To observe wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
8) To observe output wave shape in a circuit for single phase full wave controlled rectifier.
9) To study installation of UPS system and routine maintenance of batteries.

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1) Power Electronics by P.C. Sen; Tata McGraw Hill Education Pvt Ltd., New Delhi
2) Power Electronics by P.S. Bhimbhra; Khanna Publishers, New Delhi
3) Power Electronics – Pricilpes and Applications by Vithayathi; Tata Mc Graw Hill Education Pvt Ltd. New Delhi
4) Power Electronics by M.S. Berde; Khanna Publishers, New Delhi.
5) Power Electronics by MH Rashid
6) Industrial Electronics and Control by SK Bhattacharya and S. Chatterji; New Age Publications. New Delhi
7) Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
8) Power Electronics by Sugandhi and Sugandhi
9) Power Electronics – Principles and Applications by J Michael Jacob; Vikas Publishing House, New Delhi
10) Power Electronics by Puri and Chopra; North Publications, Ambala City
11) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	30
2	06	15
3	12	25
4	10	20
5	06	10
Total	**48**	**100**

MICROPROCESSORS AND PERIPHERAL DEVICES

L T P

3 - 3

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings the students face-to-face with mainframe enabling them to get employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

LEARNING OUTCOMES

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

- Describe all the internal parts and pins of 8085
- Write and Edit assembly language program using mnemonics
- Write, execute and debug assembly language programs for simple applications
- Interface various peripheral devices with microprocessor.
- Use various data transfer techniques in micro computers
- Describe the internal parts and pins of 8086

DETAILED CONTENTS

1. Evolution of Microprocessor (03 Periods)

   Typical organization of a microcomputer system and functions of its various blocks. Microprocessor, its evolution, function and impact on modern society

2. Architecture of a Microprocessor (With reference to 8085 microprocessor) (09 periods)

   Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus generation of read/write control signals, Steps to execute a stored programme

3. Instruction Timing and Cycles (06 periods)

   Instruction cycle, machine cycle and T-states, Fetch and execute cycle.

4. Programming (with respect to 8085 microprocessor) (12 periods)

   Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instructions as to which addressing mode they belong. Concept of Instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer

group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language. (Examples can be taken from the list of experiments).

5. Memories and I/O interfacing (08 periods)

Concept of memory mapping, partitioning of total memory space. Address decoding, concept of peripheral mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices.

6. Interrupts (03 periods)

Concept of interrupt, Maskable and non-maskable, Edge triggered and level triggered interrupts, Software interrupt, Restart interrupts and its use, Various hardware interrupts of 8085, Servicing interrupts, extending interrupt system

7. Data Transfer Techniques (03 periods)

Concept of programmed I/O operations, sync data transfer, async data transfer (hand shaking), Interrupt driven data transfer, DMA, Serial output data, Serial input data

8. Peripheral devices (02 periods)

8255 PPI, 8253 PIT and 8257 DMA controller

9 Architecture of 8086 Microprocessor (02 periods)

- Block diagram
- Minimum and Maximum mode
- Pin and Signals

LIST OF PRACTICALS

1. Familiarization of different keys of 8085 microprocessor kit and its memory map
2. Steps to enter, modify data/program and to execute a programme on 8085 kit
3. Writing and execution of ALP for addition and sub station of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)
7. Interfacing exercise on 8255 like LED display control
8. Interfacing exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Use of 8085 emulator for hardware testing

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as

interfacing). Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the given in the list may be given to the students.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi
2. Introduction to Microprocessor by Mathur ,Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Microprocessor and Microcontrollers by Dr BP Singh, Galgotia Publications, New Delhi
4. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Microprocessor and Microcomputers by Refiquzzaman, Prentice Hall of India Ltd., New Delhi.
6. Microprocessor programming & applications.by sudhir Goyal, North Publication.
7. Digital Logic and Computer Design by Mano, M Morris; Prentice Hall of India, New Delhi
8. Digital Electronics by Rajaraman; Prentice Hall of India Ltd., New Delhi
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	**03**	**05**
2.	**09**	**20**
3	**06**	**10**
4	**12**	**25**
5.	**08**	**15**
6.	**03**	**05**
7.	**03**	**05**
8.	**02**	**07**
9	**02**	**08**
Total	**48**	**100**

TROUBLESHOOTING OF ELECTRONIC EQUIPMENT

L	T	P
-	-	3

RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

NOTE: Students are to be given the awareness about the following topics during the Laboratory Work. There will not be any theory examination.

LEARNING OUTCOMES

After completion of the subject, the students should be able to:

- find out basic faults in test equipments like power supply, multimeter, function generator, CRO and one equipment from each group.
- pinpoint faulty block/component in circuits by observing standard voltages/wave shapes at different test points
- use digital IC tester and digital tools used for trouble shooting.

TOPICS TO BE DISCUSSED

1. Fundamental Trouble Shooting Procedures

   i) Fault location
   ii) Fault finding aids
      - Service manuals
      - Test and measuring instruments
      - Special tools

   iii) Trouble Shooting Techniques
      - Functional Areas Approach
      - Split half method
      - Divergent, convergent and feedback path circuit analysis
      - Measurement techniques

LIST OF PRACTICALS

1. Demonstration and practice of fault finding and repair of:
   (a) C.R.O
   (b) Function Generator
   (c) Power supplies
   (d) Digital multimeter

2. Demonstration, practice of fault finding and repair of any one equipment from group-I i.e. Communication

3. Demonstration, practice of fault finding and repair of any one equipment from group-II i.e.Consumer

4. Demonstration, practice of fault finding and repair of any one equipment from group- III i.e. Audio/Video systems

5 Demonstration, practice of fault finding and repair of any one equipment from group IV i.e. Computer

Choice of one equipment from each group is compulsory**.**

Group-I Communication	**Group-II Consumer**	**Group-III Audio-video**	**Group-IV Computer**
Telephone Handsets.	Inverters/UPS Emergency Lights	TV, CRT, LCD/HD	Monitor
Cordless Phones	Stabilizers	VCD, DVD Players	Printer (Laser)
Fax Machine	EPABX	CCTV	Printer (Inkjet)
Modem	Hub/Switches	Audio Systems	Scanner
Walkie / Talkie	Electronic Toys		Keyboard, Mouse
			Video Games

6 Testing of Integrated Circuits (ICs)

7 Use of digital tools for troubleshooting digital equipments

INSTRUCTIONAL STRATEGY

Emphasis must be laid on skill development in assembly and disassembly of equipments and to rectify faults practically.

MEANS OF ASSESSMENT

- Actual Laboratory and Practical Work,
- Model/prototype making
- Assembly and disassembly exercises
- Viva-Voce

RECOMMENDED BOOKS

1. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi.

Troubleshooting and maintenance of Electronics Equipment by Manoj Kumar, Satya Parkashan

MEDICAL ELECTRONICS

L	T	P
3	-	3

RATIONALE

A large number of electronic equipment s are being used in hospitals for patient care and diagnosis or carry out advanced surgeries. This subject will enable the students to learn the basic principles of different instruments used in medical science.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Describe various medical electronics equipment and their uses
- Use electrodes for various purposes
- Identify different Medical transducers and use them
- Prepare block diagrams of biomedical recorders i.e. ECG, EEG and EMG machines
- Maintain various electronics patient monitoring systems
- Measure current leakage with the help of safety analyzer

DETAILED CONTENTS

1. Overview of Medical Electronics, classification of medical Equipments, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments, typical waveforms & signal characteristics (06 Periods)

2. Electrodes (08 Periods)

   Origin of Bioelectric signals, Bio electrodes, Electrode tissue interface, contact impedance, Types of Electrodes, Biological Amplifiers, Electrodes used for ECG , EEG, EMG.

3. Bio Transducers & Biosensors (08 Periods)

   Typical signals from physiological parameters, Classification of Bio transducers, pressure transducer, Photoelectric transducer, Transducer for body temperature measurement, pulse sensor, respiration sensor.

4. Bio Medical Recorders (08 Periods)

   Block diagram description and application of following instruments
   - Electrocardiograph (ECG) Machine
   - Electroencephalograph (EEG) Machine
   - Electromyography (EMG) Machine
   - Phonocardiogram (PCG)
   - Vector cardiogram (VCG)
   - Digital Stethoscope

5. Patient Monitoring Systems (08 Periods)

   - Heart rate measurement
   - Pulse rate measurement
   - Respiration rate measurement
   - Blood pressure measurement
   - Need of defibrillator and Cardiac Pace maker
   - Bedside patient monitoring System

6. Modern Imaging System (06 Periods)

- X-Ray Machine
- Magnetic Resonance Imaging System
- Ultrasonic Imaging System

7. Patient Safety (04 Periods)

- Electric shock hazards
- Leakage currents
- Electrical safety analyser
- Safety standards.

Note: Students must be taken for a visit to hospital for exposure of various medical electronics related equipments like ventilator, boyles apparatus, pulse ox meters, defibrillators, bedside monitor and x-ray equipment etc.

INSTRUCTIONAL STRATEGY

The teacher has to play a proactive role in arranging visits to hospitals and well equipped laboratories to reinforce theory. The apparatus and equipment available should be shown to students so that they can understand where and how the various biomedical instruments are used. Various charts and models be used for demonstration. Exposure to Spectrometer and UV Spectrometer must be given to students in addition to arranging visits to biomedical industries.

LIST OF PRACTICALS

1. To operate and familiarization with:
    a) B.P. Apparatus
    b) ECG Machine
2. To operate and familiarization with:
    a) Ventilator
    b) Incubator
3. To measure the concentration of blood sugar with Glucometer (fasting, P.P., Random)
4. To measure
    a) Respiration rate and interface to PC
    b) Pulse rate
5. To Measure The EMG Signals and interface with PC
6. Body Temperature measurement and recording in excel form in pc.
7. To study the Body positions and interfacing of body position sensor and data recording
8. Installation of small medical equipment in laboratories of Hospital precautions to be taken.
9. Study of large medical equipment in Hospital / Nursing home.
10. Operation and use of Electro-physiotherapy
11. Maintenance schedule for different equipment and their records in a hospital

12. Getting body parameters from Bluetooth to android App and PC
13. Creating body Area network using Zigbee devices
14. Logging of various body parameters in SD card as excel format.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Handbook of Biomedical Instrumentation by RS Khandpur;Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Biomedical Instrumentation by Cromwell
3. Modern Electronics Equipment by RS Khandpur; TMH, New Delhi
4. Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	**06**	**12**
2	**08**	**18**
3	**08**	**18**
4	**08**	**16**
5	**08**	**16**
6	**06**	**12**
7	**04**	**8**
Total	**48**	**100**

SOFT SKILLS – II

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Develop Communication Skills
- Work in a team
- Learn to resolve conflict by appropriate method
- Identify leadership traits and learn self motivation
- Follow ethics

DETAILED CONTENTS

- Concept of team building, behavior in a team
- Developing Interpersonal Relations- empathy, sympathy
- Communication skills-improving non-verbal communication
- Conflict Management
- Motivation
- Leadership
- Professional Ethics and Values
- Health, Hygiene, Cleanliness and Safety

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Environment awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

INDUSTRIAL TRAINING

Industrial training 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.

For this purpose, students at the end of fourth semester need to be sent for industrial training for a minimum of 6 weeks upto 8 weeks duration to be organized during the semester break starting after IV 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. A teacher may guide a group of 4-5 students. 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.

An internal assessment of 100 and external assessment of 100 marks have been provided in the study and evaluation scheme of V 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. The formative and summative evaluation may comprise of weightage to performance in testing, general behavior, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry. The components of evaluation will include the following.

a) Punctuality and regularity 15%
b) Initiative in learning new things 15%
c) Relationship with workers 15%
d) Industrial training report 55%

FIFTH SEMESTER

AUDIO VIDEO SYSTEMS

L	T	P
3	-	3

RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices. This in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Explain the working of loudspeakers and microphones.
- Describe the basics of digital audio signals.
- Describe the working of colour television system (PAL).
- Use the basic principles of digital video and its compression techniques.
- Illustrate basic techniques of digital television transmission and reception.
- Compare the working of LCD and LED

DETAILED CONTENTS

1. Audio Systems (10 Periods)

Microphones and Loudspeakers

a) Carbon, moving coil, cordless microphone
b) Direct radiating and horn loudspeaker
c) Multi-speaker system
d) Optical Sound recording

2. Digital Audio Fundamentals (06 Periods)

Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

3. Television (12 Periods)

Basics of Television

- Elements of TV communication system
- Scanning and its need
- Need of synchronizing and blanking pulses, VSB
- Composite Video Signal

Colour Television

- Primary, secondary colours
- Concept of Mixing, Colour Triangle
- Camera tube
- PAL TV Receiver
- NTSC, PAL, SECAM (brief comparison)

4. Digital Video, Compression Techniques and Standards (06 Periods)

Digital Video, The RGB and YUV Representation of Video Signals, The Need for Compression, How compression works, Compression formats for video - MPEG-x format, H.26x format

5. Digital Television-Transmission and Reception (10 Periods)

Digital satellite television, Direct-To-Home(DTH) satellite television, Digital Terrestrial Television(DTT), Introduction to :Video on demand, CCTV, CATV with optical fibre.

6. Introduction to Liquid Crystal and LED Screen Televisions (04 Periods)

Basic block diagram of LCD and LED Television and their comparison.

LIST OF PRACTICALS

1. To plot the directional response of a Microphone
2. To plot the directional response of a Loud Speaker
3. To study public address system and its components.
4. To test color TV using pattern generator.
5. To perform fault identification in Colour TV.
6. Installation of Dish Antenna for best reception.
7 Installation of CCTV system.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Television and Video Engineering by A. M. Dhake McGraw Hill Education System
4. Essential Guide to Digital Video by John Watkinson; Snell Wilcox Inc Publication
5. Guide to Compression by John Watkinson; Snell Wilcox Inc Publication
6. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
7. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi
8. Consumer Electronics by Yagyik and Jain,Ishan Publication, Ambala
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	06	12
3	12	24
4	06	12
5	10	20
6	04	12
Total	**48**	**100**

DIGITAL COMMUNICATION

L	T	P
3	-	3

RATIONALE

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

LEARNING OUTCOMES

After completion of the subject, the learner should be able to:

- Describe and identify block diagram of digital and data communication link
- Transmit Hamming code on a serial link and reconvert at the receiving end
- Plot and interpret wave forms at input and output of PSK and FSK modulators
- Transmit parallel data on a serial link using USART
- Transmit data using MODEM
- Describe Space and time switching systems.
- Describe and identify concepts of PCM and DPCM
- Plot and interpret waveforms at input and output of PCM, DPCM, DM, ADM modulators.

DETAILED CONTENTS

1. Introduction: (03 Periods)

   Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.

2. Sampling theorem and its basic concept. (10 Periods)

   Use of Sampling Theorem:
   - Introduction to PAM, PPM, PWM
   - Quantization and error of Quantization
   - PCM, DPCM, their advantage and disadvantage
   - DELTA and ADAPTIVE DELTA Modulation concept of COMPANDING
   - Frequency hopping spread spectrum technique

3. Digital Modulation Techniques: (10 Periods)

   - Basic block diagram and principle of working of the following:
   - Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
   - Frequency Shift keying (FSK)
   - Phase shift keying (PSK), Quadrature Phase Shift Keying(QPSK)

4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (10 Periods)

5. Modems: (10 Periods)

Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method.

1. Space and time switching: Working principle of STS and TST switches.

(05 Periods)

LIST OF PRACTICALS

1. Observe wave forms at input and output of pulse code modulator with CRO.
2. Transmission of data using MODEM.
3. Observe wave forms at input and output of QPSK modulators
4. Observe wave forms at input and output of PSK modulators
5. Observe the working of space and time switching circuit.

NOTE:

Visits to various telephone exchanges (including mobile and rural exchanges), Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digitals and Data Communication. Emphasize should be made in the laboratory on the conduct of experiments. For the better awareness, visit must be arranged to the industries like telephone exchange, various cellular industries etc.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, and viva-voce

RECOMMENDED BOOKS

1. Electronic Communication Systems by George Kennedy Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Communication system by A.K. Gautam S.K. Kataria Sons, Delhi
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi
4. Digital Communication, Preeti Shirvastva, Ishan Publication

e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	03	06
2	10	22
3	10	20
4	10	20
5	10	20
6	05	12
Total	**48**	**100**

OPTICAL FIBER COMMUNICATION

L	T	P
3	-	3

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fiber has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

LEARNING OUTCOME

After completion of the subject, the learner should be able to:

- Set up a fiber analog link and optic digital link
- Measure bending losses in optical fibers
- Measure the splice or connector loss
- Measure and calculate numerical aperture of optical fiber
- Explain and demonstrate characteristics of optical source and optical detector
- Connect a fiber with connector at both ends
- Identify and demonstrate use of various components and tools used in optical fiber communication

DETAILED CONTENTS

1. Introduction (10 Periods)

   - Historical perspective, basic communication systems, optical frequency range, advantages of optical fiber communication, application of fiber optic communication
   - Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
   - Principle of light penetration, reflection, critical angle.

2. Optical Fibers and Cables (08 Periods)

   - Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.
   - Optical Fibers cable connectors and splicing techniques (Mechanical, fusion)

3. Losses in Optical Fiber Cable: (08 Periods)

   a) Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
   b) Dispersion: Types and its effect on data rate.
   c) Testing of losses using OTDR(Optical Time Domain Reflectometer).

4. Optical Sources (10 Periods)

   Characteristics of light sources (LED and LASER) used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5. Opticalll Optical Detectors (06 Periods)

Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors

6. Optical Amplifiers (06 Periods

Types of optical amplifiers, semiconductor & fiber optical amplifiers, principle of operation of SOA, types of SOA. EDFA, Raman amplifiers. Comparison of SOA, EDFA and Raman Amplifiers.

LIST OF PRACTICALS

1. To set up fiber analog link
2. To set up optic digital link
3. To measure bending losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical detector
8. To splice the available optical fiber
9. To connect a fiber with connector at both ends
10. To identify and use various components and tools used in optical fiber communication

INSTRUCTIONAL STRATEGY

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in communication system. Since this subject deals with theory and practical, the theory should be reinforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

2. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
3. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
4. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
5. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
6. Optical Fiber Communication by Yashpal & Sanjeev Kumar, North Publications, Ambala
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	08	15
3	08	15
4	10	22
5	06	14
6	06	14
Total	**48**	**100**

COMPUTER NETWORKS

L	T	P
4	-	-

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in electronics and communication engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- Recognize physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
- Recognize various types of connectors RJ-45, RJ-11,BNC and SCST.
- Demonstrate various types of networking models and protocol suites.
- Install and configure a network interface card in a workstation.
- Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation.
- Configure routers.
- Demonstrate sub netting of IP address.
- Identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG.
- Explain concept of wireless networking.

DETAILED CONTENTS

1. Networks Basics (10 Periods)
   - What is network
   - Peer-to –peer Network
   - Server Client Network
   - LAN, MAN and WAN
   - Network Services
   - Topologies
   - Switching Techniques

2. OSI Model (10 Periods)
   - Standards
   - OSI Reference Model
   - OSI Physical layer concepts
   - OSI Data-link layer concepts
   - OSI Networks layer concepts
   - OSI Transport layer concepts
   - OSI Session layer concepts
   - OSI presentation layer concepts
   - OSI Application layer concepts

3. Introduction to TCP/IP (10 Periods)
   - Concept of physical and logical addressing
   - Different classes of IP addressing, special IP address
   - Sub netting and super netting
   - Loop back concept
   - IPV4 and IPV6 packet Format
   - Configuring IPV4 and IPV6

4. Cables and Connectors (10 Periods)

- Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables (Straight wire Cable, CrossOver Cables) with colour coding.
- Ethernet Specification and Standardization:
  10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
- Use of RJ45, RJ11, BNC,SCST.

5. Network Connectivity (10 Periods)
   - Network connectivity Devices
   - NICs
   - Hubs
   - Repeaters
   - Switches
   - Routers and Routing Protocols.
   - Configuring of Routers.
   - VOIP and Net-to-Phone Telephony

6. Network Administration / Security (10 Periods)
   - Client/Server Technology
   - Server Management
   - RAID management and mirroring
   - Cryptography
   - Ethical Hacking

7. Wireless Networking (04 Periods)

   Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

MEANS OF ASSESSMENT

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

- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Computer Networks, Preeti Shirvastva, Ishan Publication
3. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
5. Local Area Networks by Peter Hudson
6. Network+ Lab manual by Tami Evanson; BPB Publications
7. Networking Essentials ; BPB Publications New Delhi

8. Computer Network and Communications By V.K. Jain and Nirija Bajaj, Cyber Tech Publications, New Delhi.
9. Computer Network by J.S. Katre; Tech-Max Publication, Pune
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	14
2.	10	16
3.	10	14
4.	10	16
5.	10	16
6.	10	16
7.	4	08
Total	**64**	**100**

MICROCONTROLLERS

L T P
4 - 3

RATIONALE

The study of microcontrollers in terms of architecture, software and interfacing techniques leads to the understanding of working of microcontrollers and applications of microcontroller in Electronic Industries. The microcontroller is an area of specialization. Microcontroller is the heart of the programmable devices. Students of electronics and related engineering branches often use microcontroller to introduce programmable control in their projects, automation and fault finding in industry.

LEARNING OUTCOMES

After completion of the subject, the learner should be able to:

- Understand the working of microcontrollers,
- Programmed the microcontrollers
- Interface the sensors with microcontroller
- Fault finding of microcontroller based appliances and projects

DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (16 Periods)
   - Architecture of 8051Microcontroller
   - Pin details
   - I/O Port structure
   - Memory Organization
   - Special Function Registers (SFRs)
   - External Memory

2. Instruction Set (20 Periods)
   - Instruction Set of 8051
   - Addressing Modes,
   - Types of Instructions
   - Timer operation
   - Serial Port operation
   - Interrupts

3. Assembly/C programming for Micro controller (12 Periods)
   - Assembler directives
   - Assembler operation
   - Compiler operations
   - De bugger

4. Design and Interface (12 Periods)
   - Keypad interface
   - 7- segment interface

LCD, A/D, D/A and RTC interface with programming.

5. Introduction of PIC Micro controllers (04 Periods)

LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit and its different sections
2. Familiarization with Assembly Language Programming (PC Based)
3. Programming to interface switches and LEDs
4. Programming and interface of Seven Segment and LCD.
5. Programming and interfacing of Graphical LCD .
6. Programming to interface Hex 4x4 matrix Keypad
7. Programming for A/D converter, result on LCD.
8. Programming for D/A converter, result on LCD.
9. Programming for serial data transmission from PC to Kit or Vice versa.
10. Programming and interfacing of RELAY and Buzzer

INSTRUCTIONAL STRTEGY

Instruction should be given to students by showing them actual microcontrollers in the class room so that they can develop the concept. Exercise on programming should be done by taking simple examples like interfacing of switch, LED and relay.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model making, and viva-voce

RECOMMENDED BOOKS:-

1. Fundamentals of Microprocessor and Microcontroller by B. Ram , Dhanpat Rai Publications.
2. Microcotroller : Architecture, Programming & Applications by Ayala, Kenneth J., Penram
3. Microcotroller and Embedded Systems using Assembly And C by Muhammad Ali Mazidi, Rolin Mckinlay, Janice Gilispie Mazidi: Pearson
4. PIC Microcontroller and Embedded Systems : Using assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Danny Causey; Pearson
5. Microcotroller, Sanjeev Gupta, Ishan Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%age)
1	16	25
2	20	30
3	12	20
4	12	20
5	04	05
Total	**64**	**100**

ELECTRONICS DESIGN AND SIMULATION TECHNIQUES

L	T	P
-	-	3

RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic equipment.

LEARNING OUTCOMES

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

- Demonstrate skills in assembly of components, soldering, and desoldering techniques.
- Prepare a PCB, mount the components and assemble in a cabinet.
- Design electronic circuit and layout using software ORCAD/ PSpice /EAGLE/ DIP TRACE/EDA/Multisim.
- Demonstrate drilling, photo plating, explain concept of SMDs (Surface Mount Devices).
- Assemble circuits on PCB.
- Design a project using basic techniques.

PRACTICAL EXERCISES

1. Electronic Design

   - Selection and use of commonly used active and passive components
   - Testing of active and passive components
   - Develop skills in assembly of components, soldering, and soldering techniques
   - Procedure for Cabinet Making

2. Fabrication Techniques

   - Printed Circuit Boards (PCBs):
     - PCB board materials, their characteristics and plating, corrosion and its prevention.
     - Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.
     - Assembly of circuits on PCB, soldering techniques, Role of tinning, flow and wave soldering, solderability, composition of solder, Edge connector.

3. Lab View/Multisim/Proteus/ORCAD/'Winspice based circuit simulation
   Simulation of different circuits of following types:
   a) Analog Circuits
   b) Digital Circuits
   c) Power Electronic Circuits.

4. PCB Layout Design
   Practice in designing PCB layout using software like EDA/Diptrace/Eagle/ORCAD

Every student must design and prepare a PCB, mount the components and assemble in a cabinet.

LIST OF PROJECTS (to be designed individually)

Some of the projects are listed below which is just a guideline for selecting the mini project. Students can also select any other project with the advice of his teacher.

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. Sirens and hooters
8. Electronic dice
9. Battery charger, mobile charger
10. Fire/smoke/intruder alarm
11. Liquid level controller
12. Counters
13. Combination locks
14. Electronics musical instruments
15. Electronic Ballasts
16. Emergency light
17. Fan regulator

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical project work. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Printed Circuit Board by Bosshart; McGraw Hill Education Pvt Ltd., New Delhi
2. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi
3. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh
4. Modular CAD for PCBs using EAGLE Software by Rajesh Kumar, NITTTR, Chandigarh
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SOFT SKILLS – III

L	T	P
-	-	3

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Develop communication skills.
- Learn how to speak without fear and get rid of hesitation
- Use effective presentation techniques
- Understand entrepreneurial traits
- Exhibit attitudinal changes

DETAILED CONTENTS

- Communication Skills – Handling fear and phobia
- Resume Writing
- Applying for job through email/job portal
- Interview preparation : Mock Interview, Group Discussions and Extempore
- Presentation Techniques
- Developing attitude towards safety. Disaster management.

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Entrepreneurial awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

SIXTH SEMESTER

MICROWAVE AND RADAR ENGINEERING

L	T	P
4	-	3

RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in the area of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify, explain and demonstrate construction, characteristics, operating principles and typical applications of Multi cavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube, GUNN diode, IMPATT diode
- Measure electronics and mechanical tuning range of a reflex klystron
- Measure VSWR of a given load
- Measure the Klystron frequency by slotted section method
- Measure the directivity and coupling of a directional coupler
- Plot radiation pattern of a horn antenna in horizontal and vertical planes
- Demonstrate the properties of magic tee
- Identify the block diagram and explain the operating principles of CW(Doppler), FMCW, MTI radar
- Interpret radar display PPI
- Describe the working principles of microwave communication link

DETAILED CONTENTS

1. Introduction to Microwaves (06 Periods)

   Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, Ku, Ka, Sub mm)

2. Microwave Devices (12 Periods)

   Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)
   - Multi cavity klystron
   - Reflex klystron
   - Multi-cavity magnetron
   - Traveling wave tube
   - Gunn diode and
   - Impatt diode

3. Wave guides (10 Periods)

   Rectangular and circular wave guides and their applications. Mode of wave guide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a wave guide.

4. Microwave Components (10 Periods)
   Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial to wave guide adapter, horn antenna.
5. Microwave Communication systems (10 Periods)

   a) Block diagram and working principles of microwave communication link.
   b) Troposcatter Communication-basic idea
6. Radar Systems (16 Periods)

   - Introduction to radar, its various applications, radar range equation (no derivation) and its applications.
   - Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.
   - Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.
   - Block diagram and operating principles of MTI radar.
   - Radar display- PPI

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.

NOTE:

Visit to the appropriate sites of microwave station/tower and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

Microwave and radar engineering is very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio; Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen; Pearson Publishers.
3. Electronics Communication System by KS Jamwal; Dhanpat Rai and Sons, Delhi
4 Microwave Engineering by Das; Tata McGraw Hill Education Pvt Ltd , New Delh
5 Microwave & Radar Engineering by Navneet Kaur; Ishan Publications, Ambala City
5 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	06	08
2.	12	18
3.	10	16
4.	10	16
5.	10	17
6.	16	25
Total	**64**	**100**

WIRELESS AND MOBILE COMMUNICATION

L	T	P
4	-	3

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more of mobile phones in comparison to land line phones. It is expected that within very short period, almost every body will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify and explain the features, specification and working of cellular mobile
- Measure and analyse signal strength at various points from a transmitting antenna with mobile phone.
- Describe and analyse different Multiple Access Techniques for Wireless Communication (FDMA, TDMA and CDMA)
- Describe different Mobile Communication Systems(GSM and CDMA)
- Demonstrate call processing on a GSM and CDMA trainer Kit
- Troubleshoot GSM mobile phone.

DETAILED CONTENTS

1. Wireless Communication (08 Periods)

   1.1 Basics

   1.2 Advantages of wireless communication

   1.3 Electromagnetic waves.

   1.4 Frequency Spectrum used.

   1.5 Cellular Network Systems.

   1.6 Propagation considerations

   a) Range
   b) Atmospheric Effect
   c) Geographic Effect
   d) Fading
   e) Doppler Effect
   f) Multipath Effect

2. Cellular Concept (08 Periods)

   Introduction to 1G and 2G

   2.2 Cell area

   Cell Site Structure

   Capacity of cell

Frequency Reuse (Concept)

Interference (Co-channel, Adjacent channel)

Power Control for reducing Interference

Fundamentals of cellular network planning

a) Coverage planning

b) Capacity planning

c) Cell splitting and sectoring

3 Multiple Access Techniques for Wireless Communication (10 Periods)

Introduction to Multiple Access.

Frequency Division Multiple Access (FDMA)

Time Division Multiple Access (TDMA)

Distinction between TDMA FDD and TDMA TDD

Code Division Multiple Access (CDMA), WCDMA

4. Mobile Communication Systems (10 Periods)

Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems

Introduction of GPRS, EDGE, Bluetooth and Wi-fi.

5. Introduction to 3G & 4G (06 Periods)

Introduction to Architecture and Features of UMTS
HSPA (High Speed Packet Access).
Features and Architecture of LTE (Long Term Evolution).

6. Troubleshooting GSM Mobile Phone (06 periods)

Assembling and dissembling of GSM phone
Study parts of Mobile Phone
Testing of various parts

LIST OF PRACTICALS

1. Study the features, specification and working of cellular mobile
2. To study the cell processing using CDMA trainer kit.
3. Observing call processing of GSM trainer kit.
4. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower.
5. Demonstration of data transfer using Bluetooth.
6. To set up aWi-fi network.
7. To study faults on a GSM mobile trainer.
8. Visit to Mobile Switching Centre.

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is having significant impact in Electronics Market. For the proper awareness of this subject, it is must to provide the students the detailed functioning of wireless/mobile system/equipment. For this, visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits to mobile companies

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Thedore S.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 Prakash Agarwal, Qing-An zeng.
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
9. Wireless and Mobile Communication VK Sangar, Ishan Publication, Ambala.
10. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS*:*

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	16
2.	10	16
3.	12	20
4.	14	22
5.	09	12
6	09	14
Total	**64**	**100**

6.3 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

LEARNING OUTCOMES

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

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of the organization .
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (10 Periods)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms and other forms of business organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District – level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. Market Survey and Opportunity Identification/Ideation (08 Periods)

- Scanning of the business environment
- Salient features of National and Haryana State industrial policies and resultant business opportunities
- Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection
- Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report
- Sample project report

SECTION –B MANAGEMENT

4. Introduction to Management (04 Periods)

- Definitions and importance of management
- Functions of management: Importance and process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations and their advantages

- Line organisation, staff organisation
- Line and staff organisation
- Functional Organisation

5. Leadership and Motivation (03 Periods)

a) Leadership

- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership
- Case studies of great leaders

b) Motivation

- Definition and characteristics
- Importance of self motivation
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (06 Periods)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (04 Periods)

Introduction and importance of Healthy Work Culture in organization
Components of Culture
Importance of attitude, values and behaviour
Behavioural Science – Individual and group behavior.
Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (04 Periods)

a) Basic of Accounting:

- Meaning and definition of accounting
- Double entry system of book keeping
- Trading account, PLA account and balance sheet of a company

b) Objectives of Financial Management

- Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (03 Periods)

a) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

b) Intellectual Property Right (IPR)

- Introduction, definition and its importance
- Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	08	16
3	06	14
4	04	10
5	03	06
6	06	14
7	04	08
8	04	08
9	03	06
Total	48	100

ELECTIVE
6.4.1 EMBEDDED SYSTEMS

L	T	P
4	-	-

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

LEARNING OUTCOMES

A diploma holder in the field of Electronics employed for maintenance of electronic equipment/ gadgets can

- Describe embedded system
- Explain embedded operating systems
- Program PIC microcontroller and AVR microcontroller
- Interface sensors with microcontroller
- Repair microcontroller based appliances.

DETAILED CONTENTS

1. Introduction (08 Periods)
   Embedded system, history of embedded systems, embedded system architecture, Functional structure of embedded system
2. Embedded operating systems (12 Periods)
   Real-time operating system, factors affecting embedded systems, applications of embedded systems, embedded systems characteristics and features, Reliability of embedded systems, embedded systems versus general purpose systems, selection criteria of microcontroller.
3. Introduction of PIC microcontroller, block diagram, function of each block. (08 Periods)
4. Introduction of AVR microcontroller, block diagram, function of each block.(08 Periods)
5. Programming concepts of microcontrollers. Basic introduction of Software used in microcontrollers. How to transfer C or ASM code in microcontrollers. (18 Periods)
6. Comparison between 8051, PIC and AVR, Steps involved in development of a project, interfacing of LED, 7-segment display, buzzer, relay and sensors. (10 Periods)

LIST OF PRACTICALS

1. Design PIC based Security System
2. Design AVR based Temperature indicator cum controller.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS:

1. Microcotroller:Architecture, Programming & Applications by Ayala, Kenneth J., Penram
2. Microcotroller and Embedded Systems using Assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Janice Gilispie Mazidi, Pearson
3. Embedded Systems - Architecture, Programming, Design, by Kamal, R. Tata McGraw Hill, New Delhi.
4. Embedded System Design: A Unified Hardware/Software Introduction, by Vahid, F. and Givargis, T. Student Edition, John Wiley & Sons, New York.
5. PIC Microcontroller and Embedded Systems : Using assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Danny Causey, Pearson
6. The AVR microcontroller (with CD-ROM) by Dhananjay Gadre, Tata McGraw Hill Education Private Limited.
7. Books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%age)
1	08	16
2	12	20
3	08	12
4	08	12
5	18	24
6	10	16
Total	**64**	**100**

6.4.2. INDUSTRIAL AUTOMATION

L	T	P
4	-	-

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

LEARNING OUTCOMES

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

- Explain and demonstrate the different modules of a Programmable Logic Controller
- Program a PLC using a hand-held programmer and computer interface
- Implement ladder programming concepts
- Implement basic logic operations using ladder programming
- Demonstrate Logic control systems with time response as applied to clamping operation
- Explain sequence control system
- Drive for speed and direction control of motor.

DETAILED CONTENTS

1. Introduction to PLC (10 Periods)

   Concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2. Working of PLC (12 Periods)

   - Basic operation and principles of PLC
   - Scan Cycle
   - Memory structures, I/O structure
   - Programming terminal, power supply

3. Instruction Set (18 Periods)

   - Basic instructions like latch, master control self holding relays.
   - Timer instruction like retentive timers, resetting of timers.
   - Counter instructions like up counter, down counter, resetting of counters.
   - Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
   - MOV instruction
   - RTC(Real Time Clock Function)
   - Watch Dog Timer

- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal
- Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

4. DCS Concepts (10 Periods)

Concept of DCS, DCS I/O hardware, Remote Terminal Unit

5. SCADA (10 Periods)

Block Diagram of SCADA, Difference between Open Architecture and Dedicated System. Difference between DCS and SCADA

6 Electrical Drives: AC Drive for Speed and Direction control (04 Periods)

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2) Introduction to PLCs by Gary Dunning. McGraw Hill
3) Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4) Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5) Module on "Allen Bradlag PLC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6) Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7) Instrument engineers Handbook - Process Control, Modern Control Techniques for Process Industries by G Liptak
8) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	10	16
2.	12	20
3.	18	30
4.	10	16
5.	10	12
6	04	06
Total	**64**	**100**

6.5 PROJECT WORK

L	T	P
-	-	12

RATIONALE

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

LEARNING OUTCOMES

After undergoing the project work, students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.

In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
- Assemble/fabricate and test an electronics gadget.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

- Projects related to designing small electronic equipment / instruments.
- Projects related to increasing productivity in electronic manufacturing areas.
- Projects related to quality assurance.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronics components being used.
- Projects related to design of small oscillators and amplifier circuits.
- Projects related to design, fabrication, testing and application of simple digital circuits and components.
- Projects related to microprocessor/microcontroller based circuits/ instruments.

Some of the projects based on above areas are listed below for the benefit of students:

1. Microprocessor/Microcontroller based rolling display/bell and calendar
2. Microprocessor based stepper motor control.
3. Speed control of DC Machines by Microprocessor/Microcontrollers
4. Temperature monitoring using Microprocessor/Microcontroller based systems.
5. Microprocessor/Microcontroller based liquid level indicator and control
6. Fabrication and assembling of digital clock.
7. Fabrication of PCB circuits using ORCAD/ EAGLE Software.
8. Fabrication of ON line/OFF line UPS of different ratings and inverters
9. Design, fabrication and testing of different types of experimental boards
10. Repair of oscilloscope, function generator
11. Design and developing web sites of organizations
12. Installation of computer network (LANS).
13. Microprocessor/Microcontroller based solar tracking system
14. GSM based car or home security system
15. Bank token display using microcontroller
16. Printer sharing unit
17. Microprocessor/Microcontroller Based A/D converter
18. Microprocessor/Microcontroller Based D/A converter
19. Simulation of half wave and full wave rectifiers using Simulation Software
20. Simulation of class A, Class B, Class AB and Class C amplifiers
21. Simulation of different wave forms like sine, square, triangular waves etc.
22. GPS based vehicle tracking system
23. Calculate BER(Bit Error Rate) of various modulation techniques
24. Design ALU using CPLD/FPGA
25. Design Display System using CPLD/FPGA
26. Electronic Weighing Machines
27. Setting up home security system using biometrics and video recording
28. Making an overhead tank water level controller using a pump and control system
29. PLC based water level controller/sequential motor starter/bottling plant/traffic light control.

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table.
In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	**Overall grade**
i)	More than 80	**Excellent**
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.

2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.

4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.

SOFT SKILLS – IV

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Communicate effectively.
- Apply techniques of effective time management
- Develop habits to overcome stress
- Face problems with confidence
- Exhibit attributes required to appear for an interview
- Learn about current and future career opportunities
- Exhibit entrepreneurial skills
- Use QC/QT tools

DETAILED CONTENTS

- Communication Skills - Presentation
- Time management
- Stress Management
- Problem solving
- Career opportunities-Current and future
- Entrepreneurial Skills
- Quality and Quality tools used in industry

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.