

3.1 ELECTRICAL ENGINEERING AND MACHINES

L T P
Periods/week 3 1 4

RATIONALE :For a diploma holder, it becomes imperative to know the fundamentals of the electrical engineering in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms, knowledge of fundamental concepts of electricity, and various motors and machines.

DETAILED CONTENTS

1. **Over view of DC Circuits** (08 period)
 - Basic concept of AC & DC
 - Applications of Kirchoff's Laws in solving electrical network problems.
 - Network theorem such as superposition, Thevenin theorem, Norton theorem and maximum power transfer theorem.
 - Star-delta transformation

2. **AC fundamentals** (10 period)
 - Concept of alternating current, and voltage, equation of instantaneous values.
 - Representation of alternating sinusoidal quantities by phasors
 - Power in pure resistance, inductance, capacitance. RL, RC, RLC circuits
 - Active and reactive components of current and their significance
 - Power factor and its practical significance
 - Resonance in series and parallel circuits
 - Active power reactive power, apparent power

3. **Three phase supply** (10period)
 - Advantage of three phase system over single phase system
 - Star –delta connection
 - Relation between phase voltage and line voltage, also between phase current and line current in a 3 phase system
 - Power and power factor in 3 phase system

4. **Transformer** (10 period)

Working principle of a Transformer, constructional features, voltage and current transformation. Methods of connection 3 phase transformers, current and voltage relationship, auto transformer and its uses, instruments transformer, voltage regulation and its significance, need for isolation. Losses in a transformer, cooling of transformer

5. **Electrical Machines** (16 Period)

Principles of electromechanical energy conversion,
DC Machines: Types, e.m.f. equation of generator and torque equation of motor, construction characteristics and applications of dc motors, speed control of DC motor.
Single Phase Induction Motor: Principle of operation and construction brief of single phase motor introduction to methods of starting, applications.

Three Phase Induction Motor: Types, constructional brief & Principle of operation, Slip-torque characteristics, speed control and starting methods

Three Phase Synchronous Machines: Constructional brief & Principle of operation of alternator and synchronous motor and their applications.

6. Batteries

(10Period)

- Basic idea about primary and secondary cells,
- Construction, working and applications of Lead-Acid, Nickel-Cadmium and Silveroxide batteries,
- Capacity and efficiency of lead acid battery
- Charging methods used for lead-acid battery(accumulator),
- Care and maintenance of lead-acid battery,
- Series and parallel connections of batteries,
- Testing of lead acid battery for fully charged condition and their specification
- Application of lead acid battery
- Introduction to maintenance free batteries.

LIST OF PRACTICALS

1. Familiarization of measuring instruments viz. voltmeter, ammeter, wattmeter and other accessories
2. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
3. To verify in d.c. circuits
 - Thevenin's theorem
 - Norton's theorem
 - Super Position Theorem
 - Maximum Power Transfer Theorem
4. To find a voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determination of the power factor in each case.
5. To determine effect of a single phase transformer from the data obtained through open circuit and short circuit test.
6. To connect the primary and secondary winding of a three phase transformer and to verify line and phase current and voltage relationship respectively.
7. To connect a dc shunt motor with supply through a 3 point starter and to run the motor at different speeds with the help of a field regulator.
8. To run a 3 phase induction motor with the help of a star- delta starter. To change the direction of rotation of the motor.
9. To run a synchronous motor with a.c. supply and to measure speed to verify the relation $N = 120f/p$.
10. To test a lead – acid storage battery for charged & discharged condition (with hydrometer & to recharge it)

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

RECOMMENDED BOOKS

1. Basic Electrical and Electronics Engineering by SK Sahdev ,Dhanpat Rai and CO, New Delhi.
2. Electrical Science by Choudhury S; Narosa Publishing House Pvt. Ltd. Daryaganj New Delhi.
3. Basic Electrical and Electronics Engineering by Kumar KM , Vikas Publishing House Pvt Ltd. Jangpura, New Delhi.
4. Basic Electrical Engineering by Mool Singh ,Galgotia Publication Pvt. Ltd. New Delhi.
5. Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
6. Principles of Electrical Engineering by BR Gupta , S Chand and Co, New Delhi.
7. Basic Electrical Engineering by PS Dhogal , Tata McGraw Hill , New Delhi.
8. Basic Electrical Engineering by JB Gupta ; SK Kataria and Sons , New Delhi.
9. Electrical Machine by SK Bhattacharya , Tata McGraw Hill, New Delhi.
10. Electrical Machine by SK Sahdev , Unique International Publications, Jalandhar.
11. Electrical Machine by Nagrahand Kothari, Tata McGraw Hill, New Delhi.
12. Electrical Engineering by JB Gupta , SK Kataria & Sons , New Delhi.
13. Electrical Machines by P. S. Bhimbra.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation(%)
1	08	15
2	10	15
3	10	15
4	10	15
5	16	25
6	10	15
Total	64	100

3.2 ANALOG ELECTRONICS

L T P

Periods/week 3 1 4

RATIONALE

This subject will enable the student to have conceptual understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD, understanding the working of transistors in various configuration; understanding of FETs and MOSFET etc. For effective functioning in the field of electronics service industry. The teacher should give emphasis on understanding of concepts and explanation of various terms used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposures must be given by organizing visit to local electronic industries.

DETAILED CONTENTS

1. Semi conductor Physics (12 period)
 - Review of basic atomic structure and energy level, concept of insulator, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds
 - Concept of intrinsic and extrinsic semiconductor, P and N impurities, doping of impurity
 - P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor
 - Energy level diagram of conductors, insulators and semi conductors, minority and majority carriers
 - Basic idea of Hall Effect and its uses

2. Semi Conductor Diode (12 period)
 - PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition
 - V-I characteristics, static and dynamic resistance and their calculation from diode characteristics
 - Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and π filter
 - Type of diodes, characteristics and applications of Zener diode. Zener and avalanche breakdown, use of Zener diode as a voltage regulator

3. Introduction to Bipolar Transistor (12 period)

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; current relations in transistor; concept of leakage current; CB, CE, CC configuration of the transistor, input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; current

amplification factors. Comparison of CB, CE and CC Configurations, Power rating of Transistor

4. Transistor Biasing Circuits (6 period)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits, Load line Analysis, Concept of AC load Line, Stability Factor

5. Single Stage Transistor Amplifier (10 period)

Classification of Amplifier

Single stage transistor amplifier circuits, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H-parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter

6. FET, MOSFET & UJT (12 period)

Construction, operation and characteristics of FET and its application

- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications
- C-MOS advantages and applications
- Comparison of JFET, MOSFET and BJT
- FET amplifier circuit and its working principle. (No analysis)
- Construction, operations and application of UJT.

LIST OF PRACTICALS

1. Familiarization, identification and testing of active and passive components.
2. Familiarization with operations of different Electronics instruments like analog & digital Multi-meter, CRO, Signal generator, Regulated Power Supply
3. To plot V-I characteristics of PN junction diode
4. To plot V-I characteristics of a zener diode & observe its use as voltage regulator
5. To observe the wave shape of following rectifier circuit
 - Half wave rectifier
 - Full wave rectifier
 - Bridge rectifier
6. To plot the wave shape of full wave rectifier with
 - Shunt capacitor filter
 - Series capacitor filter
 - π filter
7. To plot input and output characteristics and calculate parameter of transistor in CE configuration
8. To plot input and output characteristics and calculate parameter of transistor in CB configuration

9. To plot V-I characteristics of FET Transistor
10. To measure the Q-point and note the variation of Q- point
 - By increasing the base resistance in fixed biased circuit
 - By changing out of bias resistance in potential driver circuit
11. To measure voltage gain, input, output impedance in single stage CE amplifier circuits
12. To Plot the V-I Characteristics of UJT & use of UJT as relaxation oscillator.

INSTRUCTIONAL STRATEGY

The aim of this subject is to provide the knowledge of the fundamental concepts related to basic electronics. The teacher should give more emphasis on understanding of concepts and the measuring of various terms used in the subject. Practical exercises should be included to reinforce the various concepts. Practical applications of semiconductor diodes, transistors, field effect transistors etc must be elucidated to the students.

RECOMMENDED BOOKS

1. Basic Electronics and Linear circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Electronics Devices and circuits by D.C. Kulshreshtha; New Age Publishers, New Delhi.
3. Principle of Electrical and Electronics Engineering by VK Mehta; S Chand and Co. New Delhi.
4. Electronics Components and Materials by SM Dhi, Tata McGraw Hill, New Delhi.
5. Electronics Device and circuits by Millman and Halkias; McGraw Hill.
6. Principle of Electronics by Albert Paul Malvino; Tata McGraw Hill.
7. Electronics Devices and circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish CSaini, Eagle Prakashan, Jalandhar.
8. Electronics Devices .and circuits by Rama Reddy, Narosa Publishing House Pvt.Ltd. New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Period)	Marks Allocation
1.	12	15
2.	12	20
3.	12	20
4.	06	10
5.	10	15
6.	12	20
Total	64	100

5. Logic Simplification (04period)
+ (02 T)
- Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates
 - Karnaugh map (upto 4 variables) and simple applications in developing combinational logic circuits
 - Concept of POS & SOP.
6. Arithmetic circuits (04period)
+ (01 T)
- Half adder and Full adder circuit, design and implementation.
 - Half and Full subtracter circuit, design and implementation.
 - 4bit binary Adder and Subtractor IC (7483)
7. Decoders, Multiplexer and De Multiplexer (07period)
+ (01 T)
- Four bit decoder circuits for 7 segment display and decoder/driver ICs.
 - Multiplexers and De-Multiplexers
 - Basic functions and block diagram of MUX and DEMUX. Different ICs
8. Latches and flip flops (06period)
+ (01 T)
- Concept and types of latch with their working and applications
 - Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
 - Difference between a latch and a flip flop
 - Flip flop ICs
9. Counters (06period)
+ (02 T)
- Introduction to Asynchronous and Synchronous counters
 - Binary counters
 - Divide by N ripple counters, Decade counter.
 - Up/down counter
 - Ring counter with timing diagram
 - Counter ICs
10. Shift Register (05period)
+ (01 T)
- Introduction and basic concepts including shift left and shift right.
 - Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
 - Universal shift register
 - Buffer register, Tristate Buffer register
 - IC 7495

11. A/D and D/A Converters (06period)
+ (02 T)
- a) Working principle of A/D and D/A converters
 - b) Brief idea about different techniques A/D conversion and study of
 - Stair step Ramp A/D converter
 - Dual Slope A/D converter
 - Successive Approximation A/D Converter
 - c) Detail study of
 - Binary Weighted D/A converter
 - R/2R ladder D/A converter
 - d) Applications of A/D and D/A converter
 - e) Sample and Hold Circuit

12. Memories (05period)
+ (01 T)

Memory organization, Classification of semi conductor memories. ROM, PROM, DROM, EPROM, EEPROM, RAM, CCD memories, Programmable logic devices, programmable logic array, programmable array logic

- 13 Arithmetic & Logic Unit (05 Periods)
+ (01 T)

Basic idea about arithmetic logic unit w.r.t IC 74181 and applications, implementation of binary multiplication, division, subtraction and addition.

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 & full adder using XOR and NAND gates and verification of its operation
- 4) Realisation of 4 bit adder/subtractor using IC
- 5) 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)
- 6) Verification of truth table for encoder and decoder ICs, Mux and DeMux
- 7) To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation
- 8) Asynchronous Counter ICs
Verification of truth table for any one universal shift register IC
Use of IC 7490 or equivalent TTL (a) divide by 2 (b) divide by 10 Counter
OR
Use of IC 7493 or equivalent TTL (a) divide by 2 (b) divide by 8 (c) divide by 16 counter
9. To design A/D and D/A convertor and verify their operations.

10. Familiarity use of EPROM programmes
11. Verify the writing and reading operation of RAM IC
12. Verify the logic operation, arithmetic operation of ALU IC

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.

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, DhanpatRai and Co., New Delhi.
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala.
10. Digital Electronics by BR Gupta, DhanpatRai& 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.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)+ Tutorial	Marks Allocation
1	02	05
2	05	10
3	05	05
4	08	10
5	06	10
6	05	05
7	08	10
8	07	10
9	08	10
10	06	05
11	08	10
12	06	05
13	06	05
Total	80	100

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, transmitters, receivers and antennas relate to them while studying practical communication systems.

DETAILED CONTENTS

1. Introduction (04 period)
 - Need for modulation, frequency translation and demodulation in communication systems
 - Basic scheme of a modern communication system
2. Amplitude modulation (05period)
+ (02 T)
 - 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 & Phase Modulation (07period)
+ (02 T)
 - Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bessel function), Modulation index, maximum frequency deviation and deviation ratio, BW of signals
 - Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis
 - Expression for phase modulated wave, modulation index
 - Comparison of Phase, FM and AM in communication systems
4. Modulators (07period)
+ (02 T)
 - a. AM Modulators
Circuit Diagram and working operation of
 - i. Collector and Base Modulator
 - ii. Square Law Modulator
 - Switching Modulator
 - Balanced Modulator
 - Ring Modulator
 - b. FM Modulators

Circuit Diagram and working of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator. Stabilization of carrier for using AFC (Block diagram approach)

- 5- Demodulators (07period)
+ (02 T)
- a. AM Demodulators
- Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)
 - Principle of demodulation of AM Wave using synchronous detection.
- b. FM Demodulators
- Basic principles of FM detection using slope detector
 - Principle of working of the following FM demodulators
 - Foster-Seeley discriminator
 - Ratio detector
 - Quadrature detector
 - Phase locked Loop (PLL) FM demodulators
- 6- Pulse Modulation (08 period)
+ (02 T)
- 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)
 - Types of pulse modulation-PAM, PPM, PWM (Generation &Detection) and their comparison
 - Pulse code Modulation (PCM) Basic scheme of PCM system. Quantization, quantization error, companding Advantages of PCM systems.
7. AM/FM Transmitters (04 period)
+ (02 T)
- Classification of transmitters
 - Block diagram and working principles of AM transmitters Reactance transmitter & Armstrong FM Transmitters.
8. AM/FM Radio Receivers (12 Period)
+ (02 T)
- Block Diagram and working principle of super heterodyne AM receiver, function of each block and typical wave at I/P and O/P of each block, Advantages of super heterodyne reception.
 - Performance characteristics of a radio receiver-sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure.
 - Selection criteria of intermediate frequency (IF), Concepts of Simple and delayed AGC.
 - Block diagram of an FM receiver, function of each block and wave forms at input and output different blocks.
 - Block diagram of communication receivers, differences with respect to broadcast receivers.

9. Antennas

(10 Period)
+ (02 T)

Physical concept of radiation of electromagnetic energy from a dipole, type of propagation
Brief idea of EM wave propagation & type of propagation, Concept of polarization of EM waves, electromagnetic spectrum and its various ranges. Tropospheric scattering in brief.

- a) Definition and physical concepts of the terms with antennas like point source, gain, directivity, aperture, effective area, radiation pattern, beam angle, beam width & radiation resistance.
- b) Types of antennas : brief description, characteristics and typical applications of
 - Half wave dipole.
 - Medium wave (mast) antenna
 - Yagi & ferrite rod antenna
- c) Brief description of broadside and end fire arrays, their radiation pattern and applications (without analysis); basic concept Tropospheric scattering brief idea about rhombic antenna and disc antenna.

LIST OF PRACTICALS

1. To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation & to measure the modulation index of the wave obtained
2. To obtain an AM wave from a square law modulator circuit and observe waveforms and to measure the modulation index of the obtained wave form
3. To obtain an FM wave and measure the frequency deviation for different modulating signal
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 a FM detector
6. To observe PAM, PPM and PWM signal and compare it with the analog input signal
7. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output
8. To plot the sensitivity & selectivity characteristics of a radio receiver and determine the frequency of maximum sensitivity.
9. To align AM broadcast radio receiver and study different faults and radio receiver & major the Voltage at the different points of a radio receiver
10. Installation of directional antenna for best reception.
11. Installation of dish antenna for best reception.

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.

RECOMMENDED BOOKS

1. Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi

2. Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
4. Electronics Communication by KS Jamwal, DhanpatRai and Co, New Delhi
5. Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
6. Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala
7. Communication Engineering by A Kumar
8. Principles of Communication Engineering by Manoj Kumar, SatyaPrakashan, New Delhi
9. Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi
10. Principles of Communication Engineering by Roody , Coolin

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation
1	04	07
2	07	10
3	09	10
4	09	10
5	09	10
6	10	15
7	06	08
8	14	15
9	12	15
Total	80	100

3.5 ELECTRONIC WORKSHOP CUM MINOR PROJECT

L TP

Periods/week- - 4

RATIONALE

In electronics, with theoretical knowledge the practice is also very important. Starting from identification of components to testing of different circuit the practice must be there. To identify components, To use data book, To identify leads, Use of test equipment such as multi-meter to oscilloscope, To learn the technique of soldering and de-soldering are the areas where practice is required and it makes perfect electronics engineer. Minor project work aims at exposing the students to various developments taking place in the field of electronics and related areas in addition to developing interest in the students about working and fabrication of electronics devices. The project may be selected from utility items pertain to their laboratories or homes. It would enable first hand experience of components, their purchase, assembly, testing and trouble shooting. It would also boost up confidence of the students in repairing and maintenance of electronics gadgets. There should not be more than 2-3 students for each project. A report must be prepared with a hard and soft copy. The purpose of this subject is also to give practice to the students in elementary design and fabrication of simple electronic circuits. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices. The teacher may guide/ help students to identify their minor project work and chalk out their plan of action well in advance preferably at the beginning of 3rd semester For this purpose, the concerned teachers must identify curriculum related industrial problems which should be expository in nature and ask students (individual/group) to carry out their investigation/activity such that enough industrial exposure is gained by them during this process.

DETAILED CONTENTS

1. Laboratory Experiences (06 period)
 - Identification of components
 - Practice for color coding of resistance
 - Practice for identification of various components such as diode, capacitors, transistors, SCR, Triac and different ICs
 - Understand the use of data book for transistors, Diodes, SCR and triac
 - Understand the use of data book for TTL and CMOS ICs
 - Testing of different components using multi-meter
2. Use of electronic instruments (08 period)
 - Practice for the use of multi-meter
 - Practice for the use of signal generator
 - Practice for the use of power supply
 - Practice for the use of oscilloscope
3. Designing the PCB layout using computer software (12 period)
 - Understanding the use of printed circuit board in electronics.
 - Designing practice of PCB layout for a simple electronics circuit such as rectifier, transistor, amplifier etc.
 - Use of software --Work bench and PSPICE

4. Soldering the PCB (05 period)
 - Soldering practice for PCB
 - Soldering the PCB design in layout topic.
 - Desoldering practice

5. Testing of PCB (05period)
 - After soldering the component on given PCB testing the continuity and input / output result of given circuit

6. Fault finding of electronic circuit (06 period)
 - Basic idea of fault finding procedure

7. Minor Project Work (24 Period)

Minimum 04 Project to be fabricated by each student
 Students can also select any other project with the advice of 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. FM Transmitter and Receiver
 9. Electronic toy gun, walker, blinkers
 10. Electronic dice
 11. Cell charger, battery charger, mobile charger
 12. Fire/smoke/intruder alarm
 13. Liquid level controller
 14. Counters
 15. Combination locks
 16. Electronics musical instruments
 17. Telephone handset
 18. Audio amplifiers
 19. Tape recorders
 20. Automatic stabilizer/CVT
 21. Emergency light
 22. Design and manufacture of transformer
 23. Fan regulator
 24. Triac using Fan Regulator
 25. 555 using lighting delay Circuits
 26. Temperature sensor based fabrication
 27. Design and fabricate transistor switch to operate an LED.
 28. Design and Fabricate a single stage Amplifier for 1 KHz

RECOMMENDED BOOKS

1. Data books for transistors Diodes & SCR
2. Data book for TTL and CMOS ICs
3. PCB designing Books

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period Practical)
1	06
2	08
3	12
4	04
5	04
6	06
7	24
Total	64

3.6 COMPUTER PROGRAMMING USING C

L T P
Periods/week 2 - 4

RATIONALE

Computer plays a very vital role in present day life, more so, in the professional life of Diploma engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposure to various engineering applications of computers. The knowledge of C language will be reinforced by the practical exercises and demonstration of application software in the field of Electrical Engineering during the course of study. Introduction to data base management system is also a very significant field with vast employment potential.

DETAILED CONTENTS

1. Algorithm and Program Development (04 period)
 - Steps in development of a program
 - Flow-charts, algorithm development
 - Introduction to various computer languages
 - Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language

2. Program Structure (C Programming) (20 period)
 - History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associativity
 - I/O statements - Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O
 - Control Statements - Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements
 - Functions - Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions
 - Arrays - Single and multi dimensional arrays, character arrays
 - Pointers - To various data types, pointers in parameters passing, pointers to function
 - Structures - Definition of a structure, pointer to structure, union and array of structure
 - Strings - String processing, functions and standard library function
 - Data files - File handling and manipulation, file reading and writing, Binary and ASCII files, file records using standard function type mouse

3. Software Applications in Electronics Engineering (08 period)

Computer application overview through various applications software related to Electronics Engineering branch viz: ORCAD & MATLAB

LIST OF PRACTICALS

1. Programming exercise on executing a C Programs
2. Programming exercise on editing a C program
3. Programming exercise on defining variables and assigning values to variables
4. Programming exercise on arithmetic and relation operators
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming exercise on reading a character
7. Programming exercise on writing a character
8. Programming exercise on formatting input using print
9. Programming exercise on formatting output using scan
10. Programming exercise on simple IF statement
11. Programming exercise on IF... ELSE statement
12. Programming exercise on SWITCH statement
13. Programming exercise on GOTO statement
14. Programming exercise on DO-WHILE statement
15. Programming exercise on FOR statement
16. Programming exercise on one dimensional arrays
17. Programming exercise on two dimensional arrays
18. Basic programming and Application of the software: MATLAB & ORCAD.

INSTRUCTIONAL STRATEGY

This course is a highly practical and self- study oriented courses. The teachers are expected to explain the theoretical part and ensure that the students to execute and debug different programs. The PC needs to have Turbo C.

RECOMMENDED BOOKS

1. Programming in C by Balagurusamy, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Programming in C by Gottfried, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi
4. Let us C- YashwantKanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj, VikasPublishing House Pvt. Ltd., Jangpura, New Delhi
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi
10. The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill Education Pvt Ltd, New Delhi
11. Web site www.Beyondlogic.org
12. Pointers in C by YashwantKanetkar, BPB Publishers New Delhi
13. Programming in Applications by Chandershekhar, Unique International Publications, Jalandhar
14. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation (%)
1	04	15
2	20	70
3	08	15
Total	32	100

4.1 ELECTRONICS CIRCUITS

L T P

Periods per week 4 – 4

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.

DETAILED CONTENTS

1. Multistage Amplifiers (10 period)
 - Need for multistage amplifier
 - Gain of multistage amplifier
 - Different types of multistage amplifier, Coupling, Comparison between different types of coupling, RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth
2. Large Signal Amplifier (08 period)
 - 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
 - Concept of Thermal Runaway & its protection
3. Feedback in Amplifiers (10 period)
 - 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
 - Darlington Amplifier.
4. Sinusoidal Oscillators (08 period)
 - Barkhausen criterion for oscillations
 - Tank Circuits
 - Use of positive feedback
 - Classification of oscillators

- 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 (06 period)
 - Series and parallel resonant circuits and bandwidth of resonant circuits
 - Single and double tuned voltage amplifiers and their frequency response characteristics
 6. Wave Shaping Circuits (06 period)
 - General idea about different wave shapers
 - RC and RL integrating and differentiating circuits with their applications
 - Diode clipping and clamping circuits and simple numerical problems on these circuits
 7. Multivibrator Circuits (08 period)
 - 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
 8. Operational Amplifiers (08 period)
 - Characteristics of an ideal operational amplifier and its block diagram
 - 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
 - Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their application

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 Colpitts Oscillator
5. Plot the frequency response curve of phase shift and Wein bridge Oscillator
6. To observe the output waveforms of series and shunt clipping circuits
7. To observe the output for clamping circuits
8. Use of IC 555 as monostablemultivibrator and observe the output for different values of RC
9. Use of IC 555 as astablemultivibrator and observe the output at different duty cycles
10. To use IC 741 (op-amplifier) as
 - i) Inverter,
 - ii) Adder,
 - iii) Subtractor
 - iv) Integrator

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

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.

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 Principles by Malvino, Tata McGraw Hill, New Delhi
4. Electronic Devices and Circuits by Millman and Halkias, McGraw Hill, New Delhi
5. Electronics Devices and Circuits by Bhupinderjit Kaur, modern Publishers, Jalandhar
6. Basic Electronics by Grob, Tata McGraw Hill, New Delhi
7. Art of Electronics by Horowitz
8. Electronic Circuit Theory by Boylestad
9. Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi
10. Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
11. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
12. Electronics Devices and Circuits-II by Rajesh Kumar, Eagle Prakashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation
1	10	20
2	08	15
3	10	15
4	08	15
5	06	10
6	06	05
7	08	10
8	08	10
Total	64	100

4.2 MICROPROCESSOR AND ITS APPLICATIONS

L T P

Periods per week 3 1 4

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 them face-to-face with mainframe finding 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.

DETAILED CONTENTS

1. Evolution and Architecture of a Microprocessor (With reference to 8085 microprocessor) (12 period)
Typical organization of a microcomputer system and functions of its various blocks. 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
2. Programming (with respect to 8085 microprocessor) (16 period)
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).
3. Memories and I/O interfacing (10 period)
Memory organization, Concept of memory mapping, partitioning of total memory space. Address decoding, concept of I/O mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices. Concept of stack and its function. Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM.
4. Instruction Timing and Cycles (08 period)
Instruction cycle, machine cycle and T-states, Fetch and execute cycle
5. Interrupts (06period)
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

6. Data transfer techniques (06period)
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
7. Peripheral devices (06 period)
8255 PPI and 8253 PIT, 8257 DMA controller, 8279 Programmable KB/Display Interface, 8251 Communication Interface Adapter, 8155/8156

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 subtraction 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. Study and use of interfacing 8 bit A/D card and D/A card in sampling, wave generation, multiplexer, de-multiplexer and counter

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.

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 B P 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. Digital Logic and Computer Design by Mano, M Morris; Prentice Hall of India, New Delhi
7. Digital Electronics and Applications by Malvino Leach; Publishers McGraw Hill, New Delhi
8. Digital Integrated Electronics by Herbert Taub and Donald Sachiling; Prentice Hall of India Ltd., New Delhi
9. Digital Electronics by Rajaraman; Prentice Hall of India Ltd., New Delhi
10. Digital Electronics and Microprocessor by Rajiv Sapra, Ishan Publication, Ambala

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Period)	Marks Allotted (%)
1	12	20
2	16	25
3	10	15
4	08	10
5	06	10
6	06	10
7	06	10
Total	64	100

4.3 ELECTRONICS MEASURING INSTRUMENTS

L T P

Periods per week 3 1 4

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.

DETAILED CONTENTS

1. Basics of Measurements (06 period)
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 (12 period)
 - Principles of operation and construction of permanent magnet moving coil (PMMC) instruments
 - Moving iron type instruments, measurement of d.c voltage and current, measurement of d.c voltage and current, milli-volt measurement
 - Measurement of voltage, current and resistance using multimeter
 - Specifications of multimeter and its applications
 - Limitations with regard to frequency and input impedance
3. Cathode Ray Oscilloscope (10 period)
 - Construction and working of Cathode Ray Tube (CRT)
 - Time base operation and need for blanking during fly back, synchronization
 - Block diagram, description of a basic CRO and triggered sweep oscilloscope, front panel controls.
 - Specifications of CRO and their explanation.
 - Measurement of voltage, current, frequency, time period and phase using CRO.
 - CRO probes, special features of dual beam, dual trace, delay sweep.
 - Digital storage oscilloscope (DSO) : block diagram and working principle.
4. Signal Generators and Analytical Instruments (08 period)
 - Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
 - Wave analyzer, distortion measurement and spectrum analyser
5. Impedance Bridges and Q Meters (14 period)
 - Wheat stone bridge
 - AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge

- Block diagram description of laboratory type RLC bridge, specifications of RLC bridge
- Block diagram and working principle of Q meter

6. Digital Instruments (14 period)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multimeter
- Measurement of time interval, time period and frequency using universal counter/frequency counter
- Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltage
3. Measurement of voltage, frequency, time period and phase using CRO
4. Measurement of rise time and fall time using CRO
5. Measurement of Q of a coil and its dependence on frequency
6. Measurement of voltage, frequency, time and phase using DSO
7. Measurement of resistance and inductance of coil using RLC Bridge
8. Use of logic pulser and logic probe
9. Measurement of time period, frequency, average period using universal counter/frequency counter

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.

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 Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
5. Electronics Instrumentation by JB Gupta, SatyaPrakashan, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Period)	Marks Allocation (%)
1	6	05
2	12	20
3	10	15
4	08	10
5	14	25
6	14	25
Total	64	100

4.4 NETWORK FILTERS AND TRANSMISSION LINES

L T P

Periods per week 3 1 4

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.

DETAILED CONTENTS

1. Circuit Theory & Networks (20period)
 - a) Elements of Networks and its type, Current Sources, Voltage Source and their conversion, Dependent and Independent Sources, Nodal and Mesh analysis.
 - b) Two port (four terminals) network: Basic concepts of the following terms
 - Symmetrical and asymmetrical networks: Balanced and unbalanced network, T-network, JI network, Ladder network; Lattice network; L-network and Bridge T-network
 - c) Symmetrical Network:
 - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
 - T-network and JI Network
 - d) Asymmetrical Network
 - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss
 - The half section (L-section); symmetrical T and JI sections into half sections
2. Attenuators (08period)
 - Units of attenuation (Decibels and Nepers): General characteristics of attenuators
 - Analysis and design of simple attenuator of following types; Symmetrical T and JI type, L type
3. Filters (16period)
 - a) Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters
 - b) 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 JI filters and their significance vs
 - Simple design problems of prototype low pass section.
 - c) M-Derived Filter Sections - Limitation of prototype filters, need of m-derived filter

- d) Crystal Filters - Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
 - e) Active Filters - Basic concept of active filters and their comparison with passive filters
4. Transmission Lines (20period)
- Transmission Lines, their types and applications.
 - Distributed constants, T and JI representation of transmission line section.
 - Definition of characteristic impedance, propagation constant, attenuation constant and phase shift constant.
 - 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).
 - Transmission line equation, expression for voltage, current and impedance at a point on the line.
 - Concept of transmission lines at high frequencies.
 - Introduction to stubs. (single, open and short stubs).

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and JI networks
2. To measure the image impedance of a given asymmetrical T and JI networks
3. For a prototype low pass filter:
 - Determine the characteristic impedance experimentally
 - Plot the attenuation characteristic
4. To design and measure the attenuation of a symmetrical T/ JI 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.

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; DhanpatRai and Co. Publication, New Delhi
3. Network Analysis by Van Valkenburg: Prentice Hall of India, New Delhi
4. Network Analysis by Soni and Gupta; DhanpatRai and Co. Publication, New Delhi
5. Network Theory and Filter Design by Vasudev K. Aatre
6. Network Filters and Transmission line by UmeshSinha
7. Electrical and Electronics Measuring instrumentation , A.K Sawhney, DhanpatRai and Co. Publication, New Delhi
8. Network Analysis by G.K. Mithal
9. Network Filters and Transmission line by NardeepGoyal, Rajneesh Kumari, Tech. Max Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation (%)
1	20	32
2	08	12
3	16	24
4	20	32
Total	64	100

4.5 SIGNAL SENSING AND CONDITIONING

L T P

Periods per week 4 03

RATIONALE

This subject provides knowledge about signals, sensing of signals, signal transmission, conditioning and recording.

DETAILED CONTENTS

1. Introduction (04 Periods)
 - Signal
 - Types of Signals
 - Functional Elements of System
 - Importance of Sensing of Signals

2. Sensing Elements (24 Periods)
 - Resistive sensing elements: potentiometers, resistance thermometers, strain gauges, Load cell/Pressure cell
 - Capacitive sensing elements: variable separation, area and dielectric
 - Inductive sensing elements: variable reluctance and LVDT displacement sensors
 - Electromagnetic sensing elements: velocity sensors
 - Thermoelectric sensing elements: laws, thermocouple characteristics, installation problems
 - Elastic sensing elements : sensing elements for force, torque, acceleration, pressure
 - Piezoelectric sensing elements: static and dynamic characteristics
 - Electrochemical sensing elements: ion selective electrodes, solid state gas sensors
 - Photo sensing elements : Basic principle and characteristics of photo sources and photo detector, photo resistors, photo diodes, photo transistors, photo electric cells, LCDs, LEDs and photocouplers, LDR
 - Photo Detectors : Optical detection Principles, Electro-optic effect, Integrated Optical Devices, Magneto optic effect, Acousto-optic effect
 - Digital Transducer element, Micro sensor, smart sensors

3. Signal Transmission (12 Periods)
 - Introduction
 - Methods of Data Transmission
 - General Telemetry System
 - Types of Telemetry Systems
 - Land Line Telemetering System
 - Voltage Telemetering Systems
 - Current Telemetering System
 - Position Telemetering System
 - Land Line Telemetering

- Feed-back System
 - Radio Frequency (R.F.) Telemetry
4. Signal Conditioning (07 Periods)
- Basic Instrumentation Amplifier
 - Applications of Instrumentation Amplifiers (Specific Bridge)
 - Chopped and Modulated DC Amplifier
6. Signal Recording and Display (10Periods)
- Recording Requirements
 - Analog Recorders
 - Graphics Recorders
 - Strip Chart Recorders
 - Types of Strip Chart Recorders
 - Galvanometer Type Recorders
 - Null Type Recorders
 - Potentiometric Recorders
 - X-Y Recorders
 - Direct Recording
 - Digital Display Methods
 - Digital Display Units
 - Segmental Displays
 - Dot Matrices
 - Rear Projection Display
7. Data Acquisition System (07 Periods)
- Introduction
 - Objective of DAS
 - Single Channel Acquisition System
 - Multi-Channel DAS
 - Computer Based DAS
 - Data Loggers
 - Sensors Based Computer Data Systems

LIST OF PRACTICALS

1. Measurement of Displacement using LVDT
2. Measurement of Temperature using Thermocouple & Thermister
3. Measurement of Strain using strain gauge
4. Application of Load Cell/Pressure Cell
5. Application of capacitive transducer
6. Application of Potentiometer
7. Application and use of LDR, Photocell
8. Application of Potentiometer recording
9. Application and use of graphic and strip chart recorder
10. Use of Telemetry System

INSTRUCTIONAL STRATEGY

The teaching should be supplemented by using audio visual aids.

RECOMMENDED BOOKS

1. Electronic Instrumentation; by H.S.Kalsi; McGraw-Hill Education India Pvt.Ltd.
2. Principles of Measurement Systems by John P.Bently (Pearson)
3. Electrical and Electronic Measurements and Instrumentation by A.K.Sawhney; DhanpatRai& Co.
4. Instrumentation measurement and Analysis by B.C. Nakra, K.K.Chaudhary
5. Optoelectronics An Introduction to Materials and Devices by Singh Jasprit;McGraw Hill
6. Instrumentation Devices and Systems by C.S.Ranjan; Tata McGraw Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Period)	Marks Allocation (%)
1	04	08
2	24	32
3	12	15
4	07	10
5	10	15
6	07	10
Total	64	100

4.6 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L T P
Periods per week 5 - -

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. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (23 periods)
 - Concept /Meaning and its need
 - Qualities and functions of entrepreneur and barriers in entrepreneurship
 - Sole proprietorship and partnership forms of business organisations
 - Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)

2. Market Survey and Opportunity Identification (17 periods)
 - Scanning of business environment
 - Salient features of National and 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

3. Project report Preparation (14 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

SECTION –B MANAGEMENT

4. Introduction to Management (06 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
 - a) Line organisation
 - b) Line and staff organisation
 - c) Functional Organisation
5. Leadership and Motivation (05 periods)
- a) Leadership
- Definition and Need
 - Qualities and functions of a leader
 - Manager Vs leader
 - Types of leadership
- b) Motivation
- Definitions and characteristics
 - Factors affecting motivation
 - Theories of motivation (Maslow, Herzberg, McGregor)
6. Management Scope in Different Areas (10 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

- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT
7. Miscellaneous Topics (05 periods)
- a) Customer Relation Management (CRM)
- Definition and need
 - Types of CRM
- b) Total Quality Management (TQM)
- Statistical process control
 - Total employees Involvement
 - Just in time (JIT)
- c) Intellectual Property Right (IPR)
- Introductions, definition and its importance
 - Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar 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.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Pds)	Marks Allotted (%)
1	23	28
2	17	20
3	14	16
4	6	10
5	5	06
6	10	14
7	5	06
Total	80	100

4.7 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 4 weeks duration to be organised 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 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.

Internal assessment and external assessment 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 behaviour, 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, if any. 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%

5.1 CONSUMER ELECTRONICS AND TROUBLESHOOTING

L T P
Periods/Week 3 1 4

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 like audio-systems, CD systems. TV and other items like microwave ovens, Photostat machines etc. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

DETAILED CONTENTS

1. Audio Systems: (08 Periods)
 - 1.1. Microphones and Loudspeakers
 - a) Carbon, moving coil, cordless microphone
 - b) Direct radiating and horn loudspeaker
 - c) Multi-speaker system
 - 1.2. Sound Recording
 - a) Magnetic Recording
 - b) Digital Recording
 - c) Optical Recording (CD system and DVD)
 - 1.3. Study of VCD and DVD Player systems.

2. Television
 - 2.1. Monochrome TV (14 Periods)
 - a) Scanning and its need
 - b) Need of synchronizing and blanking pulses, VSB
 - c) Composite Video Signal
 - d) Picture Tube
 - e) Camera Tube : Vidicon and Plumbicon
 - f) TV Receiver: Block diagram, function of each block, waveform at input and output of each block.
 - 2.2. Colour Television: (12 Periods)
 - a) Primary, secondary colours
 - b) Concept of Colour Mixing, Colour Triangle
 - c) Camera tube
 - d) PAL TV Receiver
 - e) Concept of Compatibility with Monochrome Receiver
 - f) NTSC, PAL, SECAM system (brief comparison)

3. LCD and LED Television: Basic principle and working of LCD & LED TV (06 Periods)

4. Cable Television: Concept and Working of Cable TV, DTH, HDTV (06 Periods)

5. Consumer Appliances- Principle, Working and troubleshooting with special emphasis on control panel (10 Periods)
 - a) Microwave Oven
 - b) Washing Machine
 - c) Photostat Machine
 - d) DTH System
 - e) Digital Camera

6. a) Repair, Servicing and Maintenance Concepts (8 Periods)

Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance and corrective maintenance.

b) 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

LIST OF PRACTICALS

1. To plot the directivity pattern and frequency response of a microphone.
2. To plot the directivity pattern and frequency response of a loudspeaker.
3. Demonstration of VCD/DVD player and study of its transport mechanism.
4. Familiarization with the different sections of B/W TV Receiver.
5. To observe the wave forms and voltage of B/W and colour TV Receiver.

6. Fault finding of colour T.V Receiver.
7. Familiarization with different section of LCD & LED TV
8. Study of cable TV network system.
9. Demonstration and Operation of Control Panel
 - (a) Microwave Oven
 - (b) DTH System
 - (c) Photostat Machine
 - (d) Washing Machine

INSTRUCTIONAL STRATEGY

This subject gives the knowledge of the various day-to-day life electronic products. So, the teacher is required to show and demonstrate the gadgets and impart practical knowledge to the students. For that one should give home assignment and frequent industrial visit should be there. Visit to TV studio and TV transmitter station should be arranged to give a practical exposure to the students.

RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Colour Television-Principles & Practice by R.R Gulati , Wiley Eastern Limited, New Delhi
3. Complete Satellite & cable Television R.R Gulati New age International Publisher, New Delhi
4. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
5. Colour Television & Video Technology by A.K. Maini CSB Publishers
6. Colour TV by A. Dhake
7. Service Manuals, BPB Publication, New Delhi
8. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation%
1	08	15
2 a	14	15
2 b	12	20
3	06	10
4	06	10
5	10	20
6	08	10
Total	64	100

5.2 MICROWAVE COMMUNICATION

L T P
Periods/ Weeks 4 - 2

RATIONALE

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

DETAILED CONTENTS

1. Introduction to Microwaves (04 Periods)

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

2. Microwave Devices (12 Periods)

Basic concepts of thermionic emission and vacuum tubes, Effects of interelectrode capacitance, Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.

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
- Impatt diode

3. Wave guides (08 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.

5. Microwave antennas (06 Periods)

Structure characteristics and typical applications of Horn and Dish antennas

6. Microwave Communication systems (10 Periods)

- Basic idea of different modes of radio wave propagation, ground wave propagation space wave communication and sky wave propagation
- Explanation of terms – critical frequency, maximum usable frequency, skip distance, Noise in radio communication, signal fading
- Block diagram and working principles of microwave communication link.
- Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.

7. Radar Systems (08 Periods)

- Introduction to radar, radar range equation (no derivation), its various 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.
- Block diagram and operating principles of MTI radar.

8. Satellite Communication (06 Periods)

- Basic Idea of passive and active satellite. Meaning of the term orbit, apogee, perigee.
- Geo Stationary satellite. Block diagram and explanation of a satellite communication link. Link losses.
- Transponders, , VSAT and its features.

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 tee.
7. To carry out installation of a dish antenna.
8. Study of satellite communication system

NOTE:

Visit to the appropriate sites of microwave industries, radar installations 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 is a 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.

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	04	05
2	12	20
3	08	10
4	10	15
5	06	10
6	10	15
7	08	15
8	06	10
Total	64	100

5.3 ADVANCED MICROPROCESSORS

L T P
Periods/ Weeks 4 - 4

RATIONALE

The complex systems require high through put that at times is not met with 8-bit microprocessor system. So, 16 bit up based system become suitable. They provide better facilities to personal computers and other automatic process control systems.

DETAILED CONTENTS

1. The 8086 Microprocessor (08 Periods)
 - Internal Architecture of 8086.
 - Memory organisation: Memory segmentation & physical address generation.
 - 8086 Flags
2. 8086 Signal (12 Periods)
 - Pins and Signals description.
 - CLK circuitry.
 - 8086 Address and Data bus Concept
 - Maximum & Minimum mode.
 - Memory and I/O Interface block diagram
 - Types of interrupts and interrupt priority. (Brief Idea)
3. 8086 Instruction set (12 Periods)
 - Instruction Format : Example on Mov instruction only.
 - Instruction : Data transfer, Arithmetic, Bit & Logical manipulation, String, Program transfer and processor control instructions.
 - Addressing mode & its types.
 - Macros , Procedure.
4. Directives and Programming (12 Periods)
 - Editor, Assembler, Emulators, Directives.
 - Programs: Addition, Subtraction, Multiplication, Division, Shifting of data right / Left, Increment, Decrement, Complement, Block movement of data.
5. Interrupts (12 Periods)
 - 8086 Interrupt.
 - Interrupt Vector table, Vector & Non Vector Interrupt.
 - Predefined Interrupts (0 – 4)
 - User defined Software/Hardware Interrupts.
6. Latest Microprocessor (08 Periods)

Introduction to 32 bit Microprocessor, Features and advantages of Pentium processor/
Dual core processor and RISC processor

LIST OF PRACTICALS

1. To Study the Architecture of 8086 microprocessor.
2. Familiarization of different keys of 8086-microprocessor kit and its memory map.
3. Steps to enter, check /modify data or program and to execute a program on 8086 Microprocessor kit.
4. Addition of two 8 bit numbers.
5. Addition of two 16 bit numbers
6. Subtraction of two 8 bit numbers.
7. Subtraction of two 16 bit numbers
8. Multiplication of two 8 bit numbers
9. Division of two 8 bit numbers
10. Program for And, OR, X-OR & its complement.
11. Determine the Hex code of Mov instruction for various addressing mode.
12. Determine the Physical address for different segments.

INSTRUCTIONAL STRATEGY

Advanced Microprocessor gives the knowledge of 8086 and latest microprocessors. So, the teaching process require the theoretical study of microprocessors and also practical implementation using the microprocessor kits.

RECOMMENDED BOOKS

1. Microprocessor and Application by D.V. Hall.
2. Microprocessor 8086/88 by B.B. Brey
3. Microprocessors & Micro controllers by Dr. B.P. Singh
4. Microprocessor by Rajiv Sapra, Ishan Publications, Ambala
5. Microprocessor by Naresh Grover
6. Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay
7. Microprocessors and Applications by Uffenback
8. Introduction to Microprocessor by Adithya Mathur, Tata McGraw Hill Publishing Co, New Delhi
9. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar, Wiley Eastern Ltd, New Delhi
10. Microprocessor and Applications by B Ram
11. Microprocessor by SK Goel

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	12	20
3	12	20
4	12	20
5	12	20
6	08	10
Total	64	100

5.4 ELECTRONICS IN INDUSTRY

L T P
Periods/ Weeks 3 - 4

RATIONALE

This course deals with electronic devices and circuits used in industry. It involves the study of thyristors, rectifier circuits, communication circuits and also the application of electronics in industry.

DETAILED CONTENTS

1. Thyristors and Other Power Electronics Devices (30 Periods)
 - 1.1 Introduction
 - 1.2 Applications
 - 1.3 Symbolic Representations
 - 1.4 Specifications
 - 1.5 Principle of Operating of an SCR
 - 1.6 Two-Transistor Analogy of SCR
 - 1.7 DIAC
 - 1.8 TRIAC
 - 1.9 Basic Triggering circuits for Thyristors
 - 1.10 Rectifier Circuits using SCR
 - 1.11 Construction and working of Gate Turn Off (GTO) thyristor
 - 1.12 Characteristics of Programmable Uni-junction Transistor (PUT), ASCR, LASCR, RCT, SCS
 - 1.13 Construction and Working of IGBT

2. Power Electronics Circuits (18 Periods)
 - 2.1 Commutation Circuits
 - 2.2 Inverters series and parallel
 - 2.3 Choppers: Step up, Morgan's, Jones's
 - 2.4 Single phase and Three Phase Converters.

3. Module 03- Application of Electronics in Industry/ Sector (Not to include in theory) (2 weeks)
 - a. Process Industry- i) Chemical Industry ii) Sugar iii) Paper iv) Paint v) Steel vi) Fertilizer vii) Glass viii) Textile ix) Rubber
 - b. Medical and Pharmaceutical Industry
 - c. Computer Manufacturing Industry
 - d. Consumer Goods Industry
 - e. Service Sector
 - f. Power Generation and Transmission Industry
 - g. Communication Service providing Organisation as BSNL, Reliance, Airtel, Idea, Government Telecommunication Department etc
 - h. Defence Sector
 - i. Space Organisation
 - j. Petroleum Industry

Student will get the exposure of equipments, flow diagram of organisation setup maintenance and service of any of 4 above industry/ sector. And will submit the report and the evaluation will be based on viva-voice.

LIST OF PRACTICALS

1. Testing of components- SCR, DIAC, TRIAC
2. To plot and verify Characteristic of an SCR
3. To plot and verify Characteristic of an TRIAC
4. To plot V-I characteristics of UJT
5. To plot V-I characteristics of DIAC
6. Assembly and testing of Half-wave Gate-controlled Rectifier using One SCR
7. Assembly and testing of Single-phase Half-controlled Full-wave Rectifier using two SCRs and two Diodes
8. Assembly and testing of Illumination/ Fan Control circuit using SCR
9. Assembly and testing of Illumination Control circuit using Triac
10. Assembly and testing of SCR Controlled Emergency light
11. Study of Integrator and Differentiator circuit using OPAMP 741
12. Study of Adder and comparator circuit using OPAMP 741
13. To visit at least four industries mentioned at module 03 and write the report.

INSTRUCTIONAL STRATEGY

Electronics in Industry is the subject related to practical implementation and exposure of electronic devices and circuits in today's industries. Thus, it requires both theoretical as well as practical exposure.

RECOMMENDED BOOKS

1. Industrial Electronics: S.K. Bhattacharya / S Chatterjee, Tata McGraw-Hill Publishing Company Limited
2. Industrial Electronics: James Humphries, Leslie Sheets, 4e - Delmar Publications
3. Industrial Electronics: Biswanath Paul PHI
4. Industrial Electronics for Technicians: J.A.Sam Wilson Joseph Rissi, Prompt Publications
5. Thyristors and its Application by Ramamurthy, East West New Delhi
6. Modern Digital Electronics by R.P. Jain, McGraw Hill Publication
7. Op-amp and linear integrated circuits by Gaikwad, Eastern co. Edition PHI
8. Electrical and Electronic Measurements by A. K. Sawhney, Dhanpat rai & Sons New Delhi
9. Power Electronics by P.C. Sen, Tata McGraw-Hill Publishing, New Delhi
10. Digital Electronics by Malvino Leach, Tata McGraw-Hill Publishing, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	30	60
2	18	40
Total	48	100

5.5 DIGITAL SWITCHING AND CIRCUITS

L T P
Periods/Week 4 - 4

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 FAX, electronic exchanges etc. so vital for present day communication.

DETAILED CONTENTS

1. Introduction: (06 Periods)
Basic block diagram of digital and data communication systems. Their comparison with analog communication systems. Basic information theory.
2. Coding (10 Periods)
 - a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, EBCDIC
 - b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Cyclic Redundancy check (CRC), Hamming code
3. Digital Modulation Techniques: (14 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 Amplitude modulation (QAM)
4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (06 Periods)
5. UART, USART: Their need and function in communication systems (06 Periods)
6. Modems: (08 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, Modem interfacing (RS 232 Interface, other interfaces).

7. Electronic Exchange and FACSIMILE (FAX) (14 Periods)

- Typical telephone network. Various switching offices (Regional Centre, District Centre, Toll Centre, Local Office) and their hierarchy.
- Principles of space division switches. Basic block diagram of a digital exchange and its working.
- Introduction to EPABX.
- Basic idea of FAX system and its applications. Basic Principle of operation and block diagram of modern FAX system. Important features of modern FAX machines.

LIST OF PRACTICALS

1. Observe wave forms at input and output of ASK and FSK modulators
2. To transmit parallel data on a serial link using USART
3. Transmission of data using MODEM.
4. Observe wave forms at input and output of a PSK and QAM circuit
5. To study the working principle of a telephone handset
6. To study the working principle of a FAX machine.
7. To study the working principle of an EPABX.

NOTE:

Visits to the sites of all types of telephone exchanges (including mobile and WLL), FAX 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 be made in the laboratory during the conduct of experiments. For the better awareness taking around the world, visit must be arranged to the industries. Like telephone exchange, various cellular industries etc.

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

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	06	10
2	10	15
3	14	20
4	06	10
5	06	10
6	08	15
7	14	20
Total	64	100

5.6 PROCESS CONTROL AND INSTRUMENTATION

	L	T	P
Periods/ Weeks	4	-	2

RATIONALE

The technician has the responsibility of using and maintaining electronic test equipments, for measurement, design, testing and trouble shooting, with the introduction of new techniques of process control in modern industries, the use of transducing elements in agriculture and other non-engineering areas, the task of the technician has become varied and different from the previous task of measurement only.

The Course aims to develop appreciation and understanding of the use of measurement of a variety of physical quantities and their control.

(A) Process Instrumentation

1. Introduction (04 Periods)
 - Functional block diagram of instrumentation system.
 - Description of each block
 - Process
 - Process Characteristics
 - Process Variables
2. Pressure Measurement (05 Periods)
 - Types of Pressure
 - Measurement of Pressure by Manometers
 - Diaphragms
 - Bourdon Tube
 - Bellows
 - Vacuum Measurement
3. Temperature Measurement (05 Periods)
 - Temperature Measuring Devices Like Thermocouples.
 - Pyrometer
 - Resistance Thermometer.
 - Thermister
 - Bimetallic Thermometer
4. Strain Measurement (05 Periods)
 - Requirements for strain measurement
 - Strain Gauges
 - General Strain Measurement
 - Load cell

5. Vibration and Angular Velocity Measurement (05 Periods)
- Vibration Measurement Systems
 - Measurement of Angular Velocity
 - DC & AC Tachometer Generators
 - Digital Methods
6. Flow Measurement (06 Periods)
- General
 - Types of Flow
 - Flow Coefficient
 - Renolds No
 - Flow Meters
 - Venturi Meter
 - Orifice Plate
 - Pitot Tube
 - Rotameter
7. Humidity, Moisture and Level Measurement (04 Periods)
- Hygrometer method for humidity measurement
 - Moisture meter
 - Electrical contact type liquid level indicators
8. Chemical, Analytical, Medical & Nuclear Instruments (07 Periods)
- Spectrophotometer, Filters
 - Electrochemical Sensors
 - PH Meter
 - General idea and working and application of Medical Instruments as X-Ray Machine, Electronic method for BP measurement, Blood Sugar measurement, EEG and ECG machine
 - Brief description of Nuclear Instrumentation

(B) Process Control

9. Introduction (02 Periods)
- Block diagram of a general open and closed loop process
 - Automatic Control
10. Control System Components (06 Periods)
- Brief description and working of a potentiometer
 - Differential transformer, servo motors
 - Tacho Generator
 - Eddy Current clutches, relay contractors, timing relay

11. Types of Control Techniques (05 Periods)

- Brief Idea and Introduction of following control techniques
- ON-OFF Control
- Proportional
- Integral
- Derivative
- PI
- PD
- PID

12. Controller (10 Periods)

- Block Diagram & Circuits of pneumatic PI,PD & PID controller, ON-OFF Controller
- Electronic Controller/Automatic Controller
- Simple Example Of
- Heating Control using SCR
- Illumination Control
- Level Control
- Pressure Control

LIST OF PRACTICALS

1. Experiment of Pressure Measurement
2. Experiment of Temperature Measurement
3. Experiment of Flow Measurement
4. Experiment of Moisture/Humidity Measurement
5. Experiment of Strain Measurement/ load cell
6. Experiment on spectrophotometer and PH meter.
7. Measurement of Level
8. Measurement of angular velocity
9. ON /OFF Controller
10. Experiment of Elex Controller
 - a. Heating Control Using SCR
 - b. level Control
 - c. Illumination Control
 - d. Pressure Control

RECOMMENDED BOOKS

1. Instrumentation Devices & Systems by By S. Ranjan; Tata McGraw-Hill Publishing
2. Electrical & Elex Measurement by A. K. Sawhney; Danpat Rai & Co.
3. Industrial Instrumentation by Tyson
4. Process Instrumentation by Donald P. Echman
5. Process Control by Donald P. Echman
6. Instrumentation by Cirk & Rimboi
7. Instrumentation Measurement and Analysis by B. C. Nakra and K K Chaudhary; MC Graw Hill Publication

8. Electronics Instrumentation by H.S. Kalsi; McGraw Hill Publication
9. Medical Instruments by S. Ananthi; New Age International (P) Limited Publisher

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	04	05
2	05	05
3	05	05
4	05	05
5	05	05
6	06	10
7	04	05
8	07	15
9	02	05
10	06	10
11	05	10
12	10	20
Total	64	100

6.1 OPTICAL FIBRE COMMUNICATION

L T P
Periods/ Weeks 3 1 2

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 fibers 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.

DETAILED CONTENTS

1. Introduction (10 Periods)
 - Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication
 - Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
 - Principle of light penetration, reflection, critical angle.
2. Optical Fibers and Cables (10 Periods)
 - Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle, Types of optical fiber cables.
 - Optical Fibers cable connectors and splicing techniques
3. Losses in Optical Fiber Cable (08 Periods)
 - Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending losses.
 - Dispersion: Types and its effect on data rate.
4. Optical Sources (10 Periods)

Characteristics of light 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. Optical Detectors (08Periods)

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

6. Optical Amplifiers (10 Periods)

Types of optical amplifiers, semiconductor & fiber optical amplifiers
Functional types, principle of operation of SOA, types of SOA. FPA, TWA, SOA applications, advantages, Drawbacks, EDFAS, Raman amplifiers.

7. Optical Fiber System (08 Periods)

Optical transmitter circuit, optical receiver circuit, optical power budgeting, Multiplexing: WDM (Wavelength Division Multiplexing), Modulation in fibre optics

LIST OF PRACTICALS

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

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 re-enforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower, Prentice Hall of India, New Delhi
3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	8	15
4	10	15
5	8	15
6	10	15
7	8	10
Total	64	100

6.2 MOBILE COMMUNICATION

L - P
Periods/ Weeks 4 - 4

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more mobile phones in comparison to land line phones. It is expected that with in very short period almost everybody 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.

DETAILED CONTENTS

1. Wireless Communication (10 Periods)
 - 1.1 Basics
 - 1.2 Advantages of wireless communication
 - 1.3 Electromagnetic waves.
 - 1.4 Frequency Spectrum used.
 - 1.5 Paging system.
 - 1.6 Cordless Telephone System.
 - 1.7 Cellular Telephone System
 - 1.8 Comparison of above wireless communication systems.
 - 1.9 Propagation considerations
 - a) Range
 - b) Atmospheric Effect
 - c) Geographic Effect
 - d) Signal Fading
 - e) Doppler Effect
2. Cellular Concept (12 Periods)
 - 2.1 Cell area
 - 2.2 Capacity of cell
 - 2.3 Frequency Reuse
 - 2.4 Co-channel Interference
 - 2.5 Adjacent channel Interference
 - 2.6 Power Control for reducing Interference
 - 2.7 Improving coverage and capacity in cellular system
 - a) Cell Splitting.
 - b) Sectoring
 - c) Repeater for Range Extension.
3. Multiple Access Techniques for Wireless Communication (18 Periods)
 - 3.1 Introduction to Multiple Access.
 - 3.2 Frequency Division Multiple Access (FDMA)
 - 3.3 Time Division Multiple Access (TDMA)

- 3.4 Code Division Multiple Access (CDMA)
 - 3.5 Spread Spectrum Multiple Access (SSMA)
 - 3.6 Frequency Hopping spread Spectrum (FHSS).
 - 3.7 Comparison of FDMA/TDMA/CDMA
 - 3.8 Introduction to Wireless local loop (WLL) technologies.
 - (a) Satellite- Based System
 - (b) Cellular-- Based System
 - (c) Micro Cellular-- Based System
 - (d) Fixed Wireless Access Systems
4. Mobile Communication Systems (16 Periods)
- 4.1 Advanced Mobile Phone System (AMPS)
 - a) Operation of AMPS
 - b) Working of AMPS Phone System
 - 4.2 Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems
 - 4.3 Introduction of GPRS and GPS System.
5. Mobile computing (08 Periods)
- 5.1 Introduction to Blue tooth and Infrared Data Association(IRDA)
 - 5.2 Introduction to Wi-Fi ,Radio Frequency identification (RFID) .

LIST OF PRACTICALS

1. Study the features, specification and working of cellular mobile
2. Signal strength measurement of various points from a transmitting antenna/cordless phone
3. Visit of a Mobile Switching Centre (MSC) in the nearest M.S. facility provider
4. Demonstration of Base Trans Receiver (BTS) with nearby cellular tower
5. Observing call processing of GSM trainer Kit.
6. Observing call processing of CDMA trainer Kit.
7. Practical study of setting of Wi-Fi
8. Fault finding of a basic (GSM) and a (CDMA) mobile phones Demonstration
9. Study and practice of data transfer using blue tooth

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is heaving significant impact in Electronics Market. For the proper awareness of this subject it is must to provide the students the detail 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 in the BSNL, Vodafone, Airtel, SPICE, TATA Indicom etc

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Theodore 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 Publications.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	12	20
3	18	25
4	16	25
5	08	15
Total	64	100

6.3 MICRO CONTROLLERS AND EMBEDDED SYSTEM

L T P
Periods/ Weeks 4 - 4

RATIONALE

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).

DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (16 Periods)
 - Pin details
 - I/O Port structure
 - Memory Organization
 - Special Function Registers (SFRS)
 - External Memory
2. Instruction Set; Addressing Modes, Instruction types (12 Periods)
 - Timer operation
 - Serial Port operation
 - Interrupts
3. Assembly language programming (10 Periods)
 - Assembler directives
 - Assembler operation
4. Design and Interface (10 Periods)
 - keypad interface, 7- segment interface, Switches etc
5. Embedded Systems (16 Periods)

Introduction, Embedded design concept, Brief description and architecture of AVR and PIC, Application of embedded system, case study of embedded system. General Idea of Robotics, Different types of Robots, Their working principles and elements used in robotics.

LIST OF PRACTICALS

1. Familiarization of Micro Controllers (8051) kit
2. Assembly Language Programming
3. Testing of general input/output on Micro controller board

4. Development of Electrical , Instrumentation applications using 8051 micro-controller
5. Study of interfacing ADC, Infra red Sensor, RS 232, DAC with 8051.
6. Case study of embedded system

RECOMMENDED BOOKS

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming And Design , PHI
3. D. V. Hall: Microprocessors and Interfacing, TMH.
4. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
5. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning
6. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
7. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
8. V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.
9. Digital Electronics by Malvino Leach, Tata McGraw-Hill Publishing, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	16	25
2	12	20
3	10	15
4	10	15
5	16	25
Total	64	100

6.4 COMPUTER NETWORKS

L T P
4 - 3

RATIONALE

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

DETAILED CONTENTS

1. Networks Basics (8Periods)
 - Concept of network
 - Models of network computing
 - Networking models
 - 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 (12 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 IPV
4. Network Architecture (10 Periods)
 - ARC net specifications
 - Ethernet Specification and Standardization:

10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet), Introduction to Media Connectivity (Leased lines, ISDN, PSTN, RF, VSAT, Optical and IPLC)

5. Network Connectivity (8 Periods)

- Network connectivity Devices
- NICs
- Hubs
- Repeaters
- Multiplexers
- Modems
- Routers and Protocols,
- Firewall
- ATM
- VOIP and Net-to-Phone Telephony,
- Laws and Protocols

6. Network Trouble Shooting Techniques (10 Periods)

- Trouble Shooting process
- Trouble Shooting Tools: PING, IPCONFIG, IFCONFIG, NETSTAT, TRACEROUT, Wireshark/ Dsniffer/ Pcop
- Hauffman codes
- Cryptography

7. Wireless Networking (6 Periods)

Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, Wi-Max (Broad-band Wireless) and Blue-Tooth technology.

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11, BNC and SCST
3. Recognition of network devices (Switches, Hub, Routers of access points for Wi-Fi)
4. Making of cross cable and straight cable
5. Install and configure a network interface card in a workstation.
6. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
7. Managing user accounts in windows or LINUX
8. Study and Demonstration of sub netting of IP address
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Installation of Network Operating System(NOS)
11. Visit to nearby industry for latest networking techniques

Required Software

- Windows Server/Linux Server

Required Tools and Supplies

- 1) Crimping tool, crone Tool, Cable tester,
- 2) RJ 45 connectors, RJ-11, BNC, SCST
- 3) Coaxial Cable, UTP, STP, OFC cable
- 4) Screwdriver Kit
- 5) Switch/Hub
- 6) Manageable Switch

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.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
4. Local Area Networks by Peter Hudson
5. Understanding Local Area Network by Neil Jenkins
6. Area Networks by Stan Schatt, Prentice Hall of India, New Delhi
7. Network+ Lab manual,- BPB Publications -by Tami Evanson
8. Networking Essentials – BPB Publications New Delhi
9. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
10. Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.
11. Unleashed Linux by TechMedia Publishers, New Delhi
12. Computer Network by J.S. Katre, Tech-Max Publication, Pune

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	08	12
2.	10	16
3.	12	20
4.	10	15
5.	08	12
6.	10	15
7.	06	10
Total	64	100

6.5 PROGRAMMABLE LOGIC CONTROLLERS

L T P
Periods/ Weeks 4 - 4

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. A diploma holder in the field of Electronics employed for maintenance of electronic equipment/ gadgets 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.

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.

DETAILED CONTENTS

1. Introduction to PLCs (05 Periods)
What is PLC, limitations of relays. Advantages of PLCs over electromagnetic relays, Different programming languages, PLC manufacturer etc.
2. Working of PLC (14 Periods)
 - Basic operation and principle of PLC,
 - Architectural details – Processor
 - Memory structure, I/O Structure
 - Programming terminal, Power Supply
3. Instruction Set (15 Periods)
 - Basic instructions like latch, master control self holding relays.
 - Timer instructions like on-delay timers, off-delay timers, retentive timers, resetting of timers.
 - Counter instructions like up-counter, down counter, resetting of counters.
 - Sequencers, output sequencers, input sequencers time driven and event driven sequencers masking etc.
 - Comparison instruction like equal, not equal, greater, greater than equal, less than, less than equal mask equal, limit etc.

4. Ladder diagram programming (15 Periods)
Programming based on Basic instructions, timer counter, sequencer to comparison instruction using ladder diagrams.
5. Applications of PLCs (15 Periods)
- Car parking
 - Doorbell operation
 - Traffic light control
 - Microwave Oven
 - Washing machine

LIST OF PRACTICALS

1. Familiarization with the working of PLC
2. Components/sub-components of a PLC, learning functions of different modules of a PLC system
3. Introduction to programming language, ladder diagram concepts, instruction list for module 5.
4. Basic logic operations, AND, OR, NOT, functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g in lifting a device for packaging and counting
7. Writing, entering and testing programs using a hand-held programmer and computer for the following operations
 - Ladder Logic
 - Timers
 - Counters
 - Sequencers

INSTRUCTIONAL STRATEGY

The teacher should explain the scope of various measuring devices and their practical application in the field. The transducers and measuring devices must be shown to the students and they should be trained in the selection, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

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. Module on “Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
5. Module on “PLC Applications based on SLC 5/03” By Rajesh Kumar, NITTTR Chandigarh

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation (%)
1.	05	05
2.	14	20
3.	15	25
4.	15	25
5.	15	25
Total	64	100

6.6 EMPLOYABLE SKILLS

L T P
Periods per week - - 4

RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

DETAILED CONTENTS

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer (04 periods)
2. Personality types, characteristic and features for a successful engineer (04 periods)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment (04 periods)
4. Managing project (16 periods)
 - Leadership
 - Motivation
 - Time management
 - Resource management
 - Computer Software
 - Interpersonal relationship
 - Engineer economics and fundamentals
5. Effective Communication (08 periods)
 - Listening
 - Speaking
 - Writing
 - Presentation Technique/Seminar
 - Group discussion
6. Preparing for Employment (08 periods)
 - Searching for job/job hunting
 - Resume Writing
 - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference

7. Managing Self (06 periods)
 - Managers body, mind, emotion and spirit
 - Stress Management
 - Conflict resolution

8. Continuing professional development (04 periods)
 - Organising learning and knowledge
 - Use of computer for organising knowledge resource

9. Creativity, Innovation and Intellectual property right (06 periods)
 - Concept and need in present time for an engineer

10. Basic rules, laws and norms to be adhered by engineers during their working (04 periods)

6.7 MAJOR PROJECT WORK

L T P
- - 4

RATIONALE

Major 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 with a view to:

- i) 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.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) 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.
- iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

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:

- a) Projects related to designing small electronic equipment / instruments.
- b) Projects related to increasing productivity in electronic manufacturing areas.
- c) Projects related to quality assurance.
- d) Projects connected with repair and maintenance of plant and equipment.
- e) Projects related to design of PCBs.
- f) Projects related to suggesting substitutes of electronics components being used.

- g) Projects related to design of small oscillators and amplifier circuits.
- h) Projects related to design, fabrication, testing and application of simple digital circuits and components.
- i) Projects related to microprocessor/microcontroller based circuits/ instruments.

A. 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 Bit Error Rate (BER) of various modulation techniques
24. Design ALU using CPLD/FPGA
25. Design Display System using CPLD/FPGA
26. Electronic Weighing Machines

B. FABRICATION AND TESTING (AT LEAST TWO OF THE FOLLOWING):

- 1 Voltage Stabilizer for Refrigerator, Air-Conditioner
- 2 Emergency Light using SCR
- 3 Power amplifier
- 4 Low cost intercom for home
- 5 Analog computer
- 6 Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906
- 7 Automatic battery charger using SCR
- 8 Burglar Alarm
- 9 Automatic street light/dressing table light
- 10 Inverter circuit 500 watt.
- 11 Microprocessor/Microcontroller Based A/D converter
- 12 Microprocessor/Microcontroller Based D/A converter
- 13 Simulation of half wave and full wave rectifiers using Simulation Software

- 14 Simulation of class A, Class B, Class AB and Class C amplifiers
- 15 Inverter/Emergency light circuit using power transistors
- 16 SCR based automatic battery charger
- 17 SCR operated illumination controller
- 18 SCR operated automatic water level controller
- 19 SCR based speed controller for DC shunt motor
- 20 Three phase full wave rectifier using power diodes
- 21 Timer circuit using 555-IC
- 22 SCR controlled rectifier circuit
- 23 Speed control circuit of DC shunt motor using SCR
- 24 Inverting and non-inverting amplifiers using OP AMP(741)
- 25 Comparator circuits using OP AMP (741)

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				
			Excel lent	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.