2.1 BASIC ELECTRONICS WORKSHOP & PRACTICES

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, 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 Theory (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 ,Intrinsic and extrinsic semiconductor
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

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
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
Characteristics and applications of Zener diode.Zener and avalanche breakdown,

3. Introduction to Bipolar Transistor (10 period)
Concept of bipolar transistor, PNP and NPN transistor, their symbols and mechanism of current flow, current relations in bipolar transistor, concept of leakage current, CB, CE, CC configuration of the transistor, input and out characteristics in CB and CE and cc configurations, current amplification factors, comparison of CB, CE and CC configurations.

4. Transistor Biasing Circuits (06 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 (08 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.
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.

WORKSHOP PRACTICAL
1. Information about Basic Tools used in Electronics
   1.1 Identification and familiarization with the following tools used in electronic shop: Such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux. Their demonstration and uses.
   1.2 Identification and familiarization with Multimeter (analog and digital) Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done
   1.3 Various types of protective devices such as: wire fuse, cartridge fuse etc.
   1.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video)
   1.5 Safety precautions to be observed in the electronic shop
   1.6 Identification and familiarization with soldering and desoldering practice

2. Laboratory Experiences
   2.1 Identification of components
   2.2 Practice for color coding of resistance
   2.3 Understand the use of data book for transistors, Diodes, SCR and triac

3. Use of electronic instruments
   3.1 Practice for the use of multi-meter
   3.2 Practice for the use of signal generator
   3.3 Practice for the use of power supply
   3.4 Practice for the use of oscilloscope

LAB PRACTICALS
1. Familiarization, identification and testing of active and passive components.
2. To plot V-I characteristics of PN junction diode
3. To plot V-I characteristics of a zener diode & observe its use as voltage regulator
4. To observe the wave shape of following rectifier circuit
   - Half wave rectifier
   - Full wave rectifier
   - Bridge rectifier
5. To plot the wave shape of full wave rectifier with
   - Shunt capacitor filter
• Series capacitor filter
• $\pi$ filter

6. To plot input and output characteristics of transistor in CE configuration
7. To plot input and output characteristics of transistor in CB configuration
8. To plot V-I characteristics of FET Transistor
9. To plot the frequency response of RC coupled amplifier
10. 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
2. Electronics Devices and circuits by D.C. Kulshereshtha; New Age Publishers, New Delhi.
3. Principle of Electrical and Electronics Engineering by VK Mehta; S Chand and Co. New Delhi.
5. Electronics Device and circuits by Millman and Halkias; McGraw Hill.

SUGGESTED DISTRIBUTION OF MARKS

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2.2 SIGNAL SENSING AND CONDITIONING

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

DETAILED CONTENTS

1. Introduction (06 Period)
   1.1 Signal
   1.2 Types of Signals
   1.3 Functional Elements of System
   1.4 Importance of Sensing of Signals

2. Sensing Elements (26 Period)
   2.1 Resistive sensing elements: potentiometers, resistance thermometers, strain gauges, Load cell/Pressure cell
   2.2 Capacitive sensing elements: variable separation, area and dielectric
   2.3 Inductive sensing elements: variable reluctance and LVDT displacement sensors
   2.4 Electromagnetic sensing elements: velocity sensors
   2.5 Thermoelectric sensing elements: laws, thermocouple characteristics, installation problems
   2.6 Elastic sensing elements: sensing elements for force, torque, acceleration, pressure
   2.7 Piezoelectric sensing elements: static and dynamic characteristics
   2.8 Electrochemical sensing elements: ion selective electrodes, solid state gas sensors
   2.9 Photo Detectors: Optical detection Principles, Electro-optic effect, Integrated Optical Devices, Magneto optic effect, Acousto-optic effect Digital Transducer element, Micro sensor, smart sensors
   2.10 Photo Detectors: Optical detection Principles, Electro-optic effect, Integrated Optical Devices, Magneto optic effect, Acousto-optic effect
   2.11 Digital Transducer element, Micro sensor, smart sensors

3. Signal Transmission (18 Period)
   3.1 Introduction
   3.2 Methods of Data Transmission
   3.3 General Telemetry System
   3.4 Types of Telemetry Systems
   3.5 Land Line Telemetry System
   3.6 Voltage Telemetry Systems
   3.7 Current Telemetry System
   3.8 Position Telemetry System
   3.9 Land Line Telemetry System
   3.10 Feed-back System
   3.11 Radio Frequency (R.F.) Telemetry
4. **Signal Conditioning** (10 Periods)
   - **4.1** Basic Instrumentation Amplifier
   - **4.2** Applications of Instrumentation Amplifiers (Specific Bridge)
   - **4.3** Chopped and Modulated DC Amplifier

**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. Use of Telemetry System

**RECOMMENDED BOOKS**
1. Electronic Instrumentation; by H.S.Kalsi; McGraw-Hill Education India Pvt.Ltd.
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

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2.3 ELEMENTS OF AUTOMOBILE ENGINEERING

RATIONALE

4 - 2

The development of automobile industry direct and indirect dependence of the present day society on the services of its products has made the knowledge of the technology imperative, this subject deals with automotive needs.

DETAILED CONTENTS

1. Introduction (08 Periods)
Definitions and specifying an automobile, Automobile development and scope, Components of an automobile, Classification of automobiles, Layout of chassis, Types of drives - front wheel, rear wheel, four wheel, left hand, right hand, Body or superstructure

2. Elements of Transmission System (12 Periods)
Clutch - introduction, Functions, clutch troubles, gear box - Introduction of gear box, 4-speed gear box, sliding mesh, constant mesh and synchromesh, Torque converter and overdrive, Transfer box, Propeller shaft and rear axle, Universal joint, Final drive and differential, Front driving axles, Real axle drives and different types of rear axles, wheels - Types of wheels - disc wheel, wire wheel and alloy cast wheel, tyres - Types of tyres used in Indian vehicles, Toe in, Toe out, camber, caster, kingpin inclination, Tubeless tyres

3. Elements of Steering System (07 Periods)
Introduction, Function and principle, Introduction of Ackerman and Davis steering gears, Types of steering gears - worm and ball nut, worm and wheel, worm and roller, rack and pinion type, Power steering

4. Elements of Braking System (06 Periods)
Introduction mechanical, hydraulic and vacuum brake, Parking brake, Anti-lock braking system

5. Suspension System (07 Periods)
Function, Types, Working of coil spring, leaf spring, rubber springs, Shock absorber - telescopic type, Air suspension, Strut suspension

6. Battery (08 Periods)
Introduction of lead acid cell battery, Specific gravity of electrolyte - effect of temperature on specific gravity, Battery charging, Maintenance of Batteries, Checking of batteries for voltage and specific gravity, Battery leakage test

7. Dynamo and Alternator (06 Periods)
Introduction of dynamo & alternator, Construction and working, Charging of battery from alternator

8. Lighting System and Accessories (06 Periods)
Wiring circuit, Headlight, aiming of headlights, Lighting switches, Direction indicators, Windscreen wiper, Horn, Speedometer, Heater, Air conditioning, Temperature indicator
**RECOMMENDED BOOKS**
1. Automobile Engineering vol. 1 by Dr. Kirpal Singh; Standard Publishers and Distributors, Delhi
2. Automobile Engineering by Dr. PS Gill

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2.4 ELECTRONICS MEASURING INSTRUMENTS

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 (04 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)
   2.1 Principles of operation and construction of permanent magnet moving coil (PMMC) instruments
   2.2 Moving iron type instruments, measurement of d.c voltage and current, measurement of d.c voltage and current, milli-volt measurement
   2.3 Measurement of voltage, current and resistance using multimeter
   2.4 Specifications of multimeter and its applications
   2.5 Limitations with regard to frequency and input impedance

3. Cathode Ray Oscilloscope (10 period)
   3.1 Construction and working of Cathode Ray Tube (CRT)
   3.2 Time base operation and need for blanking during fly back, synchronization
   3.3 Block diagram, description of a basic CRO and triggered sweep oscilloscope, front panel controls.
   3.4 Specifications of CRO and their explanation.
   3.5 Measurement of voltage, current, frequency, time period and phase using CRO.
   3.6 CRO probes, special features of dual beam, dual trace and delay sweep.
   3.7 Digital storage oscilloscope (DSO) : block diagram and working principle

4. Signal Generators and Analytical Instruments (06 period)
   4.1 Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
   4.2 Wave analyzer, distortion measurement and spectrum analyser

5. Impedance Bridges and Q Meters (14 period)
   5.1 Wheat stone bridge
   5.2 AC bridges: Maxwell’s induction bridge, Hay’s bridge, De-Sauty’s bridge, Schering bridge and Anderson bridge
   5.3 Block diagram description of laboratory type RLC bridge, specifications of RLC bridge
   5.4 Block diagram and working principle of Q meter

6. Digital Instruments (14 period)
   6.1 Comparison of analog and digital instruments
6.2 Working principle of ramp, dual slope and integration type digital voltmeter
6.3 Block diagram and working of a digital multimeter
6.4 Measurement of time interval, time period and frequency using universal counter/frequency counter
6.5 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

RECOMMENDED BOOKS
1. Electronics Measurement and Instrumentation by AK Sawhney, DhanpatRai 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, Satya Prakashan, New Delhi

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2.5 ENVIRONMENTAL SCIENCE

RATIONALE

Any people must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Basics of ecology, eco system and sustainable development (03 Period)

2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table (03 Period)

3. Sources of pollution - natural and man made, their effects on living and non-living organisms, Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms, Pollution of air-causes and effects of man, animal, vegetation and non-living organisms, Sources of noise pollution and its effects (16 Period)

4. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods (06 Period)

5. Mining, blasting, deforestation and their effects (03 Period)

6. Legislation to control environment (04 Period)

7. Environmental Impact Assessment (EIA), Elements for preparing EIA statements (04 Period)

8. Current issues in environmental pollution and its control, role of non-conventional sources of energy in environmental protection (06 Period)
RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Engineering and Management by Suresh K Dhamija; SK Kataria and Sons, New Delhi.
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

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2.6 BASIC COMPUTER APPLICATION

RATIONALE
Computer has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

DETAILED CONTENT
LIST OF PRACTICALS
1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection
4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
   - Start
   - Shutdown and restore
   - Creating and operating on the icons
   - Opening closing and sizing the windows
   - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
   - Creating and operating on a folder
   - Changing setting like, date, time color (back ground and fore ground)
   - Using short cuts
   - Using on line help
7. MS-Word
   - File Management:
     Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
   - Page Set up:
     Setting margins, tab setting, ruler, indenting
   - Editing a document:
     Entering text, Cut, copy, paste using tool- bars
   - Formatting a document:
Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document, Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools
- Tables and Borders:
  Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using Find, Replace options
- Using Tools like: Spell checker, help, use of macros, mail merge, thesaurus word content and

RECOMMENDED BOOKS
1. Fundamentals of Computer by V. Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi