

**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING  
SEMESTER - II  
090221 - COMMUNICATION SKILLS II**

**RATIONALE**

Language is the most commonly used and effective medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and be able to pursue the present course of study and handle the future jobs in industry. The objective of this course is to assist the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension, improve vocabulary, develop grammatical ability, enhance writing skills, correspond with others, enhance skills in spoken English.

**DETAILED CONTENTS**

**Theory**

1. Prose Text Book (12 hrs)

The following six chapters of A Book of English for Polytechnics – Prose Selection, Published by MacMillan India Ltd., on behalf of Technical Teachers' Training Institute, Chandigarh

- a) Uncle Podger Hangs a Picture
- b) Subash Chandra Bose
- c) A Pair of Mustachios
- d) Guru Gobind Singh
- e) With the Photographer
- f) Sir Jagdish Chandra Bose

The will be one general question from one of these six chapters.

2. Precise writing (selected from the prescribed 6 chapters of Prose Text Book) (4 hrs)
3. Grammar (2 hrs)  
Antonyms change of words into different parts of speech
4. Correspondence (10 hrs)
- a) Business letters such as:

- Registration as supplier
- Floating quotations and tenders
- Quarry for product specification, price and other details etc from a firm/Company
- Covering letter for quoting prices against a quotation/tender
- Placing supply order

b) Personal letters such as:

- Application for leave and extension of leave
- Application for seeking a job/employment
- Conveying congratulation messages to a relative/friend /colleague on different occasions
- Conveying condolence message to a relative/friend/colleague
- Request letter to guardian for sending money for excursion/study tour
- Letter to your brother/sister/friend describing your first day experience in the polytechnic

c) Official letter such as:

- Letter to editor for placing an advertisement in the newspaper for purchase/selling of goods
- Letter to Municipal Commissioner for improving water supply/sanitation system in your locality
- Letter to General Manager, Telephone Department for restoring a dead telephone/shifting a telephone
- Letter to State Electricity Board for repair of street lighting/correction of bills etc.
- Letter to the supplier for rectifying or replacing a defective machinery/item of purchase
- Letter to Registrar, State Board of Technical Education for allowing to improve grades/marks in diploma examination

5. Report writing (2 hrs)

- Drafting a technical report of a visit to a factory, construction site, modern office, etc.
- Report writing on current general themes/topics related to economy, industry, social issues
- Elements of periodical progress report

6. Inspection Note (2 hrs)

- Write an inspection note after inspecting technical/industrial goods
  - Write an inspection note after visiting a construction site or production shop
7. Writing “Preface” and “acknowledgement” of a project report (2 hrs)
8. A paragraph on current topics/themes (2 hrs)
- Technology
  - Science
  - Economy
  - Politics
  - Social
  - General
9. Vocabulary (2 hrs)
- Words, idioms, phrases, antonyms and synonyms
  - Translation of 100 most popular administrative terms from English to Hindi and from Hindi to English
10. Drafting (4 hrs)
- Press notes
  - Memos/circulars
  - Notices (lost and found: obituary/auction, etc)
  - Telegrams
  - Press releases
  - Agenda and minutes of the meeting
  - Personal resume/curriculum vitae
11. Communication Techniques (6 hrs)
- Importance of communication
  - Types of communication – verbal and non-verbal
  - One way and two way communication
  - Process of communication – horizontal, vertical, upward, downward
  - Essentials of good communication
  - Level of communication – inter and intra personal, group to person, group to group

- Methods of effective oral, written and non-verbal communication, Horizons – tone, frequency, rate, volume, depth
- Barrier to communication and overcoming barriers
- Listening skill
- Use of audio visual aids for effective communication

### **LIST OF PRACTICALS**

1. Presentation of Technical Report, using Audio-visual aids
2. Preparation and Presentation on a Seminar of a given topic/theme using power-point
3. Telephonic conversation- Conveying and Receiving
4. Mock Exercises for an interview for a job/ employment
5. Listening comprehension from a radio/cassette talk in English
6. Extempore speech
7. Oral presentation with stress on proper body language, voice modulation

**Note :**For reading comprehension, listening comprehension and effective speaking skills, English Language Laboratory Manual and Workbook published by State Board of Technical Education, Hyderabad (AP) may be used along with text book

### **RECOMMENDED BOOKS**

1. Essentials of Business communication by Pal and Rorualing; Sultan Chand and Sons
2. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
3. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
4. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

5. A Practical English Grammar by Thomson and Marlinet
6. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
7. English Conversation Practice by Grount Taylor; Tata McGraw Hill
8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
9. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGoaw Hill Publishing company Ltd. New Delhi
10. Communication Skills by Ms. R Datta Roy and KK Dhir, Vishal Publication, Jalandhar

**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING**  
**SEMESTER - II**  
**090222 - APPLIED MATHEMATICS – II**

**RATIONALE**

Applied Mathematics forms the backbone of engineering discipline. Basic elements of differential calculus, integral calculus, differential equations and coordinate geometry have been included in the curriculum as foundation course and to provide base for continuing education to the students

**DETAILED CONTENTS**

1. Co-ordinate Geometry (18 hrs)
  - 1.1 Area of a triangle, centroid and incentre of a triangle (given the vertices of a triangle), Simple problems on locus
  - 1.2 Equation of straight line in various standard forms (without proof) with their transformation from one form to another, Angle between two lines and perpendicular distance formula (without proof)
  - 1.3 Circle: General equation and its characteristics given:
    - The center and radius
    - Three points on it
    - The co-ordinates of the end's of the diameter
  - 1.4 Conics (parabola, ellipse and hyperbola), standard equation of conics (without proof), given the equation of conic to calculate foci, directrix, eccentricity, latus rectum, vertices and axis related to different conics Differential Calculus
2. Differential Calculus (22 hrs)
  - 2.1 Concept of function, four standard limits  
 $\lim_{x \rightarrow a} (x^n - a^n) / (x - a)$ ,  $\lim_{x \rightarrow 0} \sin x / x$ ,  $\lim_{x \rightarrow 0} (a^x - 1) / x$ ,  $\lim_{x \rightarrow 0} (1+x)^{1/x}$
  - 2.2 Concepts of differentiation and its physical interpretation
    - Differentiation by first principle of  $x^n$ ,  $(ax + b)^n$ ,  $\sin x$ ,

$\cos x$ ,  $\tan x$ ,  $\sec x$ ,  $\operatorname{cosec} x$  and  $\cot x$ ,  $e^x$ ,  $a^x$ ,  $\log x$ .  
Differentiation of a function of a function and explicit and implicit functions

- Differentiation of sum, product and quotient of different functions
- Logarithmic differentiation. Successive differentiation excluding  $n^{\text{th}}$  Order

2.3 Application of derivatives for (a) rate measure (b) errors (c) real root by Newton's method (d) equation of tangent and normal (c) finding the maxima and minima of a function (simple engineering problems)

### 3. Integral Calculus (16 hrs)

3.1 Integration as inverse operation of differentiation

3.2 Simple integration by substitution, by parts and by partial fractions

3.3 Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals

3.4 Applications of integration for

- Simple problem on evaluation of area under a curve where limits are prescribed
- Calculation of volume of a solid formed by revolution of an area about axis (simple problems) where limits are prescribed
- To calculate average and root mean square value of a function
- Area by Trapezoidal Rule and Simpson's Rule

### 4. Differential Equations (8 hrs)

Solution of first order and first degree differential equation by

- Variable separation
- Homogeneous differential equation and reducible homogeneous differential equations
- Linear differential equations and reducible linear differential equations

## **RECOMMENDED BOOKS**

1. Higher Engineering Mathematics by BS Grewal
2. Engineering Mathematics by BS Grewal
3. Engineering Mathematics vol. II by S Kohli and Others, IPH, Jalandhar
4. Engineering Mathematics by Ishan Publication
5. Applied Mathematics Vol. II by SS Sabharwal and Others; Eagle Parkashan, Jalandhar
6. Engineering Mathematics by IB Prasad
7. Applied Mathematics Vol. II by Dr RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi
9. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi
10. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi



**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING**  
**SEMESTER - II**  
**090223 - APPLIED PHYSICS – II**

**RATIONALE**

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

**DETAILED CONTENTS**

1. Applications of sound waves (6 hrs)
  - 1.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
  - 1.2 Ultrasonics – production (magnetostriction and piezoelectric) and their engineering applications
2. Principle of optics (9 hrs)
  - 2.1 Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection
  - 2.2 Defects in image formation by lenses and their correction
  - 2.3 Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case)
  - 2.4 Overhead projector and slide projector
3. Electrostatics (9 hrs)
  - 3.1 Coulombs law, unit charge
  - 3.2 Gauss's Law

- 3.3 Electric field intensity and electric potential
  - 3.4 Electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
  - 3.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
  - 3.6 Dielectric and its effect on capacitors, dielectric constant and dielectric break down
4. Electricity (6 hrs)
- 4.1 Ohm's law
  - 4.2 Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance
  - 4.3 Kirchoff's laws, wheatstone bridge principle and its applications
  - 4.4 Heating effect of current and concept of electric power
5. Semi conductor physics (9 hrs)
- 5.1 Energy bands, intrinsic and extrinsic semi conductors, p- n junction diode and its characteristics
  - 5.2 Diode as rectifier – half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)
6. Modern Physics (9 hrs)
- 6.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
  - 6.2 Fibre optics: Introduction, optical fiber materials, types, light propagation and applications
  - 6.3 Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical field, type I and type II super conductors and their applications)

- 6.4 Energy sources – conventional and non-conventional (wind, water, solar, bio, nuclear energy), only elementary idea

### **LIST OF PRACTICALS**

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To determine the magnifying power of a compound microscope
4. To determine the magnifying power of an astronomical telescope
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To find the wavelength of a He-Ne laser
8. To find the frequency of a tuning fork by a sonometer
9. To study characteristics of a pn junction diode

### **RECOMMENDED BOOKS**

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by S Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand & Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications

9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING**  
**SEMESTER - II**  
**090224 - APPLIED CHEMISTRY-II**

**RATIONALE**

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

**DETAILED CONTENTS**

1. Metallurgy (8 hrs)
  - 1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations
  - 1.2 Metallurgy of (i) Aluminium (ii) Iron with their physical and chemical properties
  - 1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar
2. Fuels (10 hrs)
  - 2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
  - 2.2 Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

- 2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel
  - 2.4 Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels
  - 2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas
- 3 Corrosion (3 hrs)
- 3.1 Meaning of the term 'corrosion' and its definition
  - 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
  - 3.3 Prevention of corrosion by
    - 1. (a) Alloying  
(b) Providing metallic coatings
    - 2. Cathodic protections:
      - (a) Sacrificial
      - (b) Impressed voltage method
- 4 Lubricants (4 hrs)
- 4.1 Definition of (i) lubricant (ii) lubrication
  - 4.2 Classification of lubricants
  - 4.3 Principles of lubrication
    - (i) fluid film lubrication
    - (ii) boundary lubrication
    - (iii) extreme pressure lubrication
  - 4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.
- 5 Cement and Glass (2 hrs)

- 5.1 Manufacture of Portland Cement
  - 5.2 Manufacture of ordinary glass and lead glass
6. Classification and Nomenclature of Organic Compounds (5 hrs)
- Classification of Organic Compounds, functional group, Homologous Series, Nomenclature, Physical and Chemical properties, and industrial use of Organic Compounds, IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.

### **LIST OF PRACTICALS**

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid, amine
9. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
10. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given).

### **RECOMMENDED BOOKS**

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40

3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar



**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING  
SEMESTER - II  
090225 - BASIC ELECTRICAL ENGINEERING**

**RATIONALE**

This course will enable the students to understand the basic concepts and principles of d.c and a.c fundamental, a.c circuits, batteries, electromagnetic induction etc. including constant voltage and current sources. A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location etc. In addition, he may be working in testing laboratories where he uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential.

**DETAILED CONTENTS**

1. DC Circuits (5 hrs)
  - 1.1 Concept of electricity, various applications of electricity, advantages of electricity over other types of energy.
  - 1.2 Basic terms – voltage, current, potential difference, power, energy and their units.
  - 1.3 Ohm’s law and its practical applications, concepts of resistance, conductance, resistivity and their units,
  - 1.4 Effect of temperature on resistance, temperature coefficient of resistance.
  - 1.5 Series and parallel combination of resistors, wattage consideration, simple problems.
  - 1.6 Kirchhoff’s current law and Kirchhoff’s voltage law and their applications to simple circuits. Conversion of circuits from Star to Delta and Delta to Star.
  
2. DC Circuit Theorems (4 hrs)

Thevenin’s theorem, Norton’s theorem, super position theorem, maximum power transfer theorem, application of network theorem in solving d.c circuit problems.

3. Constant Voltage and Constant Current Sources (3 hrs)
  - a) Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.
  - b) Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.
4. Electro Magnetic Induction (8 hrs)
  - a) Concepts of magnetic field produced by flow of current, Magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
  - b) Faraday's law and rules of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
  - c) Concept of current growth, decay and time constant in an inductive (RL) circuit.
  - d) Energy stored in an inductor, series and parallel combination of inductors.
5. Batteries (4 hrs)
  - 5.1 Basic idea about primary and secondary cells
  - 5.2 Construction, working and applications of Lead-Acid battery and Nickel- Cadmium cells, Silver-Oxide cells.
  - 5.3 Charging methods used for lead-acid battery( accumulator )
  - 5.4 Care and maintenance of lead-acid battery
  - 5.5 Series and parallel connections of batteries.
  - 5.6 General idea of solar cells, solar panels and their applications.
6. AC Fundamentals (12 hrs)
  - 6.1 Concept of alternating voltage and current

- 6.2 Difference between a.c and d.c
  - 6.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
  - 6.4 Representation of sinusoidal quantities by phasor diagrams.
  - 6.5 Equation of sinusoidal wave form (with derivation)
  - 6.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.
7. AC Circuits (10 hrs)
- 7.1 Inductive reactance and Capacitive reactance
  - 7.2 Alternating voltage applied to resistance and inductance in series.
  - 7.3 Alternating voltage applied to resistance and capacitance in series.
  - 7.4 Impedance triangle and phase angle
  - 7.5 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
  - 7.6 Introduction to series and parallel resonance and its conditions.
  - 7.7 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, importance of power factor.
  - 7.8 j-notation and its application in solving a series and parallel AC circuits.
  - 7.9 Definition of conductance, susceptance and admittance
- 8.. Various Types of Power Plants (2 hrs)
- Brief explanation of principle of power generation in thermal, hydro and nuclear power stations and their comparative study. Elementary block diagram of above mentioned power stations.

## **LIST OF PRACTICALS**

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories.
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter.
4. To verify in d.c circuits:
  - a. Thevenin's theorem,
  - b. Norton's theorem,
  - c. Super position theorem,
  - d. Maximum power transfer theorem,
5. To observe change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit].
7. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance.
8. To find the voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determine the power factor in each case .
9. To test a lead - acid storage battery and to charge it.
10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.
11. Visit to a nearby Power Station(s).

### **RECOMMENDED BOOKS**

1. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers.
2. Electrical Technology by BL Theraja, S Chand and Co, New Delhi

3. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi.
4. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.
5. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi
6. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi.
7. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi.
8. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi.
9. Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi.
10. Basic Electrical Engineering by Mool Singh, Gilgotia Publications Pvt. Ltd. New Delhi.
11. Electrical Science by S Chaudhari, R Chakrabarti and PK Chattopathyay, Narosa Publishing House, New Delhi.

**0902 - DIPLOMA IN AUTOMOBILE ENGINEERING**  
**SEMESTER - II**  
**090226 - ANALOG ELECTRONICS – I**

**RATIONALE**

This subject gives the knowledge of fundamental concepts of basic electronics and aims at providing the students with basic 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 configurations; understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various term used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visit.

**DETAILED CONTENTS**

1. Semi conductor physics: (12 hrs)

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds.

Concept of intrinsic and extrinsic semi conductor, 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.

2. Semi conductor diode: (12 hrs)

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 froward 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  $\pi$  filter.

Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown.

3. Introduction to Bipolar transistor: (12 hrs)

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;

Transistors as an amplifier in CE Configurations; d.c load line and calculation of current gain, voltage gain using d.c load line.

4. Transistor biasing Circuits: (6 hrs)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

5. Single stage transistor amplifier: (10 hrs)

Single stage transistor amplifier circuit, 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. Field effect Transistors (12 hrs)

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).

### **LIST OF PRACTICALS**

1. Familiarization with operation of following instruments.  
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities with their help.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zenor diode
4. Observe the wave shape of following rectifier circuit
  - a. Half wave rectifier
  - b. Full wave rectifier
  - c. Bridge rectifier
5. Plot the wave shape of full wave rectifier with
  - a. Shunt capacitor filter
  - b. Series inductor filter
  - c. Filter
6. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
7. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
8. Plot V-I characteristics of FET amplifier.
9. Measure the Q-Point and note the variation of Q-Point.
  - a. By increasing the base resistance in fixed bias circuit.
  - b. By changing out of bias resistance in potential divider circuit.



10. Measure the Voltage Gain, input, output impedance in single stage CE amplifier circuit.

### **BOOKS RECOMMENDED**

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi.
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hill, New Delhi.
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi.
6. Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C Saini, Eagle Prakashan, Jalandhar.
7. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

## **ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP**

A diploma holder 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 adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

An awareness camp is to be organized at a stretch for 3 to 4 days during the first year. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land and its reforms, preservation of species, prevention of advancement of deserts and lowering of water table.
3. Sources of pollution – natural and man made, their effects on living and non-living organisms.
4. Pollution of water – causes, effects of domestic wastes and industrial effluent on living and non-living organisms.
5. Pollution of air-causes and effects on man, animal, vegetation and non-living organisms.
6. Sources of noise pollution and its effects on human beings
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods.
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment pollution
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements.
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection.