## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
## FIRST SEMESTER

| Sr. No | Subject | STUDY SCHEME | | | EVALUATION SCHEME | | | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | | External Assessment (Examination) | | | | |
| | | | | | Theory | Practical | Written Papers | | Practicals | | |
| | | L | T | P | | | | | | | |
| | | Hrs/week | | | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| 1.1* | Communication Skills-I(030011) | 3 | - | 2 | 25 | 25 | 100 | 3 | 50 | 2 | 200 |
| 1.2* | Applied Mathematics-I(030012) | 4 | 1 | - | 50 | - | 100 | 3 | - | - | 150 |
| 1.3* | Applied Physics-I(030013) | 4 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 1.4* | Applied Chemistry-I(030014) | 2 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 1.5* | Basics of Information Technology | - | - | 4 | - | 50 | - | - | 100 | 3 | 150 |
| 1.6* | Engineering Drawing-I(030015) | - | - | 6 | - | 50 | 100 | 3 | 25 (viva) | 2 | 175 |
| 1.7* | General Workshop Practice-I | - | - | 6 | - | 50 | - | - | 100+ | 3 | 150 |
| | # Student centered activities | - | - | 4 | - | 25 | - | - | - | - | 25 |
| | Total | 13 | 1 | 26 | 125 | 250 | 500 | - | 375 | - | 1250 |

\*     Common with that of other diploma programmes.
+     Including 25 marks of viva voce.
\#     Students centered activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities.

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
## SECOND SEMESTER

| Sr. No | Subject | STUDY SCHEME L T P Hrs/week | | | EVALUATION SCHEME | | | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | | External Assessment (Examination) | | | | |
| | | | | | Theory | Practical | Written Papers | | Practicals | | |
| | | L | T | P | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| 2.1* | Communication Skills(030021) | 3 | - | 2 | 25 | 25 | 100 | 3 | 50 | 2 | 200 |
| 2.2* | Applied Mathematics(030022) | 4 | 1 | - | 50 | - | 100 | 3 | - | - | 150 |
| 2.3* | Applied Physics(030023) | 3 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 2.4* | Applied Chemistry(030024) | 2 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 2.5* | Applied Mechanics (030026) | 3 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 2.6* | Engineering Drawing-II(030025) | - | - | 6 | - | 50 | 100 | 3 | 25 (viva) | 2 | 175 |
| 2.7* | General Workshop Practice-II | - | - | 6 | - | 50 | - | - | 100+ | 3 | 150 |
| | # Student centered activities | - | - | 4 | - | 25 | - | - | - | - | 25 |
| | Total | 15 | 1 | 24 | 150 | 225 | 600 | - | 325 | - | 1300 |

\*     Common with that of other diploma programmes.
\+     Including 25 marks of viva voce.
\#     Students centered activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
THIRD SEMESTER

| Sr. No | Subject | STUDY SCHEME | | | EVALUATION SCHEME | | | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | | External Assessment (Examination) | | | | |
| | | | | | Theory | Practical | Written Papers | | Practicals | | |
| | | L | T | P | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| | | Hrs/week | | | | | | | | | |
| 3.1 | Strength of Material (031731) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 3.2 | Fundamental of electrical Engg. (030932) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 3.3 | Basic Electronics (030933) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 3.4 | Construction Material (030734) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 3.5 | Operating System (030831) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 3.6 | Workshop Technology-I (031733) | 3 | - | - | 50 | - | 100 | 3 | - | - | 150 |
| | Student Centered Activities | - | - | 4 | - | 25 | - | - | - | - | 25 |
| | TOTAL | 21 | - | 19 | 175 | 150 | 600 | - | 250 | - | 1175 |

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
FOURTH SEMESTER

| Sr. No | Subject | STUDY SCHEME | | | EVALUATION SCHEME | | | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | | External Assessment (Examination) | | | | |
| | | | | | Theory | Practical | Written Papers | | Practicals | | |
| | | L | T | P | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| | | Hrs/week | | | | | | | | | |
| 4.1 | Electronics Instrument & Measurement (031036) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 2 | 200 |
| 4.2 | Computer Programming & Applications (031043) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 4.3 | Materials & Metallurgy (030342) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 4.4 | Building Construction (030735) | 3 | - | - | 25 | - | 100 | 3 | - | 3 | 125 |
| 4.5 | Auto CAD* | - | - | 3 | - | 50 | - | - | 100 | 3 | 150 |
| 4.6 | Electronic Devices & Circuits (030943) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 4.7 | Workshop Practice-I | - | - | 6 | - | 50 | - | - | 100 | 3 | 150 |
| | Student Centered Activities | - | - | 4 | - | 25 | - | -- | - | - | 25 |
| | TOTAL | 15 | - | 25 | 125 | 225 | 500 | - | 400 | - | 1250 |

* Common with Plastic Engg.

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
## FIFTH SEMESTER

| Sr. | Subject (Code) | Study Scheme L. T. P | | | Evaluation Scheme | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | | External Scheme (Examination) | | | | |
| | | | | | Theory | Practical | Written Paper | | Practical | | |
| | | | | | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| 5.1 | Digital Electronics & Microprocessor (030955) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 5.2 | Industrial Engg. (030354) | 4 | - | - | 50 | - | 100 | 3 | - | - | 150 |
| 5.3 | Power Electronics (031055) | 4 | - | 2 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 5.4 | MOCS (031052) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 5.5 | Non Conventional Energy Sources (030954B) | 4 | - | - | 50 | - | 100 | 3 | - | - | 150 |
| 5.6 | Elective* (030851, 030854) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| | #Student Centered Activities | - | - | 4 | - | 25 | - | -- | - | - | 25 |
| | Total | 23 | - | 16 | 200 | 125 | 600 | | 200 | | 1125 |

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GE
SIXTH SEMESTER

| Sr. | Subject (Code) | Study Scheme L. T. P | | | Evaluation Scheme | | | | | | Total |
|-----|----------------|---|---|---|---|---|---|---|---|---|-------|
| | | | | | Internal Assessment | | External Scheme (Examination) | | | | |
| | | | | | Theory | Practical | Written Paper | | Practical | | |
| | | | | | Max. Marks | Max. Marks | Max. Marks | Hrs. | Max. Marks | Hrs. | |
| 6.1 | E.D.M. (030364) | 3 | - | - | 50 | - | 100 | 3 | - | - | 150 |
| 6.2 | Inspection & Quality Control (031762) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 6.3 | Installation Testing& Maintenance (031765) | 3 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 6.4 | Environmental Engg. (030766B) | 4 | - | - | 25 | - | 100 | 3 | - | - | 125 |
| 6.5 | Automobile Engg. (031763) | 4 | - | 3 | 25 | 25 | 100 | 3 | 50 | 3 | 200 |
| 6.6 | Major Project | - | - | 9 | - | 200 | - | - | 100 | 3 | 300 |
| | Student Centered Activates | - | - | 4 | - | 25 | - | - | - | - | 25 |
| | Total | 17 | - | 22 | 150 | 300 | 500 | - | 250 | - | 1200 |

* Elective- To be chosen one from the following
1. Internet and web Designing(030854)
2. Computer Network(030851)

# 1.1    COMMUNICATION SKILLS – I                030011

L  T  P
3  -  2

**Rationale**

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieving results and creating successful organizations. The goal of the ***Communicating Effectively in English*** course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance.

**Objectives of Course in Communicating Effectively in English for the First Year**
**(I & II Semesters) are: \*** *Understanding how communication works \* Gaining active listening and responding skills \* Understanding the importance of body language*
*\* Acquiring different strategies of reading texts \* Increasing confidence by providing opportunities for oral and written expressions*

## DETAILED CONTENTS FOR FIRST SEMESTER                48 Hrs

**1. COMMUNICATION SKILLS 6 hrs**
1.1 Verbal and Non-verbal Communication
1.2 Process of Communication
1.3 Barriers to Communication; Overcoming Strategies
1.4 Listening and Speaking Skills and Sub-Skills
2. Spoken English-Introduction, Features of Spoken English
**(Note: This module is only for practice. This should not be included in the final examination)**

**2. DEVELOPING ORAL COMMUNICATION SKILLS 8 hrs**
 2.1 Greeting, Starting a Conversation
2.3 Introducing Oneself
2.4 Introducing Others
2.5 Leave Taking
2.6 Thanking, Wishing Well
2.7 Talking about Oneself
2.8 Talking about Likes and Dislikes

**3. GRAMMAR AND USAGE 12 hrs**
3.1 Punctuation
3.2 Articles-a, an, the
3.3 Framing Questions
3.4 Verbs-Classification: Main Verb, Auxiliary Verb, Transitive & Intransitive Verbs, Phrasal Verbs
3.5 Word Formation

**4. WRITING SKILLS 10 hrs**
4.1 Writing Paragraphs
4.2 Picture Composition

**5. READING SKILLS 12 hrs**
5.1 Vocabulary Enhancement
5.2 Techniques of Reading: Skimming, Scanning, Intensive and Extensive Reading

**NOTE: The Reading Skills of the learners (along with vocabulary enhancement) will be through reading thematic articles/essays and/or stories.**

**RATIONALE**

Applied Mathematics forms the backbone of engineering discipline, Basic elements of permutations and combinations, trigonometry, vector, complex number and statistics have been included in the curriculum as foundation course and to provide base for continuing education to the students.

## DETAILED CONTENTS

1.  **Algebra**                                                   (20 hrs)

    1.1   Permutations and Combinations, Value of $^n p_r$ and $^n c_r$, its properties and simple problems

    1.2   Binomial theorem (without proof) for positive integral index (expansion and general term); Binomial theorem for any index (expansion only) first and second binomial approximation with application to engineering problems

    1.3   Partial fractions (linear factors, repeated linear factors, non reducible quadratic factors)

    1.4   Determinants and Matrices – expansion of determinants (upto third order) using sarrus rule, expansion method and pivotal's condensation method. Properties of determinants, solution of equations (upto 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction and multiplication of matrices (upto third order). Inverse of a matrix by adjoint method and elementary row transformations. Solution of equations (up to 3 unknowns) by Matrix method

    1.5   Logarithm: general properties of logarithms, calculations of engineering problems using log tables

2.  **Trigonometry**                                              (11 hrs)

    2.1   Addition and Subtraction formulae, Product formulae and their application in engineering problems. Transformation from product to sum or difference of two angles or vice versa, multiple and sub-multiple angles

    2.2   Conditional identities, solution of triangles (excluding ambiguous cases).

    2.3   Graphs of sin x, cos x, and tan x, ex

3.  **Vectors** (11 hrs)

    Definition of vector and scalar quantities, Addition and subtraction of vectors. Dot product and cross product of two vectors. Thumb rule. Angle between two vectors, application of dot and cross product in engineering problems, scalar triple product and vector triple product

4.  **Complex Numbers** (9 hrs)

    Definition, Real and Imaginary parts of a complex number, Polar and Cartesian representation of a complex number and conversion from one form to the other, conjugate of complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number.

5.  **Statistics and Probability** (13 hrs)

    Evaluation of standard deviation and process capabilities Rank, Rank correlation, probability: definition and laws on probability, concept of random variable, probability distribution ( Binomial, Poisson and Normal ) and their applications. Drawing control charts for average (x) and range ( R )

## RECOMMENDED BOOKS

1.  Applied Mathematics Vol. I by SS Sabharwal and Others by Eagle Prakashan, Jalandhar

2.  Applied Mathematics Vol. II by SS Sabharwal and Others by Eagle Prakashan, Jalandhar

3.  Engineering Mathematics Vol. I by Ishan Publishing House

4.  Engineering Mathematics Vol. I by S Kohli and Others; IPH, Jalandhar

5.  Applied Mathematics Vol. I by RD Sharma

6.  Engineering Mathematics by Dass Gupta

7.  Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi

8.  Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi

9.  Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

# APPLIED PHYSICS-I                    030013
L T P
4 - 2

**RATIONALE**

Applied physics includes the study of a large number of diverse topics all 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 will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

**DETAILED CONTENTS**

**1. Unit and Dimensions. (8 hrs)**
1.1 Physical quantities
1.2 Fundamental and derived units
1.3 Systems of unit (CGS, MKS and SI units)
1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain)
1.5 Principle of homogeneity
1.6 Dimensional equations and their uses with examples.
1.7 Limitations of dimensional analysis.

**2. Force and Motion (9 hrs + 6 hrs + 8 hrs)**
2.1 Scalar and vector quantities - examples, addition and multiplication of vectors, scalar product and vector product of vectors
2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces, friction, law of friction and type of friction.
2.3 Equilibrium of forces, Lami's theorem
2.4 Newton's Laws of motion – concept of momentum, determination of force equation from Newton's second law of motion, Newton's third law of motion Conservation of momentum, impulse and impulsive forces, simple numerical problems.
2.5 Projectile, horizontal and oblique projections and equation of Trajectory (Derivation) Derivation of time of flight, maximum height and horizontal range
2.6 Circular motion (Definition)
     Relation between linear and angular velocity and linear acceleration and angular acceleration
2.7 Centripetal force (derivation) and centrifugal force Banking of roads.
2.8 Rotational Motion **(6 hrs)**
    Definition of torque, moment of inertia, radius of gyration, Derivation of rotational kinetic energy and angular momentum, Conservation of angular momentum (qualitative) related problems.
2.9 Planatary Motion **(8 hrs)**
    Newton's law of gravitation, Kepler's law of planetary motion, Escape velocity (derivation), Artifical satellites and related problems.

**3. Work, Power and Energy (8 hrs)**
3.1 Work: definition and its units.
3.2 Work done against friction in moving an object on horizontal and inclined plane (incorporating frictional forces)
3.3 Power: definitions and its units, calculation of power in simple cases.
3.4 Energy: Definitions and its units: Types: Kinetic energy and Potential energy, with examples and their derivation.
3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another and related problems.

**4. Properties of Matter (9 hrs)**
4.1 Elasticity, definition of stress and strain
4.2 Different types of modulus of elasticity
4.3 Pressure- its units, gauge pressure, absolute pressure, atmospheric pressure (Relation between them), Bourdon's pressure gauge, Fortin's barometer
4.4 Surface tension- its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension.
4.5 Fluid motion, stream line and turbulent flow.
4.6 Viscosity and coefficient of viscosity, Effect of temperature on viscosity

**5. Temperature and its measurement (8 hrs)**
5.1 Difference between heat and temperature on the basis of K.E. of Molecules.
5.2 Principles of measurement of temperature and different scales of temperature.
5.3 Bimetallic and Platinum resistance thermometer: their merits and demerits
5.4 Pyrometers – Disappearing filament optical pyrometer

**6. Transfer of Heat (8 hrs)**
6.1 Modes of transfer of heat (conduction, convection and radiation with examples)
6.2 Coefficient of thermal conductivity
6.3 Properties of heat radiation. Prevost's theory of heat exchange
6.4 Laws of black body radiations: Stefan's law, Kirchoff's law, Wien's law

**LIST OF PRACTICALS**

1. To find the thickness of wire using a screw gauge

2. To find volume of solid cylinder and hollow cylinder using a vernier caliper

3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer

4. To find the surface tension of a liquid by capillary rise method.

5. To determine the atmospheric pressure at a place using Fortin's Barometer.

6. To determine the time period of simple pendulum and plot a graph between l & t

7. Verify parallelogram Law of forces.

**RECOMMENDED BOOKS**

1. Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)

2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)

3. A Text Book of Applied Physics : Egale Parkashan, Jullandhar

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2  -  2

## 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 and 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

**DETAILED CONTENTS**

1. **Language of Chemistry** (6 hrs)
1.1 Definition of symbol, formula, valency and chemical equation.
1.2 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound
1.3 Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method

2.**Atomic Structure (6 hrs)**
Introduction to atom and its constituent particle, Dalton's , Rutherford's model. Bohr's model (postulates only), atomic number, mass number, isotopes, isobars, concept of atomic orbitals, shapes of S and P orbitals, quantum numbers, electronic configuration-Aufbau Principle, Hund's rule and Pauli's exclusion Principle, Hybridization (sp3, sp2 and sp).

3. **Chemical Bonding (4 hrs)**
3.1 Electronic concept of binding.
3.2 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each.
3.3 Orbital concept of covalent bond, Sigma and Pi bond.

4. **Water (10 hrs)**
4.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation.
4.2 Methods to remove hardness of water (i) Soda Lime process (ii) Ion-Exchange process. Simple numerical problems related to soda lime process.
4.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water, (Estimations method not included)
4.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply.

## 5. **Solutions (8 hrs.)**

5.1 Concept of homogeneous solution (i) Colloids (ii) Suspensions (iii) Brownian Movement (iv) Osmosis (v) Acidity (vi) Basicity (vii) Equivalent weight and gram equivalent weight with suitable examples (viii) Mole (ix) Avogadro number (x) pH (xi) Industrial application of pH

5.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution.

5.3 Simple numerical problems related to volumetric analysis.

## 6. **Electrolysis (6 hrs)**

6.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples

6.2 Faraday's Laws of Electrolysis

6.3 Simple numerical problems based upon the laws of electrolysis

6.4 Different industrial applications of 'Electrolysis'

6.5 Elementary account of (i) lead acid battery and (ii) Ni-Cd battery

## LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein.
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid
4. Determine the strength of solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid
5. Estimation of total alkalinity of water volumetrically
6. Determine, pH of water sample using pH meter

## RECOMMENDED BOOKS

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

## Other additional Books for Reading

1. Engineering Chemistry by Jain PC and Jain M
2. Chemistry of Engineering by Aggarwal CV
3. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

# 1.5 BASICS OF INFORMATION TECHNOLOGY

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- - 4

## RATIONALE

Information technology 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 environment, 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; holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

## Note:

1.  *Teaching of theory should be dovetailed with practical work*

2.  *The following topics may be taught in the laboratory along with the practical exercises.*

## DETAILED CONTENTS

1.  Information Technology – its concept and scope

2.  Computers for information storage, information seeking, information processing and information transmission

3.  Elements of computer system, computer hardware and software; data – numeric data, alpha numeric data; contents of a program, processing

4.  Computer organization, block diagram of a computer, CPU, memory

5.  Input devices; keyboard, mouse etc; output devices; VDU and Printer, Scanner, Plotter

6.  Electrical requirements, inter-connections between units, connectors and cables

7.  Secondary storage; magnetic disk – tracks and sectors, optical disk (CD and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus

8.  Exercises on file opening and closing; memory management; device management and input - output (I/O) management with respect of windows

9. Installation concept and precautions to be observed while installing the system and software

10. Introduction about Operating Systems such as MS-DOS and Windows

11. Special features, various commands of MS word and MS-Excel

12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing

13. Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)

14. Basics of Networking – LAN, WAN, Topologies

## 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 and loading the system software and application software

4. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands

5. Exercises on entering text and data (Typing Practice)

6. Installation of Windows 98 or 2000 etc.
   (1) 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 footnote, end note, use of comments

- 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 statistics, printing envelops and lables

- Using shapes and drawing toolbar,

- Working with more than one window in MS Word,

- How to change the version of the document from one window OS to another

- Conversion between different text editors, software and MS word

## 8    MS-EXCEL

- Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save worksheet, switching from another spread sheet
- Menu Commands:
Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications, programming with MS-Excel, getting information while working

- Work books:
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays

- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

- Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chat to analyzes data
- Using a list to organize data, sorting and filtering data in list

- Retrieve data with MS – query: Create a pivot table, customizing a pivot table. Statistical analysis of data

- Customize MS-Excel:
How to change view of worksheet, outlining a worksheet, customize workspace, using templates to create default workbooks, protecting work book

- Exchange data with other application: linking and embedding, embedding objects linking to other applications, import, export documents.
9.    Internet and its Applications
a)    Log-in to internet
b)    Navigation for information seeking on internet
c)    Browsing and down loading of information from internet

d)      Sending and receiving e-mail

-       Creating a message
-       Creating a address Book
-       Attaching a file with e-mail message
-       Receiving a message
-       Deleting a message

## RECOMMENDED BOOKS

1.      Fundamentals of Computer by V Rajaraman; Prentice Hal of India Pvt.Ltd., New Delhi

2.      Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi

3.      MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House 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

6.      Mastering Windows 95, BPB Publication, New Delhi

7.      Computer Fundamentals by PK Sinha; BPB Publication, New Delhi

8.      Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

## 1.6    ENGINEERING DRAWING – I              030025

L   T   P
-   -   6

**RATIONALE**

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Note:  1.    First angle projection is to be followed
2.    Minimum of 15 sheets to be prepared by each student
3.    SP46 – 1988 should be followed
4.    Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

**DETAILED CONTENTS**

1.    Drawing Office Practice

1.1    Drawing instruments

1.2    Sizes and layout of standard drawing sheets

1.3    Sizes of drawing boards

1.4    Drafting table/board

2.    Different types of Lines and Free Hand Sketching (1sheet)

2.1    Different types of lines in engineering drawing as per BIS specifications

2.2    Practice in free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, small and large circles, parabolas, curves and ellipses

3.    Lettering Techniques and Practice (2sheets)

3.1    Instrumental single stroke (capital and inclined) lettering of 35 mm height in the rations of 7:4

3.2    Instrumental double stroke lettering of 35 mm height in the ratio of 7:4, vertical

3.3 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5,3,5,7,10, and 15 mm heights in the ratio of 7:4

4. Dimensioning (1 sheet)

4.1 Necessity of dimensioning, terms and notations – methods and principles, dimensioning small components as in 4.2 below (mainly theoretical instructions)

4.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches – chain and parallel dimensioning

5. Scale (3 sheets)

5.1 Scales – their need and importance, Definition of representative fraction (RF); Find RF of a given scale

5.2 Types of scales

5.3 Construction of plain and diagonal scales

6. Principle of Projections (strictly in first angle projection)(8sheets)

6.1 Principle of orthographic projection

6.2 projection of points situated in different quadrants

6.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa

6.4 Projection of planes: Planes perpendicular and parallel to either of the planes: planes perpendicular to one plane and parallel to the other or vice versa

6.5 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or Parallel to horizontal plane/vertical plane or both

6.6 Drawing 3 orthographic views of given objects (at least five objects)

6.7 Drawing 6 views of given objects (non-symmetrical one or two objects may be selected for this exercise)

6.8 Identification of surfaces on drawn orthographic views from isometric object drawn

6.9 Exercises on missing lines, surfaces and views

6.10 Sketching practice of pictorial views from isometric objects

7. Sectional views (2 sheets)

Need for sectional views – cutting planes methods of representing sections, conventional sections of various material, classification of sections, conventions in sectioning

Drawing of full section, half section, partial broken out sections, off-set sections, revolved sections and removed sections. Exercises on sectional views of different isometric views

Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

8. Isometric Views (2 sheets)

8.1 Fundamentals of isometric projections (theoretical instructions)

8.2 Isometric views from 2 or 3 given orthographic views

9. Introduction to Third angle projection (1 sheet)

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House

2. A Text Book of Engineering Drawing by Surjit Singh, Published by Dhanpat Rai and Co., New Delhi

3. Engineering Drawing by PS Gill, Published by SK Kataria and Sons, Delhi

## 1.7 and 2.7   GENERAL WORKSHOP PRACTICE – I and II

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I                                   -   -   6
II                                  -   -   6
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**RATIONALE**

Manual abilities to handle engineering materials with hand tools need to be developed in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides developing the necessary skills, the students will appreciate the importance of quality and safety measures.

## DETAILED CONTENTS

**Note:**

1.     The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory, importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.
2.     The shops to be offered in I and II semester may be decided at polytechnic level
3.     The students should be taken to various shops (not included in the curriculum) in the polytechnic in batches and should be given knowledge of the various machines/equipment. Such as machine shop, foundry shop, sheet metal shop, etc.

**4.     Students of diploma in computer Engineering and information Technology will undergo shops 2,6 and 7 only**

Following seven shops are being proposed:

> **1.     Carpentry shop**
> **2.     Fitting and plumbing shop**
> **3.     Welding Shop**
> **4.     Paint Shop**
> **5.     Forging and sheet metal shop**
> **6.     Electric shop**
> **7.     Electronics shop**

**1.     Carpentry Shop**

1.1     Introduction to various types of wood, carpentry tools – their identification with sketches. Different types of wood joints.

1.2     Simple operations viz. hand sawing, marking, planning

1.3     Introduction and sharpening of wood working tools and practice of proper adjustment of tools

1.4     Demonstration and use of wood working machines i.e. band saw, circular saw, rip saw, bow saw and trammels. Universal wood working machine and wood turning lathe

1.5     Making of various joints (Also draw the sketches of various wooden joints in the Practical Note Book)
   a)     Cross lap joint
   b)     T-lap joint
   c)     Corner lap joint
   d)     Mortise and tenon joint
   e)     Dovetail joint
   f)     Prepare a file handle or any utility items by wood turning lathe

## 2.     Fitting and Plumbing shop

2.1     Introduction to fitting shop, common materials used in fitting shop, description and demonstration of various types of work-holding devices and surface plate, V-block

2.2     Demonstration and use of simple operation of hack-sawing, demonstration of various types of blades and their uses

2.3     Demonstrate and use of all important fitting shop tools with the help of neat sketches (files, punch, hammer, scraper, taps and dyes etc.)

2.4     Introduction of chipping, demonstration on chipping and its applications. Demonstration and function of chipping tools.

2.5     Description, demonstration and practice of simple operation of hack saw, straight and angular cutting

2.6     Demonstrations description and use of various types of blades – their uses and method of fitting the blade.

2.7     Introduction and use of measuring tools used in fitting shop like: Try square, Steel rule, Measuring Tape, Outside micrometer, Vernier Calipers and Vernier height Gauge

2.8     Description, demonstration and practice of thread cutting using taps and dies

2.9     Plumbing: Descriptions and drawing of various plumbing shop tools, Safety precautions, Introduction and demonstration of pipe dies, Pipe holding devices, Demonstration and practice of Pipe Fittings such as Sockets, Elbow, Tee, Reducer, Nipple, Union coupling, plug, Bend, Float valves and Taps

Job:    Cutting and filing practice on a square of 45 X 45 mm$^2$ from MS flat
Job:    Angular cutting Practice of $45^0$ (on the above job)

Job:    Preparation of stud (to out external threads) with the help of dies (mm or BSW)

Job:    Drilling, counter drilling and internal thread cutting with Taps

Job:    H-Fitting in Mild steel (ms) square

Job:    Pipe cutting Practice and thread cutting on GI Pipe with pipe dies

## 3.     Welding Shop

3.1     Introduction to welding, type of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding. Welding tools and safety precautions

3.2     Introduction to electric arc welding (AC and DC), practice in setting current and voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity and their use

3.3     Introduction to brazing process, filler material and fluxes; applications of brazing. Use of solder. Introduction of soldering materials

3.4     Demonstrate and use of the different tools used in the welding shop with sketches. Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, apron, goggles etc.

3.5     Demonstration of welding defects and various types of joints and end preparation

Job:    Preparation of cap joint by arc welding
Job:    Preparation of Tee joint by arc welding
Job:    Preparation of single V or double V butt joint by using Electric arc welding
Job:    Brazing Practice. Use of Speltor (on MS sheet pieces)
Job:    Gas welding practice on worn-out and broken parts

### 4. Paint shop

Introduction of painting shop and necessity, Different types of paints. Introduction of powder coating plant their uses.

Job: Preparation of surface before painting such as cleaning, Sanding, putty, procedure and application of primer coat, and painting steel item.

Job: Painting practice by rush on MS sheet

Job: Practice of dip painting

Job: Practice of lettering: Name plates / Sign board

Job: Polishing and painting on wooden and metallic surfaces

Job: Practical demonstration of powder coating

### 5. Forging and sheet metal shop

Introduction to forging, forging tools, tongs, blowers/pressure blowers, hammers, chisels, punch, anvil, swag-block etc. Forging operations.

5.1 Forge a L hook or Ring from MS rod 6 mm $\phi$

5.2 Forge a chisel and give an idea of hardening and tempering

5.3 Lap joint with forge welding

5.4 High strength steel (HSS) tools − forging of Lathe shaper tools like side-tools and V-shape tools

5.5 Making sheet metal joints

5.6 Making sheet metal trey or a funnel of a computer chassis

5.7 Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering

5.8 Prepare a lap riveted joint of sheet metal pieces

### 6. Electric Shop

6.1 Demonstration of tools commonly used in Electric Shop

6.2 Safety precautions, electric shock treatment

6.3 Demonstration of Common Electric material like: wires, fuses, ceiling roses, battens, cleats and allied items

6.4 Demonstration of Voltmeter, Ammeter, Multimeter and Energy meter

Job: Wiring practice in batten wiring, plastic casing-capping and conduit

Job: Control of one lamp by one switch

Job: Control of one lamp by two Switches

Job: Control of one bell by one switch

Job: Assemble a Tube light

Job: Dismantle, study, find out fault, repair the fault, assemble and test domestic appliances like electric iron, electric mixer, ceiling and table fan, tube-light, water heater (geyser) and desert cooler

Job: Laying out of complete wiring of a house (Single-phase and Three-phase)

## 7. Electronics Shop

7.1 Identification, familiarization, demonstration and use of the following electronic instruments:

a) Multi-meter digital
b) Single beam simple CRO, function of every knob on the front panel
c) Power supply, fixed voltage and variable voltage, single output as well as dual output.

7.2 Identification, familiarization and uses of commonly used tools; active and passive components; colour code and types of resistor and potentiometers

7.3 Cut, strip, join and insulate two lengths of wires/cables (repeat with different types of cables/wires)

7.4 Demonstrate and practice the skill to remove components/wires by unsoldering

7.5 Cut, bend, tin component, leads, inserts. Solder components e.g. resistor, capacitor, diodes, transistors on a PCB

7.6     Wiring of a small circuit on a PCB/tag strip involving laying, sleeving and use of identifier tags

7.7     Demonstrate the joining (or connecting) methods/mounting and dismantling method, as well as uses of the items mentioned below:

a)      Various types of plugs, sockets, connectors suitable for general-purpose audio video use. Some of such connectors e.g. 2 and 3 pin mains plug and sockets, Banana plugs, sockets and similar male and female connectors and terminal strips.
b)      various types of switches such as: normal/miniature toggle, slide, push button piano key, rotary, SPST, SPDT, DPST, DPDT, band selector, multi-way Master Mains Switch

7.8     Exposure to modern soldering and de-soldering processes (Field visits)

7.9     De-solder pump, remove and clean all the components and wires from a given equipment a PCB or a tag strip

# 2.1  COMMUNICATION SKILLS – II                    030021

**Rationale**

Interpersonal communication is a natural and necessary part of organizational life. Yet communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieving results and creating successful organizations. The goal of the ***Communicating Effectively in English*** course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance.

# II SEMESTER 48 hrs

**1. LISTENING COMPREHENSION 4hrs**
1.1 Locating Main Ideas in a Listening Excerpt
1.2 Note-taking

**2. ORAL COMMUNICATION SKILLS 14 hrs**
2.1 Offering-Responding to Offers
2.2 Requesting-Responding to Requests
2.3 Congratulating
2.4 Expressing Sympathy and Condolences
2.5 Expressing Disappointments
2.6 Asking Questions-Polite Responses
2.7 Apologizing, Forgiving
2.8 Complaining
2.9 Persuading
2.10 Warning
2.11 Asking for and Giving Information
2.12 Giving Instructions
2.13 Getting and Giving Permission
2.14 Asking For and Giving Opinions

**3. GRAMMAR AND USAGE 10hrs**
3.1 Prepositions
3.2 Pronouns
3.3 Determiners
3.4 Conjunctions
3.5 Question and Question Tag
3.6 Tenses (Simple Present, Simple Past)
*One chapter revising the topics discussed during the first semester.
(Punctuation, Articles, Framing questions, Verbs, Word formation)

**4. WRITING SKILLS 10hrs**
4.1 Writing Notice
4.2 Writing Circular
4.3 Writing a Memo
4.4 Agenda for a Meeting
4.5 Minutes of the Meeting
4.6 Telephonic Messages
* Writing a paragraph will be a continuous exercise through out the session.
(Writing will be based on verbal stimuli, tables and graphs.)

**5. READING SKILLS 10hrs**
5.1 Vocabulary Enhancement
5.2 Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading

**NOTE: The Reading Skills of the learners (along with vocabulary enhancement) will be through reading thematic articles/essays and/or stories.**

## 2.2    APPLIED MATHEMATICS – II

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4  1  -

## 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 form 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 return, vertices and axis related to different conics Differential Calculus

2.    Differential Calculus                                                    (22 hrs)

2.1    Concept of function, four standard limits

$$\underset{x \to a}{Lt} \; (x^n - a^n)/(x-a), \quad \underset{x \to}{Lt} \; Sin\, x/x, \quad \underset{x \to 0}{Lt} \; (a^x - 1)/x \quad \underset{x \to 0}{Lt} \; (1+x)^{1/x}$$

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,, 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 $n^{th}$ 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, Khanna Publishers, New Delhi
2. Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
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 Jai; Khanna Publishers, Delhi

11. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

# 2.3   APPLIED PHYSICS – II                              030023

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3 - 2

## 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. Waves and vibrations (8 hrs)
1.1 Waves, Generation of waves by vibrating particles.
1.2 Types of wave motion, transverse and longitudinal wave motion with examples
1.3 Relation between velocity of wave, frequency and wave length of a wave ($v = \eta \lambda$)
1.4 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
1.5 Vibration of spring mass system, cantilever and determination of their time period.
1.6 Free, forced and resonant vibrations with examples

### 2. Applications of sound waves (8 hrs)

2.1 Acoustics of buildings-reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
2.2 Ultrasonics-Methods of production (magnetostriction and piezoelectric) and their engineering applications to cold welding, drilling, cleaning, flaw detection and SONAR

### 3. Principles of optics (8 hrs)

3.1 Review of concept of mirrors, lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual image, magnification.
3.2 Power of lens
3.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case)
3.4 Total internal reflection, critical angle and conditions for total internal reflection.

### 4. Electrostatics (10 hrs)

4.1 Coulomb's law, unit charge
4.2 Gauss's Law
4.3 Electric field intensity and electric potential
4.4 Electric field of point charge, charged sphere, straight charged conductor, plane charged sheet
4.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors

4.6 Dielectric and its effect on capacitors, dielectric constant and dielectric

### 5. Current Electricity (8 hrs)

5.1 Ohm's law
5.2 Resistance of a conductor, specific resistance, series and parallel Combination of resistors, effect of temperature on resistance
5.3 Kirchhoff's laws, Wheatstone bridge principle and its applications

5.4 Heating effect of current and concept of electric power

### 6. Semi conductor physics (8 hrs)
6.1 Energy bands, intrinsic and extrinsic semi conductor, p-n junction diode and its characteristics
6.2 Diode as rectifier-half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)

### 7. Modern Physics (9 hrs)
7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, ruby laser and applications
7.3 Fiber optics: Introduction and applications
7.4 Super conductivity: Phenomenon of super conductivity, Type I and Type II super conductor and its applications

## LIST OF PRACTICALS

1. To determine and verify the time period of cantilever by drawing graph between load and depression

2. To determine the magnifying power of a compound microscope

3. To determine the magnifying power of an astronomical telescope

4. To verify Ohm's law

5. To verify law of resistances in series

6. To verify law of resistances in parallel

7. To convert a galvanometer into an ammeter of given range

8. To convert a galvanometer into a voltmeter of a given range

## RECOMMENDED BOOKS

1. Concept of Physics Prof. H.C. Verma, Part-1 (Bharti Bhawan)

2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)

3. A Text Book of Applied Physics: Egale Parkashan, Jullandhar

**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 (10 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 (iii) copper 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.

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 (iv) LPG (V) CNG

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) electrochemical 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. **Classification and Nomenclature of Organic Compounds (7 hrs)**
5.1 Homologous series
5.2 IUPAC Nomenclature of Hydrocarbons , Alcohols, Aldehydes and Ketones & Carboxylic acids
5.3 Hydrocarbons (Alkanes, Alkenes and Alkynes)-general preparation, Chemical properties and uses.
5.4 Alcohols (Diols and Triols not included)-general preparation, Chemical properties and uses.
5.5 Aldehydes and Ketones preparation properties and uses.
5.6 Monocarboxlic acids-general preparation, chemical properties and uses

6 **Rubber and Polymers (2 hrs)**
6.1 Definition of Rubber and Polymers
6.2 Types of Rubber
6.3 Classification of Polymers
6.4 Composition and uses of Polythene, PVC, Teflon, Bakelite.

**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. Estimate the amount of ash in the given sample of coal
5. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
6 Electroplate the given strip of Cu with Ni
7. Detection of organic compounds (Aldehydes, Ketones, Carboxylic acid, and Amines)

**RECOMMENDED BOOKS**

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

**Other additional books for reading**

1. Engineering Chemistry by Jain PC and Jain M
2. Chemistry of Engineering by Aggarwal CV
3. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

L  T  P
3  -  2

**RATIONALE**

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

**DETAILED CONTENTS**

1.    Introduction                                                                              (6 hrs)

    1.1    Concept of engineering mechanics, definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields

    1.2    Concept of rigid body

2.    Laws of forces                                                                            (6 hrs)

    2.1    Different force systems (coplanar and non-coplanar), principle of transmissibility of forces

    2.2    Parallelogram law of forces, triangle law of forces, polygon law of forces (graphically and analytically) resolution of forces, resolving a force into two rectangular components

    2.3    Free body diagram

    2.4    Equilibrium force and its determination

    2.5    Lami's theorem

3.    Moment                                                                                    (6 hrs)

    3.1    Concept of moment

    3.2    Moment of a force and units of moment

    3.3    Varignon's theorem (definition only)

3.4     Principle of moment and its applications

3.5     Parallel forces (like and unlike) and calculating their resultant

3.6     Concept of couple, its properties and effects

3.7     General conditions of equilibrium of bodies under co-planar forces

3.8     Position of resultant force by moment

4.    Friction                                                (6 hrs)

4.1     Definition and concept of friction, types of friction

4.2     Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

4.3     Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on rough inclined plane, friction in simple screw jack

4.4     Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

   a)     acting along the inclined plane
   b)     horizontally
   c)     at some angle with the inclined plane

5.    Centre of Gravity                                        (6 hrs)

5.1     Concept, definition of center of gravity and centroid of plan figure and symmetrical solid body

5.2     Determination of centroid of plain and composite lamina using moment method, centroid of bodies with removed portion

5.3     Determination of center of gravity of solid bodies – cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

6.    Application of the laws of motion                        (10 hrs)
      Simple problems on second law of motion, piles, lift, bodies tied with strings

7.    Simple machines                                          (8 hrs)

7.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machine

7.2 Simple and compound machine

7.3 Definition of ideal machine, reversible and self locking machine

7.4 Effort lost in friction, determination of maximum mechanical advantage and maximum efficiency

7.5 System of pulley (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

7.6 Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double purchase winch crab, expression for their velocity ratio and field of their application

**Note: Simple problem/numerical may be included in all the above topics wherever feasible**

## LIST OF PRACTICALS

1. Verification of the following laws:
   a) Parallelogram law of forces
   b) Triangle law of forces
   c) Polygon law of forces

2. To verify the forces in different members of a jib crane

3. To verify the reaction at the supports of a simply supported beam

4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane

5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack

6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel

7. To find mechanical advantage, velocity ratio and efficiency of single purchase winch crab

8. To find center of gravity of regular lamina

9. To find center of gravity of irregular lamina

10.     To determine coefficient of friction between different surfaces on horizontal plane

**RECOMMENDED BOOKS**

1.      A Text Book of Engineering Mechanics ( Applied Mechanics ) by RK Khurmi; S Chand and Co.Ltd., New Delhi

2.      Text Book in Applied Mechanics by MM Malhotra, R Subramanian, PS Gahlot and BS Rathore; Wiley Eastern Ltd., New Delhi

3.      Engineering Mechanics by SS Bhavikatti, KG Rajashekarappa; Wiley Eastern Ltd., New Delhi

4.      Engineering Mechanics and Strength of Materials by S Ramamurtham; Dhanpat Rai Publishing Co.(P) Ltd.

5.      Engineering Mechanics by AB Basu; Tata McGraw Hill Publishing Co.Ltd.

6.      Engineering Mechanics – Volume I and I by VS Mokashi; Tata McGraw Hill Publishing Co. LTD.

7.      Elements of Strength of Materials by SP Timoshenko, DH Young; East West Press Pvt Ltd.

8.      Schaum's Outline Series – Theory and Problems of Strength of Materials by William A Nash, McGraw HILL Book Company

9.      A Text Book of Applied Mechanics by NL Arora and RK Dhawan; India Publishing House, Delhi

10.     A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi

11.     Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi

## 2.6    ENGINEERING DRAWING – II

L  T  P
-  -  6

## RATIONALE

Drawing is said to be the language of engineers and technicians, Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Note:  1.    First angle projection is to be followed
2.    Minimum of 15 sheets to be prepared by each student
3.    SP 46-1988 should be followed
4.    Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

## DETAILED CONTENTS

1.    **Detail and Assembly Drawing (2 sheets)**

1.1    Principle and utility of detail and assembly drawings

1.2    Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenen joint, Corner and Through halving joint, Closed Mortise and Tenon joint

2.    **Threads (3 sheets)**

2.1    Nomenclature of threads. Types of threads (metric), single and multiple start threads

2.2    Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads

2.3    Simplified conventions of left hand and right hand threads, both external and internal threads

3.    **Locking Devices (1sheet)**

Lock nuts, castle nuts, split pin nuts, sawn nuts, slotted nut

4.  **Nuts and Bolts (3 sheets)**

Different views of hexagonal and square nuts; Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck bolts with hexagonal and square nuts and washers. Foundations bolts – Rag bolt and Lewis bolt

5.  **Screws, Studs and Washers ( 1 sheet)**

    5.1   Drawing various types of machine screws

    5.2   Drawing various types of studs and set screws

6.  **Keys and Cotters (3 sheets)**

    6.1   Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position

    6.2   Cotter joints (i) sleeve and cotter joint (ii) gib and cotter joint (iii) knuckle joint (iv) Spigot and socket joint

7.  **Rivets and Riveted Joints (2 sheets)**

    7.1   Types of structural and general purpose rivet heads
    7.2   Caulking and fullering  of riveted joints
    7.3   Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting

8.  **Welded Joints (1 sheets)**
    8.1   Various conventions and symbols of welded joints (1S 696)
    8.2   Practical applications of welded joints say joints on steel frames, windows, door and furniture

9.  **Couplings ( 2 sheets)**
    9.1   Muff or Box coupling, half tap muff coupling
    9.2   Flange coupling (Protected and non-protected)
    9.3   Flexible coupling

10. **Symbols and Conventions (2 sheets)**

10.1 Civil engineering sanitary fitting symbols

10.2 Electrical fitting symbols for domestic interior installations

10.3 Building plan drawing with electrical and civil engineering symbols

## 11. Development of Surfaces (3 sheets)

11.1 Construction of geometrical figures such as square, pentongon, hexogon
11.2 Development of surfaces of cylinder, square, pentagonal and hexazonal, Prism, Cone and Pyramid, Sequence pentagonal and hexa pyramid

## 12. Interpenetration of (2 sheets)

12.1 Cylinder to Cylinder
12.2 Cylinder to cone

## 13. AUTO CAD

13.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode
13.2 Drawing commands – point, line, arc, circle, ellipse
13.3 Editing commands – scale, erase, copy, stretch, lengthen and explode
13.4 Dimensioning and placing text in drawing area
13.5 Sectioning and hatching
13.6 Inquiry for different parameters of drawing entity

**Note: A minimum of 15 sheets should be prepared by each student**

## RECOMMENDED BOOKS

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House
2. A Text Book of Engineering Drawing by Surjit Singh Published by Dhanpat Rai and Co. Delhi
3. Engineering Drawing by PS Gill; published by SK Kataria and Sons; New Delhi

## 3.1 STRENGTH OF MATERIALS

L T P
3 1 2

### RATIONALE

Diploma holders in this course are required to analyse reasons for failure of different components and select the required materials for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. Hence this subject has been introduced. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles to the solution of applied problems to develop the required competencies.

### DETAILED CONTENTS

**1. Stresses and Strains**                                            **(6 hrs)**
- Concept of load, stresses and strain
- Tensile, compressive and shear stresses and strains
- Concept of elasticity, elastic limit and limit of proportionality
- Hooke's Law, Young's Modulus of elasticity, Yield point, plastic stage, Strain hardening,  Stress strain diagram, Ultimate strength and breaking stress, Percentage elongation, Principle of  superposition, Free body diagram, Proof stress and working stress, Factor of safety, Bars of  varying cross-section, Temperature stresses and strains, Composite sections under compression and tension, Lateral strain, Poisson's ratio, Numerical Problems.

**2. Resilience and Instantaneous Stress**                             **(5 hrs)**
- Concept of resilience, proof resilience and co-efficient of resilience
- Modes of loading: gradual loading, sudden loading and falling load
- Calculation of instantaneous stress induced due to gradual loading, sudden load and falling loads
- Numerical problems on the above

**3. Beams and Bending Stress**                                        **(8 hrs)**
- Concept of beams
- Types of beams
- Types of loading
- Concept of end supports – Roller, hinged and fixed
- Concept of bending moment and shearing force
- Bending moment and shearing force diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and UDL. Point of contra flexure.
- Numerical problems

## 4. Moment of Inertia                                              (6 hrs)
- Concept
- Second moment of area
- Radius of gyration
- Theorem of parallel axes
- Theorem of perpendicular axes
- Section modulus
- Moment of inertia of plane figures such as rectangle, square, triangle, circle, trapezium (without proof)
- Numerical problems on: Angle section, T section, I section, circular section, channel section, Z section, hollow section and removed section.

## 5. Bending Stress                                                  (7 hrs)
- Concept of bending stresses
- Theory of simple bending, assumptions made in bending theory
- Use of equation $\sigma/y = M/I = E/R$
- Concept of moment of resistance
- Bending stress diagram
- Calculation of maximum bending stress in beams of rectangular, I and T sections
- Permissible bending stress, section modulus for rectangular, circular and symmetrical I sections

## 6. Springs                                                         (4 hrs)
- Determination of number of plates
- Maximum bending stress and deflection
- Closed coil helical spring subjected to axial load
- Stress deformation
- Stiffness and angle of twist and strain energy
- Falling loads on springs
- Numerical problems

## 7. Columns                                                         (5 hrs)
- Concept of column, modes of failure
- Types of columns
- Buckling load, crushing load
- Slenderness ratio
- Factors effecting strength of a column
- End restraints
- Effective length
- Strength of column by Euler Formula without derivation
- Rankine Gourdan formula (without derivation)
- Numerical problems

**8. Torsion** (7 hrs)
- Concept of torsion, difference between torque and torsion
- Derivation and use of torque equation
- Shear stress diagram for solid and hollow circular shaft
- Comparison between solid and hollow shaft with regard to their strength and weight
- Power transmitted by shaft
- Concept of mean and maximum torque
- Numerical problems

**LIST OF PRACTICALS**
1. Tensile test on bars of mild steel and aluminum
2. Shear test on specimen of two different metals
3. Impact test on metals (a) Izod test (b) Charpy test
4. Torsion test on specimens of different metals for determining the angle of twist for a given torque
5. To determine the stiffness of a helical spring and to plot a graph between load and extension
6. Hardness test on metal and finding the Rockwell hardness

**RECOMMENDED BOOKS**
1. Strength of Materials by R.S. Khurmi; S. Chand and Company, Delhi.
2. Strength of Materials by DR Malhotra, Satya Prakashan, Delhi.
3. Strength of Materials by RK Rajput, SK Kataria and Sons, Delhi
4. Strength of Materials by Birender Singh.
5. Strength of Materials by Dr. Sadhu Singh.

## 3.2 FUNDAMENTALS OF ELECTRICAL ENGINEERING

L T P
4 - 2

### RATIONALE

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

### DETAILED CONTENTS

**1. Applications and Advantages of Electrical Energy** (03 hrs)
1.1 Different forms of energy
1.2 Advantages of electrical energy
1.3 Difference between AC and DC
1.4 Uses of electrical energy

**2. Basic Electrical Quantities** (03 hrs)
2.1 Basic concept of charge, current, voltage, resistance, power, energy and their units
2.2 Conversion of units of work, power and energy from one form to another.

**3. Batteries** (10 Hrs)
3.1 Basic idea about primary and secondary cells
3.2 working principle, construction and applications of Lead acid battery and Nickel Cadmium cells, Silver Oxide Cells
3.3 Charging methods used for lead acid accumulator
3.4 Care and maintenance of lead acid battery
3.5 Grouping of cells in series and parallel (simple numerical problems).

**4. DC Circuits** (6 Hrs)
4.1 Ohm's law, resistances in series and parallel
4.2 Kinchhoff laws and their applications in solving electrical network problems
4.3 Network theorems such as theorem and Newton theorem
4.4 Star-delta transformation

**5. Magnetism and Electromagnetism** (6 Hrs)
5.1 Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors.
5.2 Force on a conductor placed in the magnetic field
5.3 Series magnetic circuits, simple problems
5.4 Concept of hyteresis, hysteresis loop and hysteresis loss.

## 6. Electromagnetic Induction                                    (8 Hrs)
6.1 Faraday's Laws of electromagnetic induction
6.2 Lenz's law
6.3 Fleming's Right and Left Hand Rule
6.4 Principle of self and mutual induction
6.5 Principle of self and mutually induced e.m.f. and simple problems
6.6 Inductances in series and parallel
6.7 Energy stand in a magnetic field
6.8 Concept of eddy currents, eddy current loss

## 7. AC Fundamentals                                              (18 Hrs)
7.1. Concept of alternating current and voltage, equation of instantaneous values
7.2. Representation of alternating sinusoidal quantities by vectors
7.3. Phasor algebra (addition, subtraction, multiplication and division of complex
     quantities)
7.4. AC through pure resistance, inductance and capacitance
7.5. Concept of susceptance, conductance and admitance
7.6. Alternating voltage applied to RL,RC and RLC series and parallel circuits
     (impedance triangle, phasor diagram and their solutions)
7.7. Power in pure resistance, inductance, capacitance, RL, RC, RLC circuits
7.8. Active and reactive components of current and their significance
7.9. Power factor and its practical significance
7.10. Resonance in series and parallel circuits
7.11. J-notation and its application in solving problems in ac circuits

## 8. Polyphase systems
8.1 Advantages of 3 phase over single phase system
8.2 Star and delta connections (relationship between phase and line voltages, phase and
     line currents
8.3 Power in 3 phase circuits
8.4 Measurement of power and power factor of a 3 phase load by two wattmeter method

## LIST OF PRACTICALS
1. To verify Ohm's law
2. To verify that Rt = R1+R2+…. where R1, R2 etc. are resistances connected in series
3. To verify R1 R2 R3

Rt = ------------------ Where R1, R2 etc. are resistances connected in parallel
R1+R2+R3
4. Verification of Kirchhoff's laws applied to DC circuits
a) to construct a circuit arrangement consisting of resistances in series, parallel
   combination
b) identification of msde points in the circuit
c) to see that algebric sum of currents at made point is zero

d) to see that algebric sum of e.m.f.s. and voltage drops in a closed loop is zero

5. Filament lamp

a) measure the resistance of a cold lamp filament with the help of multimeter

b) measuer the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between resistance and voltage

6. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance

7. To construct an R-L series circuit and to measure:

(a) impedance (z) of the circuit

(b) Inductive reactance (XL) of the circuit by measuring voltage drop across the inductance dividing it by the current through the circuit

c) to verify impedance $Z = \sqrt{(R^2 + X^2_L)}$

d) to determine phase angle between voltage and current and its power factor

e) construct its impedance triangle

9. To construct an RLC series circuit and to measure

a) its impedance

b) inductive (XL) and capacitive reactance(Xc)

c) verify $z = \sqrt{R^2 + (X_L - X_c)^2}$

d) measure phase angle between voltage and current

e) construct impedance triangle

9. Measurement of power and power factor of a single phase RC, RL and RLC circuit. To calculate KVA and KVAR

10. Measurement of power and power factor of a 3 phase circuit by using 2 wattmeter and 3 wattmeter method. To calculate KVA and KVAR

12. Testing a battery for its changed condition and to charge it

Note: The result should be verified analytically also.

**RECOMMENDED BOOKS**

1. Electrical Science by VK Mehta, S Chand & Co., New Delhi
2. Electrical Science by Sahdev, Unique International Publication, Jalandhar
3. Electrical Engineering by DR Arora, Ishan Publications, Ambala
4. Electrical Science by JB Gupta, SK Kataria & Sons, New Delhi
5. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
6. Electrical Science by Trilok Singh, SK Kataria, New Delhi
7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
9. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
10. Principles of Electrical Engineering y BR Gupta, S Chand & Co., New Delhi
11. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi
12. Electrical Power System by S Channi Singh, McGraw Publishing Co.

# 3.3 BASIC ELECTRONICS

L T P
4 - 2

## RATIONALE

At present electronics gadgets are being extensively used in manufacturing process in industries, power system operations, communication systems, computers etc. Even for an electrical diploma holder, it is absolutely necessary to take a basic understanding of electronics components, their function and applications. This understanding should facilitate in operation and maintenance equipments which are electronically controlled.

In this course, topics like electronics components, semi-conductor physics, rectifiers, and amplifiers have been included. The remaining topics are included in electronic devices and circuits.

## DETAILED CONTENTS

### 1. Introduction                                                (5 hrs)

1.1 Brief history of development of electronics
1.2 Active and passive components
1.3 Concept of current and voltage sources, constant voltage and current sources, their graphical representation. Conversion of voltage source into current source and vice-versa
1.4 Difference between actual voltage source and constant voltage source

### 2. Semi-conductor Theory                                       (10 hrs)

2.1 Atomic structure, crystaline structure
2.2 Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination. Energy band structure of Silicon and Germanium
2.3 Silicon versus Germanium for mobility and conductivity
2.4 Concept of intrinsic and extrinsic semiconductors
2.5 Effect of temperature on intrinsic and extrinsic semiconductors

### 3. Semiconductor Diodes                                        (10 hrs)

3.1 PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing and a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism
3.2 Ideal diode, Semiconductor diode characteristics, static and dynamic resistance
3.3 Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), relation between DC output and AC input voltage, rectifier efficiency
3.4 Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie ($\pi$) filters and their applications
3.5 Diode ratings/specifications
3.6 Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications
3.7 Zener diode and its characteristics

3.8 Use of zener diode for voltage stabilization

## 4. Bi-polar Transistors                                    (7 hrs)
4.1 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow
4.2 Transistor configurations: common base (CB), Common emitter (CE) and common collection (CC), current relation and their input/output characteristics; comparison of the three configurations

## 5. Transistor Biasing and Stabilization                    (10 hrs)
5.1 Transistor biasing, its need, operating point and need of stabilization of operating point.
5.2 Difference between circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of thevenin theorem to determine operating point
5.3 Effect of temperature on the operating point of a transistor
5.4 Concept of h-parameters of a transistor
5.5 Use of data book to know the parameters of a given transistor

## 6. Single-Stage Transistor Amplifiers                      (10 hrs)
6.1 Single stage transistor amplifier circuit in CE configuration, function of each component
6.2 Working of single stage transistor amplifier, physical and graphical explanation, phase reversal
6.3 Concept of DC and AC load line
6.4 Voltage gain of single stage transistor amplifier using characteristics of the device
6.5 Concept of input and output impedance
6.6 AC equivalent circuit of single stage transistor amplifiers
6.7 Calculation of voltage gain using AC equivalent circuit
6.8 Frequency response of a single stage transistor amplifier

## 7. Multi-Stage Transistor Amplifiers                       (7 hrs)
7.1 Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications.
7.2 Knowledge of various terms such as voltage gain, current gain, power gain, frequency response, decibel gain and band width
7.3 RC coupled two-stage amplifiers, circuit details, working, frequency response, applications
7.4 Loading effect in multistage amplifiers
7.5 Elementary idea about direct coupled amplifier, its limitations and applications
7.6 Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers

**8. Field Effect Transistor (FET)** (05 hrs)
8.1 Construction, operation, characteristics and applications of a N channel JFET and P channel JFET
8.2 JFET as an amplifier
8.3 Construction, operation, characteristics and applications of a MOSFET in depletion enhancement mode
8.4 Comparison between BJT, JFET and MOSFET

**LIST OF PRACTICALS**
1. a) Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transister
b) Measurement of resistances using multimeter and their comparison with colour code values
2. V-I characteristics of a Semiconductor diode and to calculate its static and dynamic resistance
3. a) V-I characteristics of a zenor diode and finding its reverse breakdown voltage
b) Fabrication of a zenor diode voltage stabilizer circuit using PCB
4. Observation of input and output wave shapes of a half-wave rectifier and verification of relationship between dc output and ac input voltage
5. Observation of input and output wave shapes of a full wave rectifier and verification and relationship between dc and ac input voltage
6. Observation of input wave shape of a full wave rectifier with (i) shunt capacitor) (ii) series induction (iii) Π filter circuits
7. Plotting input and output characteristics of a transistor in CB configuration
8. Plotting input and output characteristics of a transistor in CE configuration
9. Measurement of operating point in case of (i) fixed biased circuit (ii) potential divider biasing circuit and to observe the effect of temperature variation on the operating point.
10. To measure the voltage gain of a single stage amplifier using CE configuration at different loads
11. To plot frequency response curve of a single stage transistor amplifier using semilog sheet and to measure its band width
12. To measure the voltage gain of a two-stage RC coupled amplifier (a) as individual stages (b) after coupling as multi-stage amplifier (c) to study effect of coupling capacitor on frequency response
13. To plot frequency response curve of a two stage RC coupled amplifier using semi-log sheet and measure the band width
14. To plot V-I characteristics of a FET
**RECOMMENDED BOOKS**
1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hill, New Delhi
2. Analog Electronics by BP Arora, Ishan Publications, Ambala
3. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
4. Electronic Devices and Circuits by R Boylestead
5. Electronic Devices and Circuits by Ravi Raj Dubey

6. Analog Electronics by JC Karhara, King India Publication, New Delhi

7. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi

8. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi

# 3.4 CONSTRUCTION MATERIALS

L T P
3 - 2

## RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition specifications of various materials should also be known (PWD/BIS) for effective quality control.

## DETAILED CONTENTS

### 1. Building Stones                                              (4 hrs)

**1.1** Classification of Rocks: (General Review)

1.1.1 Geological classification: Igneous, sedimentary and metamorphic rocks

1.1.2 Chemical classification; Calcareous, argillaceous and siliceous rocks

1.1.3 Physical classification: Unstratified, startified and foliated rocks

1.2 General characteristics of stones – Marble, Granite, Sand stone, Lime stone and Slate

1.3 Requirements of good building stones

**\*\*1.4 Identification of common building stones

1.5 Various uses of stones in construction

1.6 Kota stone, marble

### 2. Bricks and Tiles                                              (10 hrs)

2.1 Introduction to bricks

2.2 Raw materials for brick manufacturing and properties of good brick making earth

2.3 Manufacturing of bricks

2.3.1 Preparation of clay (manual/mechanically)

\*\*2.3.2 Moulding: hand moulding and machine moulding, hand moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-flyash bricks, sun dried bricks, only line diagram of kilns

2.4 Classification and specifications of bricks as per BIS: 1077

2.5 Testing of common building bricks as per BIS: 3495 Compressive strength, water absorption – hot and cold water test, efflorescence, Dimensional tolerance

2.6 Tiles

2.6.1 Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles

2.6.2 Ceramic, linoleum, terrazo and PVC tiles, their properties and uses

2.7 Stacking of bricks and tiles at site

### 3. Cement                                                       (7 hrs)

\*\*3.1 Introduction, raw materials, flow diagram of manufacturing of cement, by wet process

3.2 Various types of Cements and their uses: Ordinary portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, white and coloured cement, portland pozzolana cement, super sulphated cement
3.3 Properties of cement
3.4 Storage of Cement

## 4. Lime                                                                                 (4 hrs)
4.1 Introduction: Lime as one of the cementing materials
4.2 Definition of terms; quick lime, fat lime, hydraulic lime, hydrated lime, lump lime
4.3 Calcination and slaking of lime
4.4 IS classification of lime

## 5. Timber and Wood Based Products                                                       (7 hrs)
5.1 Identification of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail and Chir
** 5.2 Market forms of converted timber as per BIS
5.3 Seasoning of timber: Purpose, methods of seasoning, kiln seasoning as per BIS
5.4 Defects in timber, decay in timber
5.5 Preservation of timber and methods of treatment as per BIS
5.6 Properties of timber and specifications of structural timber
**5.7 Common timbers in India, their uses - Teak, Deodar, Chir, Kail, Shisham, Sal and Mango, Plywood; Veneers and veneering, manufacturing of plywood (brief description only), uses of plywood.
5.8 Other wood based products, their brief description of manufacture and uses: laminated board, black board, fibre board, hard board

## 6. Paints and Varnishes                                                                 (6 hrs)
6.1 Purpose and use of paints
6.2 Different types of paints: oil paints, water paints and cement paints
6.2.1 Cement paints - commonly available cement paints, their properties and uses. Application of Cement paints
6.2.2 Varnishes and polish-types, properties and their uses.
6.2.3 Lacquers and enamels - their properties and uses.
6.2.4 Oil paints: their properties and uses

## 7. Metals                                                                               (4 hrs)
7.1 Ferrous metals: Composition, properties and uses of cast iron, steel (mild and high tension steel), requirements of mild steel as per BIS.
7.2 Non Ferrous metals: properties and uses of the following non ferrous metals in Civil Engineering works - copper, lead, zinc, tin and aluminium
7.3 Commercial forms of ferrous and non ferrous metals.

**8. Miscellaneous Materials** **(6 hrs)**

8.1 Plastics: Important commercial products of plastics used in Civil Engineering construction.

8.2 Asbestos based products: Commercial forms and their uses (Asbestos tiles, fibre boarded, cellotex)

8.3 Insulating materials for Sound and Thermal Insulation

8.4 Construction chemicals like: water proofing components, epoxies, sulphides, polymers.

8.5 Glass: Types of glasses, their properties, Commercial forms and uses: plate glass, wired glass, bullet resisting glass, coloured glass, fibre glass, foamed glass, glass wool, Float glass, glass reinforced plastic.

8.6 Water proofing materials; Bitumen sheets and felts, chemical admixtures

**8.7 Finishings Materials: Homogenous laminated fibres, panel boards, wall boards, wall papers etc

NOTE: **A field visit may be planned to explain and show the relevant things

**PRACTICAL EXERCISES:**

i) To identify different types of stones

ii) To determine the crushing strength of bricks

iii) To determine the water absorption of bricks

iv) To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail & Hollock

v) To determine fineness (by sieve method) of cement

vi) To determine normal consistency of cement

vii) To determine initial and final setting times of cement

viii) To determine soundness of cement

ix) To determine compressive strength of cement

**INSTRUCTIONAL STRATEGY**

Teachers are expected to physically show various materials while imparting instructions. Field-visits should also be organized to show manufacturing processes and use of various materials in Civil engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic.

**RECOMMENDED BOOKS**

1) TTTI, Chandigarh "Civil Engineering Materials:" Tata McGraw Hill Publication

2) Surendra Singh; "Engineering Materials;" New Delhi, Vikas Publishing House Pvt. Ltd.

3) Chowdhuri, N; "Engineering Materials;" Calcutta, Technical Publishers of India.

4) Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.

5) Sharma, SK; and Mathur, GC; "Engineering Materials;" Delhi-Jalandhar, R. Chand and Co.

6) Kulkarni, GJ; "Engineering Materials;" Ahmedabad, Ahmedabad Book Depot.

7) Shahane; Engineering Materials; Poona, Allied Book Stall.

8) Gurcharan Singh; Engineering materials, Standard Publishers Distributors

## 3.5 OPERATING SYSTEMS (OS)
## (Common with Information Technology)

L T P
3 - 2

**RATIONALE**

The course provides the students with an understanding of human computer interface existing in computer system and the basic concepts of operating system and its working. The students will also get hand-on experience and good working knowledge to work in DOS and windows environments. The aim is to gain proficiency in using various operating systems after undergoing this course. While imparting instructions, the teachers are expected to lay more emphasis on concepts and principles of operating systems, its features and practical utility.

**DETAILED CONTENTS**

**1. Brief Introduction to System Software** (6 Hrs)

1.1 Compiler
1.2 Assembler
1.3 Loader
1.4 Operating system

**2. Brief Introduction to MS-DOS and WINDOWS** (8 Hrs)

**2.**1 Brief history of DOS, and WINDOWS
2.2 Main features of DOS
2.3 Directory structure of DOS
2.4 File structure of DOS
2.5 Detail concept of DOS commands
2.6 Introduction to Windows

**3. Overview of Operating Systems** (10 Hrs)

3.1 Definition of Operating Systems
3.2 Types of Operating Systems
3.3 Importance of Operating Systems
3.4 Softness organization
3.5 Linking, loading and executing control program

**4. Functions of Operating System** (24 Hrs)

4.1 Process Management Functions (Principles and Brief Concept)
4.1.1 Job Scheduler
4.1.2 Process Scheduler
4.1.3 Process synchronization
4.2 Memory Management Function (Principles and Brief Concept)
4.2.1 Introduction
4.2.2 Single Process System
4.2.3 Fixed Partition Memory

4.2.4 System Loading
4.2.5 Segmentation
4.2.6 Swapping
4.2.7 Simple Paging System
4.3 I/O Management Functions (Principles and Brief Concept)
4.3.1 Dedicated Devices
4.3.2 Shared Devices
4.3.3 I/o Devices
4.3.4 Storage Devices
4.3.5 Buffering
4.3.6 Spotting
4.4 File Management
Principles and Brief Concept
Types of File System
- Simple file system
- Basic file system
- Logical file system
- Physical file system

**LIST OF PRACTICALS**
1. Demonstration of all the controls provided on Control Panel
2. Practical exercises involving various internal and external DOS commands (20 No.)
3. Practical exercises involving Basics of Windows (20 No.)
4. Exercises on windows operating system

**RECOMMENDED BOOKS**
1. Operating System Concepts by Ekta Walia , Khanna Publishers, New Delhi.
2. Operating Systems by John J Donovan
3. System Programming by Dham Dhare
4. Operating Systems by C. Ritchie
5. MS DOS by Peter Norton, BPB Publications
6. Microsoft Windows Manual
7. First Course in Computers by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
8. DOS Manual
9. Windows 2000 by BPB Publication, New Delhi.
10. Operating System by Stallings, Tata McGraw Hill, New Delhi.

# 3.6 WORKSHOP TECHNOLOGY - I

L T P
3 - -

## RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes, modern machining methods, processing of plastic, CNC machining, tool, jigs and fixtures is required to be imparted. Hence the subject of workshop technology.

## DETAILED CONTENTS

### 1. Welding Process                                                          (2 hrs)
- Principle of welding
- Welding positions and techniques, symbols.

### 2. Gas Welding                                                              (3 hrs)
- Types of gas welding flames and their applications
- Gas welding equipments- Gas welding torch, Oxy – acetylene cutting torch, Blowpipe, Pressure regulators, Filler rods and fluxes.

### 3. Arc Welding                                                              (3 hrs)
- Arc welding machines and equipment
- A.C. and D.C. arc welding
- Effect of polarity, current regulation and voltage regulation
- Electrodes: Classification, B.I.S. specification and selection
- Flux for arc welding

### 4. Other Welding Processes                                                  (3 hrs)
- Principle of resistance welding, working and applications of spot welding, seam welding, projection welding and percussion welding.
- Welding defects and inspection of welded joints.

### 5. Modern Welding Methods                                                   (4 hrs)
Principle of operation, advantages, disadvantages and applications of:
- Tungsten inert gas (TIG) welding
- Metal inert gas (MIG) welding
- Thermit welding
- Electro slag welding

### 6. Pattern Making                                                           (3 hrs)
- Types of pattern
- Pattern material
- Pattern allowances
- Pattern codes as per B.I.S.

- Introduction to cores, core boxes and core materials
- Core making procedure
- Core prints, positioning of cores

## 7. Moulding Sand                                                      (2 hrs)
- Properties of moulding sand, their impact and control of properties viz. permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility.
- Various types of moulding sand.

## 8. Mould Making                                                       (3 hrs)
- Introduction to moulding tools
- Types of moulds
- Step involved in making a mould
- Moulding boxes, hand tools used for mould making
- Moulding processes: Bench moulding, floor moulding, pit moulding and machine moulding.

## 9. Special Casting Processes                                          (2 hrs)
Principles, working and applications of
- Dies casting: hot chamber and cold chamber
- Centrifugal casting

## 10. Gating and Risering System                                        (2 hrs)
- Elements of gating system
- Pouring basin, sprue, runner, gates
- Types of risers, location of risers
- Directional solidification

## 11. Casting Defects                                                   (3 hrs)
- Different types of casting defects
- Testing of defects: radiography, magnetic particle inspection, and ultrasonic inspection.

## 12. Lathe                                                             (8 hrs)
- Description and function of various parts of a lathe
- Classification and specification of various types of lathe
- Work holding devices
- Lathe operations: - Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling.
- Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.
- Lathe accessories:- Centers, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder

### 13. Drilling                                                        (4 hrs)
- Classification of drilling machines and their description.
- Various operations performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.
- Speeds and feed during drilling, impacts of these parameters on drilling, machining time.
- Types of drills and their features, nomenclature of a drill
- Drill holding devices.
- Types of reamers.

### 14. Boring                                                          (3 hrs)
- Principle of boring
- Classification of boring machines and their brief description.
- Specification of boring machines.
- Boring tools, boring bars and boring heads.
- Description of jig boring machine.

### 15. Cutting Tools and Cutting Materials                             (3 hrs)
- Various types of single point cutting tools and their uses.
- Single point cutting tool geometry, tool signature.
- Properties of cutting tool material.
- Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, satellite, ceramics and diamond.
- Cutting fluid – their types, importance, properties & advantages and applications.

### REFERENCE BOOKS

1. A Text Book of Welding Technology by O.P. Khanna.
2. Welding Technology by R.L. Agarwal and Tahil Maghanani; Khanna Publishers, Delhi.
3. A Text Book on Foundry Technology by M.Lal and O.P.Khanna.
4. Foundry Engineering by Tahil Maghnani.
5. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons, Delhi.
6. Manufacturing Technology by M.Adithan and AB Gupta; New Age International (P) Ltd, Delhi.
**7.** Workshop Technology by RC Jindal; Ishan Publication Ambala city.
8. Elements of Workshop Technology by S.K.Choudhary and Hazara; Asia Publishing House.

# 4.1 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L T P
4 - 3

## 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 hrs)

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, requirements, importance and applications of standards, calibration

### 2. Multimeter                                        (08 hrs)

Principles of measurement of DC voltage, DC current, AC voltage, AC current, moving coil and moving iron type instruments (voltmeter and Ammeter) Block diagram of multimeter and measurement of voltage, current and resistance using multimeter
Specifications of multimeter and their applications Limitations with regard to frequency and input impedance

### 3. Electronic Voltmeter                              (06 hrs)

Advantages over conventional multimeter for volt measurement with respect to input impedance and sensitivity Principles of voltage, current and resistance measurement (block diagram only) Specifications of electronics voltmeter

### 4. AC Milli Voltmeter                                (04 hrs)

Types of AC milli voltmeters and their block diagram description Typical specifications and their significance

### 5. Cathode Ray Oscilloscope                          (05 hrs)

Construction and working of different blocks used in CRT Time base operation and need for blanking during flyback, synchronization Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls Specifications of CRO and their explanation Measurement of current, voltage, frequency, time period and phase using CRO: CRO probes, special features of dual beam, dual trace, delay sweep
Digital storage oscilloscope: block diagram and working principle

6. **Signal Generators and Analysis Instruments** (06 hrs)
Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator Distortion factor meter; wave analyser and spectrum analyser

7. **Impedance Bridges and Q Meters** (12 hrs)
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

8. **Digital Instruments** (08 hrs)
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 and logic 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 meter
8. Measurement of distortion of RF signal generator using distortion factor meter
9. Use of logic pulser and logic probe
10. Measurement of time period, frequency, average period using universal counter/ frequency counter
11. Study of operation and features of a logic analyser
**RECOMMENDED BOOKS**
1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai & Sons, Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India
3. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
4. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

# 4.2 COMPUTER PROGRAMMING AND APPLICATIONS

L T P
3 - 3

## DETAILED CONTENTS

### 1. Information Storage and Retrival
1.1 Need for information storage and retrieval
1.2 Creating data base file
1.3 Querying database file on single and multiple keys
1.4 Ordering the data on a selected key
1.5 Programming a very simple application

### 2. Programming in C

2.1 Basic structure of C programs
2.2 Executing a C program
2.3 Constants, variables, and data types
2.4 Operators and expressions
2.5 Managing input-output operations like reading a character, writing a character, formatted input, formatted output through print, scan, getch, putch statements etc.
2.6 Decision making and branching using IF ….. else, switch, go to statements
2.7 Decision making and looping using do-while, and for statements
2.8 Arrays – one dimensional and two dimensional
2.9 File

### 3. Computers Application Overview

3.1 Commercial and business data processing application
3.2 Engineering computation
3.3 CAD, CAM , CAE, CAI

### 4. Typical Applications:

Students will be required to make a small programme for analysis of circuits design in the area of Electronics and Communication Engineering.
Use of various software available in the field of Electronics and Communication Engineering.

## LIST OF PRACTICALS

1. Creating database.
2. Querying the database.
3. Report generation.
4. Programming in dbase
5. Use of spread sheets/Matlan/Mathematica/Eureka (or any other package) for engineering computers.
6. Use of design packages (appropriate design packages may be selected depending upto the availability) on Estimating and Costing. Analysis of rates and other areas
7. Use of and electrical engineering related CAI packages.
8. Programming for DAS and control.
9. Exercises on data acquisition.
10. Exercises on control – on/off switch, and proportional control.
11. Programming exercise on executing C program
12. Programming exercise on editing C program
13. Programming exercise on defining variables and assigning values to variables.
14. Programming exercise on arithmetic and relational operators.
15. Programming exercise on arithmetic expressions and their evaluation.
16. Programming exercise on reading a character.
17. Programming exercise on writing a character.
18. Programming exercise on formatting input using print.
19. Programming exercise on formatting output using scan.
20. Programming exercise on simple if statement.
21. Programming exercise on IF…. Else statement.
22. Programming exercise on switch statement.
23. Programming exercise on go to statement.
24. Programming exercise on do-while statement.
25. Programming exercise on for statement.
26. Programming exercise on one-dimensional arrays
27. Programming exercise on two-dimensional arrays
28. Exercises on
Internet use/application
Typical application on Electrical Engineering

## RECOMMENDED  BOOKS

1. Programming in C by Sachaum Series, McGraw Hills
2. Programming in C by Kerning Lan and Riechle Prentice Hall of India, New Delhi
3. Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi
4. Let us C – Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj,Vikas Publishing 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

# 4.3 MATERIALS AND METALLURGY

L T P
3 - 2

## RATIONALE

Materials play an important role in the construction and manufacturing of equipment/tools. Right selection of materials add to the economy, working and life of machinery. A diploma holder must be conversant with the properties, uses, availability and costs of materials used for construction/fabrication to enable him to perform his functions confidently. The subject of Materials and Metallurgy has been designed to cover the above aspects.

## DETAILED CONTENTS

## 1. Importance of Materials                                  (4 hrs)

- Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys
- Names of common metals, their alloys and non-metals used in Industry
- Properties of metals and alloys
- Physical properties - Appearance, luster, colour, density and melting point
- Mechanical Properties: Strength, stiffness, elasticity, plasticity, toughness, ductility, malleability, brittleness, hardness, fatigue and creep.
- Thermal and electrical conductivity
- Corrosion, causes, effects and prevention.

## 2. Metallurgical Considerations                              (6 hrs)

Solidification of metals form liquid to solid state of pure metals, cooling curves of pure metals, dendritic solidification, crystal formation, types of crystal structure. Phase diagram of:

(i) Solid-state solubility.

(ii) Partial solubility.

(iii) Nil solubility i.e. eutectic solution (Binary only). Effects of all alloying elements on engineering materials. Effect of grain size on mechanical properties.

## 3. Ferrous Metals and Alloys                                 (12 hrs)

- Flow diagram for the production of ferrous metals from their ores, constituents of iron, iron carbon diagram.
- Classification, composition and uses of cast iron and plain carbon steels. IS, BS and SAE Grades
- Effect of alloying elements such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorous on steels.
- Composition, properties, grades and uses of special steels such as High speed steel, Stainless steels, Silicon steels, Heat resistant steels, Spring steel.

- Heat Treatment: Iron-carbon diagram, objectives and practical aspects of heat treatment. Brief description and uses with examples of principal heat treatment processes, Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding and applications. Examples in heat-treating engineering components time, temperature transformation curve.

## 4. Non-ferrous Metals and Alloys                          (12 hrs)
- Copper: Properties and uses
- Composition, properties and uses of copper alloys.
- Brasses: Cartridge brass, Nickel silver.
- Bronzes: Phosphor bronze, Al-bronze, Mn-bronze, and Gun metal.
- Properties and uses of Aluminium.
- Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnalium and Hindalium
- Properties and uses of alloys of lead, tin and magnesium.
- Bearing Metals: Requisite qualities. Composition, properties and uses of white metal bearing, copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bimetallic and tri-metallic bushes

## 5. Identification and Examination of Metals and Alloys       (1 hrs)
Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure. Different types of etchants for preparation of surface structure.

## 6. Other Important Materials                                (10 hrs)
- Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics and their uses and grades.
- Composite materials.
- Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica.
- Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt.
- Sound insulating materials: Cork, fibre boards.
- Fabrication materials: Wood, plywood, rubber – natural and synthetic, Glass – plate glass, toughened glass, safety glass.
- Refractory materials: General characteristics and uses of dolomite, ceramics.
- Protective coating materials: Paints, primers, varnishes, enamels, putti, electroplating materials, rubasil, teflon coating.
- Sealant and adhesives – Application and availability of sealant and adhesives for industrial user.

**7. Selection, specifications and commercial availability of materials    (3 hrs)**
- Practical considerations for selection of material for different purposes
- ISO/Bureau of Indian standard specifications for metals, non-metals, various components and materials.

**LIST OF PRACTICALS**
1. Classification of about 25 specimen of materials/parts in material lab, identify and indicate the type of materials with respect to their properties
2. Study of metallurgical microscope.
3. To prepare microscopic structure for examination and to examine the micro structure of specimens of various metals and alloys.
4. Study of heat treatment furnaces.
5. To study the effects of heat treatments processes on the following materials:
(i) Low carbon steel
(ii) Mild steel
(iii) High Carbon Steel

**RECOMMENDED BOOKS**
1. Material Science by GBS Narang, Khanna Publishers, New Delhi.
2. Material Science and Metallurgy by RB Choudary, Khanna Publishers, New Delhi.
3. Material Science by RK Rajput; SK Kataria and Sons, Delhi.
4. Materials and Matallurgy by D.S. Nutt. SK Kataria and Sons, Delhi.

# 4.4 BUILDING CONSTRUCTION

L T P
4 - -

## RATIONALE

Diploma holders in Civil Engineering are supposed to supervise construction of buildings. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

## DETAILED CONTENTS

### 1. Introduction (1 hr)
1.1 Definition of a building, classification of buildings based on occupancy
1.2 Different parts of a building

### 2. Foundations (4 hrs)
2.1 Concept of foundation and its purpose
2.2 Types of foundation-shallow and deep
**2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonary pillars and concrete columns, raft foundation,
2.2.2 Deep foundations; Pile foundations - their suitability
(This topic may be demonstrated with the help of transparencies)
2.2 Earthwork
2.3.1 Surface excavation, definition, setting out, cutting, filling and blasting
2.3.2 Excavation of foundation, trenches, shoring, timbering and dewatering

### 3. Walls (4 hrs)
3.1 Purpose of walls
3.2 Classification of walls - load bearing, non-load bearing, dwarf, retaining, breast walls and dhaji walls
3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
3.4 Partition walls: Constructional details, suitability and uses of brick and wooden partition walls
3.5 Mortars: types, selection of mortar and its preparation
3.6 Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning

## 4. Masonry                                                                 (8 hrs)

4.1 Brick Masonry: Definition of terms, bond, facing, backing, hearting, column pillar, jambs, reveals soffit, plinth masonry, header, stretcher, bed of bricks bat, queen closer, king closer, frog and quoin

4.1.1 Bond – meaning and necessity; English and flemish bond

4.1.2 Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, racking, back and block bonding), Expansion and contraction joints

4.2 Stone Masonry

4.2.1 Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates throating, thorugh stone parapet, coping, plaster and buttress

4.2.2 Types of stone masonry, rubble masonry, random and coursed ashlar masonry, principles to be observed in construction of stone masonry walls

## 5. Arches and Lintels                                                       (4 hrs)

5.1 Meaning and use of arches and lintels:

5.2 Glossary of terms used in arches and lintels - abutment, peir, arch ring, intrados, soffit, extrados, voussoiers, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

5.3 Arches:

5.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

5.3.2 Stone arches and their construction

5.3.3 Brick arches and their construction

5.4 Lintels

5.4.1 Purpose of lintel

5.4.2 Materials used for lintels: RCC, RBC, stone, steel and timber

5.4.3 Cast-in-situ and pre-cast lintels

5.4.4 Lintel along with sun-shade or chhajja

## **6. Doors, Windows and Ventilators                                         (2 hrs)

6.1 Glossary of terms

6.2 Classification and their suitability for different situations

## *7. Damp Proofing and Water Proofing                                        (6 hrs)

7.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to asthetic appearance, damage to heat insulating materials, damage to stored articles and health, sources and causes of dampness

7.2 Types of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture

7.3 Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc.

7.4 Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc.

7.5 Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals

7.6 Damp proofing of : basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills

**\*\*8. Floors** (6 hrs)

**8.**1 Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose

8.2 Types of floor finishes - cast-in-situ, concrete flooring (monolithic, bonded) Terrazo tile flooring, stone (marble and kota) flooring, PCV flooring, Terrazo flooring, Timber flooring, description with sketches of the methods of construction of the floors and their specifications

**9. Roofs** (6 hrs)

9.1 Glossary of terms for pitched roofs - batten, eaves, barge, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge

9.2 Types of roofs, concept of flat, pitched and arched roofs

9.3 Ceilings – Gypsum, plaster boards, cellotex, fibre boards

**10. Stairs** (4 hrs)

10.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing

10.2 Classifica tion of staircase on the basis of material – RCC, timber, steel, Aluminium

10.3 Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc

10.4 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

**11. Surface Finishes** (6 hrs)

11.1 Plastering - classification according to use and finishes like grit finish, rough cast, pebble dashed, concrete and stone cladding, plain plaster etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing

11.2 Pointing - different types of pointing and their method

11.3 Painting - preparation of surface priming coat and application of paints on wooden, steel and plastered wall surfaces

11.4 White washing, colour washing and distempering, polishing, application of cement and plastic paints

11.5 Commonly used water repellent for exterior surfaces, their names and applications

## 12. Anti Termite Measures (As per IS 6313 –I – III) (4 hrs)

12.1 Introduction, site preparation and chemicals used in anti-termite treatment

12.2 Treatment of masonry foundation

12.3 Treatment of RCC foundation

12.4 Treatment of top surface of earth filling

12.5 Treatment of junction of walls and floors

12.6 Treatment along external perimeter of building

12.7 Treatment and selection of timber

12.8 Treatment in existing buildings

## 13. Building Planning (4 hrs)

13.1 Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public building

13.2 Basic principles of building planning, arrangement of doors, windows, cupboards etc for residential building

13.3 Orientation of building as per IS: 7662 in relation to sun and wind direction, rains, internal circulation and placement of rooms within the available area.

13.4 Planning of building services

## 14. Repair and Maintenance of Buildings (4 hrs)

14.1 Introduction

14.2 Importance of repair and maintenance of buildings

14.3 Common repair problems and their solutions

14.4 Cracks in buildings

14.5 Repair of DPC against rising dampness

14.6 Repair and maintenance of public health services

14.7 Types of materials for building repairs

**Note** * An expert may be invited from field/industry for extension lecture

** A field visit may be planned to explain and show the relevant things

**Demonstration and site visits should be done for following:**

i) Demonstration of tools and plants used in building construction

ii) Layout of a building: two rooms building with front verandah

iii) To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns

iv) Demonstration of pre-construction and post-construction termite treatment of building and woodwork

v) Demonstration of following items of work at construction site:

a) Timbering of excavated trenching

b) Damp proof courses

c) Construction of masonry walls

d) Flooring: Laying of \flooring on an already prepared lime concrete base

e) Plastering and pointing

f) White and colour washing

g) Use of special type of shuttering/cranes/heavy machines in construction work

h) RCC work

**INSTRUCTIONAL STRATEGY**

While imparting instructions in this subject, teachers are expected to take students to work site and explain constructional process and special details for various subcomponents of a buildings. It is also important to make use of audio visual aids/video films (if available) to show specialised operations. The practical work should be given due importance and efforts should be made that each student should perform practical work independently. For carrying out practical works, polytechnics should have building yard where enough raw materials is made available for students to perform practical work

**RECOMMENDED BOOKS**

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.

2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.

3. Rangwala, SC: "Building Construction"; Anand, Charotar Book Stall

4. Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot

5. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.

6. Sharma,SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.

7. Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi

8. Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.

9. SP – 62 Hand Book of BIS

10. Singh Gurcharan, "Building Materials", Standard Publishers Distributor, Delhi

11. B.I.S. – 6313 Part 1, 2, 3

**4.5 AUTOCAD**

L T P
- - 4

**RATIONALE**
This subject enables the students to make drawings using computer software, take prints/plots

**DETAILED CONTENTS**

**Introduction to AutoCAD**

1. Starting up, practice on – how to create a new drawing file, setting drawing limits and saving a file, drawing lines in different ways using absolute co-ordinates, user co-ordinates, WCS, UCS, drawing lines, circles, arcs, ellipses, polygons, splines, polylines, zoom commands

2. Practice on Edit commands such as erase, copy, mirror, array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend, chamfer, fillet

3. Practice on text commands, single line text, paragraph text, editing text, text size, text styles, changing properties commands

4. Practice on layer commands, creating layer, freeze, layer on/off colour assigning, making a layer, current layer, load line type, lock and unlock layer, move from one layer to other.

5. Practice on Hatching-Hatch pattern selection

6. Practice on dimensioning – linear dimensioning, angular dimensioning radius/diameter dimensioning, O-snap command, aligned dimensioning, editing of dimensioning, tolerances in dimensioning

7. Blocks and X-refs - How to make a block, how to insert a block, using block in any drawing, working with x-refs, x-ref options

8. Practice on print/plot commands. Export/import commands

9. Practice on making complete drawings of components by doing exercises

**RECOMMENDED BOOKS**

1. AutoCad by RW Leigh, Galcotia, N.D.
2. Engineering Drawing with AutoCAD 2000 by T. Jaypooran, Vikas Publishing House

# 4.6 ELECTRONIC DEVICES AND CIRCUITS

L T P
4 - 2

## RATIONALE

The purpose of the introduction of electronics in the electrical engineering diploma course has been already explained in the rationale of the subject Basic Electronics in this course topic like Amplifiers, Oscillators and Wave Shape Circuits have been dealt with.

## DETAILED CONTENTS

**1. Transistor Audio Power Amplifier** (10 hrs)
1.1 Difference between voltage and power amplifier
1.2 Important terms in Power Amplifier collector efficiency, distortion and dissipation capability
1.3 Classification of power amplifier class A, B and C
1.4 Class A single-ended power amplifier, its working and collector efficiency
1.5 Impedance matching in a power amplifier using transformer
1.6 Heat sinks in power amplifiers
1.7 Push-pull amplifier circuit details, working and advantages (no mathematical derivations)
1.8 Principles of the working of complementary symmetry push-pull amplifier

**2. Tuned Voltage Amplifier** (7 hrs)
2.1 Introduction
2.2 Series and paralled resonance
2.3 Single and double tuned voltage amplifiers
2.4 Frequency response of tuned voltage amplifiers
2.5 Applications of tuned voltage amplifiers

**3. Feedback in Amplifiers** (7 hrs)
3.1 Feedback and its importance, positive and negative feedback and their need A
3.2 Voltage gain of an amplifier with negative feedback A = ----------1+AB
3.3 Effect of negative feedback on voltage gain, stability, distortion, band width, output and input impedance of an amplifier (No mathematical derivation)
3.4 Typical feedback circuits
3.5 Effect of removing the emitter by-pass capacitor on an ordinary CE transistor amplifier
3.6 Emitter follower and its applications

**4. Sinusodal Oscillators**
4.1. Sinusodal Oscillators – positive feedback in amplifiers
4.2. Difference between an oscillator and an alternator
4.3. Essentials of an oscillator
4.4. Circuit details and working of LC oscillators viz. Tuned Collector, Hartley and Colpitt's oscillators
4.5. R-C oscillator circuits, phase shift and Wein bridge oscillator circuits
4.6. Introduction to piezoelectric crystal and crystal oscillator circuit

**5. Wave-Shaping and Switching Circuits** (15 hrs)
5.1   Concept of Wave-shaping

5.2    Wave-shaping circuits
5.2.1 R-C differentiating and integrating circuits
5.2.2  Diode clipping circuits
5.2.3  Diode clamping circuits
5.2.4  Application of wave-shaping circuits
5.3    Transistor as a switch (explanation using CE transistor characteristics)
5.4    Collector coupled astable, monostable, bistable multivibrator circuits (explanation
       using wave shapes). Brief mention of uses of multivibrators
5.5    Working and applications of transistor inverter circuit using power transistors

8. **Working Principles of different types of power suppliers viz. CVTs, UPS, Stabilizers,
SMPS, IC voltage regulator etc.** (5 hrs)

9. **Operational Amplifier**
7.1. The basic operational amplifier. The differential amplifier. The emitter coupled
     differential amplifier. Offset even voltages and currents
7.2. Basic operational amplifier applications, analog integrator and differentiator
7.3. Familiarisation with specifications and pin onfiguration of IC 741
7.4. Block diagram and operation of 555 IC timer

**LIST OF PRACTICALS**
1. To measure (a) optimum load (b) output power in Class A single-ended transistor amplifier
2. To measure (a) optimum load (b) output power (c) signal handling capacity in a push-pull
   amplifier
3. To measure voltage gain and plot the frequency response curve of single-stage feedback
4. To measure (a) voltage gain (b) input and output impedance for an emitter follower circuit
5. To measure frequency generation in (a) Hartley (b) Colpitt and (c) Wein bridge oscillators
(d) phasing oscillator
6. To observe the differentiated and integrated square wave on a CRO for different values of
   R-C time constant
7. (i) Clipping of one portion of sine-wave using diode
8. Clipping of both portion of sine-wave using:
    a) diode and dc source
    b) zener diodes
    (ii) Clamping a since-wave to:
     a) Negative dc voltage
b) Positive dc voltage
9. To generate square-wave using an astable multivibrator and to observe the wave form on
   a CRO
10. To observe Triggering and working of a bistable multivibrator circuit and observe its output
    wave form on a CRO
11. To use the op-Amp (IC 741) as inverting one) and non-inverting amplifiers, adder,
    comparator, integrator and differentiator
12. To study the pin configuration and working of IC 555 and its use as nonostable and astable
    multivibrator
13. To realize the regulated power supply by using three terminal voltage regulator ICs such

as 7805, 7905, 7915 etc.

**RECOMMENDED BOOKS**

1. A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, Tata McGraw Hill, New Delhi
2. Electronics Principles by SK Sahdev, Dhanpat Rai and Co., New Delhi
3. Electronics Principles by Albert Paul Malina, Tata McGraw Hill, New Delhi
4. Operational Amplifiers and Linear Circuits by Rama Kant and A. Gaykwad, Prentice Hall of India, New Delhi
5. Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
6. Electronic Devices and Circuits by Millman & Halkias, McGraw Hill, New Delhi
7. Analog Electronics – II by DR Arora, Ishan Publication, Ambala
8. Electronic Devices and Circuits by JC Karhara, King India Publication, New Delhi
9. Electronic Devices and Circuits-I, Eagle Prakashan, Jalandhar

# 4.7 WORKSHOP PRACTICE I

L T P
- - 6

**RATIONALE**

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, skills in various machining processes, modern machining methods, processing of plastic, CNC machining, tool, jigs and fixtures is required to be imparted. Hence the subject of workshop practice.

**LIST OF PRACTICALS**
**WELDING**
1. Making following types of joints by gas welding
- Preliminary joining practice
- Vertical welding
2. Exercises of gas welding on the following
- Aluminum
- Brass
- Copper
- C.I.
3. Gas cutting of the following types
- Preliminary gas cutting practice
- Stock cutting by oxy acetylene
- C.I. cutting
4. Making following types of joints by arc welding on M.S, C.I and aluminium
- Joining practice by arc welding
- Butt and lap joint (in vertical position, travel up and down).
- Welding of outside corner joint.
- Inspection of the welding defects occurred in the job.
5. Exercise on spot welding.
6. Exercise on projection welding (industrial visit should be arranged).
7. Exercise on brazing.
8. Exercise on TIG welding.
9. Exercise on MIG welding.

**FOUNDRY**
10. Preparation of the following types of moulds.
- Floor molding
11. Moulding and casting of
- A solid pattern
- A split pattern
12. Testing and inspection of casting defects visually.
13. Study of constructional features of coupla furnace.

**TURNING**
14. Simple exercise on turning and step turning.
15. A composite job involving turning, taper turning, thread cutting and knurling and Eccentric turning.
16. Exercise on internal threading on lathe.

**DRILLING AND FITTING**
17. Marking and drilling practice using column and knee type drilling machine and radial drilling machine.
18. A job on drilling, threading, reaming, counter boring and counter sinking.
19. Exercise on boring with the help of boring bar.
20. Dovetail fitting in mild steel piece
21. Radius fitting in mild steel piece.
22. Exercise on pipe bending on MS pipe and PVC pipe using pipe bending machine.

**PATTERN MAKING**
23. Preparation of solid pattern (single piece)
24. Preparation of split pattern
25. Preparation of self cored pattern

**Note**: 1. The Workshop Superintendent will prepare & finalize the specific drawings of all jobs in the beginning of semester in consultation with staff
2. The Institutions where foundry shop is not existing, they should arrange a visit to foundry industry in the nearby area.

# 5.1 DIGITAL ELECTRONICS AND MICROPROCESSORS

L T P
4 - 3

## RATIONALE

Digital electronics has made extremely rapid advances in the last five decades. It has important applications in communication entertainment, instrumentation, control, automation etc. Thus it appears that there is no end to its usefulness in the light and the new world belongs to it. So it is necessary to give the knowledge of digital electronics to the students. Microprocessor is one of the most exciting technological among the semiconductor devices in recent times. It has a tremendous impact on the Industrial processes due to its high reliability and flexibility both at the design and the Implementation stages. The decreasing cost of with increasing facilities act as catalysts in widening their scope of applications.

## DETAILED CONTENTS

### (Part-A)

**1. Number Systems** (4 hrs)

1.1 Decimal, binary, octal and hexa-decimal number systems and their interconversion
1.2 Binary addition, substraction and multiplication
1.3 1's and 2's complement methods of addition/substraction

**2. Gates** (3 hrs)

Definition, symbol and truth tables for inverter, OR, AND, NAND, NOR and X-OR gates

**3. Boolean Algebra** (5 hrs)

3.1 Boolean Relations
3.2 DeMorgan's Law
3.3 K-Map upto four variables

**4. Combinational Circuits** (8 hrs)

4.1 Half adder, Full adder
4.2 Encoder, Decorder
4.3 Multiplexer/Demultiplexer
4.4 Display Devices (LED, LCD and 7-segment display)

**5. Flip-Flops** (6 hrs)

5.1 J-K Flip-Flop
5.2 R-S Flip-Flop
5.3 D-Type Flip-Flop
5.4 T-Type Flip-Flop
5.5 Applications of Flip-Flops

## 6. A/D and D/A Converters (4 hrs)

6.1 D/A converters (Binary weighted, R-2R D/A Converter)

6.2 A/D converter (Counter ramp, successive approximation method of A/D Conversion)

## 7. Semi-conductor Memories (2 hrs)

## (PART-B)

## 1. Microprocessor (20 hrs)

1.1 Study 8085 microprocessor architecture, pin configuration, bus organisation, registers flags, interrupts

1.2 Instruction set of 8085 microprocessor, addressing modes, instruction format. Writing some simple assembly language programmes. Use of stacks and subroutines in programming

1.3 Interfacing and data transfer between peripheral, I/O and microprocessor

1.4 Study of peripheral chips – 8255, 8253, 9155

1.5 Introduction of 16-bit, 32-bit microprocessor, their advantages over 8-bit microprocessor

1.6 Concept of 8086 and 68000 microprocessors

## 2. Introduction to Microcontrollers (5 hrs)

2.1 Different between microprocessor and microcontroller

2.2 Architecture of 8031 and 8051 varieties of microprocessor

## 3. Programmable Logic Controller (PLC) (6 hrs)

3.1 Introduction to PLC

3.2 Basic configuration of PLC

3.3 Comparison of logic controller

## LIST OF PRACTICALS

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, X-OR gates

2. Construction of Half Adder using gates

3. Construction of Fulf Adder using gates

4. Verification of operation of a 8-bit D/A Converter

5. Writing assembly language programme using numemoanics and test them on μP Kit (any three)

i) Addition of two 8-bit numbers

ii) Substraction of two 8-bit numbers

iii) Mltiplication of two 8-bit numbers

iv) Division of two 8-bit numbers

v) Finding average of N given integer

vi) Finding maximum number out of three given numeric

6. Assembly language programming for different applications on 8051 microprocessor

7. Dadder diagram programming on PLC (any available version of PLC)

**RECOMMENDED BOOKS**

1. Modern Digital Electronics by RP Jain
2. Digital Principles and Electronics by Malvino & Leach
3. Digital Electronics by RL Rokheine
4. Digital Electronics by SN Ali
5. Microprocessor by Goanker,Wiley Eastern Ltd. New Delhi
6. Digital Electronics by T.L. Foyal
7. Digital Electronics by Jamwal
8. Microprocessors Architecture, Programming and Application with 8085/8080A, RS Gaonkar, Wiley Eastern Ltd. New Delhi
9. Introduction to Microporcessors by Aditya Mathur, TMH Publishing Co., New Delhi

**Note**: Question paper will be set 50% from Part-A and50% from Part-B.

## 5.2 INDUSTRIAL ENGINEERING

**L T P**
**4 - -**

**RATIONALE**

A diploma holder will have to conduct time and motion study to improve the methods/system. This subject impart valuable skills to plan and understand plant layout, and production planning and control.

**DETAILED CONTENT**

1. **Production and Productivity** **(6 hrs)**

Production, production functions, productivity, factors affecting productivity, measurement of productivity, causes of decrease in productivity, difference between production and productivity.

2. **Plant Location, Layout and Material Handling** **(8 hrs)**

Plant location, factors affecting plant location, concept of plant layout, types of layout, their characteristics, factors affecting plant layout, work station design, factors considered while designing a work station, introduction, need and objective of material handling, factors considered while selecting a material handling device, safety concept of material handling equipment.

3. **Work Study** **(12 hrs)**

Definition and scope of work study; areas of application of work study in industry, Role of work study in improving productivity, Objectives, needs and methods of method study, information collection, recording techniques, process symbols, charts and diagrams, critical examination, development, installation and maintenance of improved methods, work measurement objectives, needs and methods of work measurement, time study, various allowances, calculation of time, work sampling, standard data and its use. Application of engineered time standards and work sampling Ergonomics, concept and advantages.

4. **Job Evaluation and Incentives** **(12 hrs)**

Introduction, objectives, needs of job evaluation, job definition, job analysis, data source, job evaluation methods such as ranking method, grade description method, point system and factor comparison method, hybrid system. Incentive-definition and concept, incentive and productivity relation, types of incentives such as financial, non financial. Individual and group incentives, pre requisites for incentives, characteristics of a good incentives plan

5. **Production Planning and Control** **(14 hrs)**

Introduction, objectives and components (functions) of P.P.C, Advantages of production planning and Production Control, stages of P.P.C, process planning, routing, scheduling, dispatching and follow up, routing purpose, route sheets, scheduling – purpose, machine loading chart, Gantt chart, dispatching – purpose, and procedure, follow up –purpose and

procedure. CPM/PERT technique, drawing of simple networks and critical time calculation. Production Control in job order, batch type and continuous type of productions. Difference between these controls.

## 6. **Estimation and Costing** (12 hrs)

Introduction, purpose/functions of estimating, costing concept, ladder and elements of cost, difference between estimation and costing. Overheads and their types, estimation of material cost, estimation of cost for machining processes, numerical problems.

## RECOMMENDED BOOKS

1. Industrial Engineering by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.
2. Industrial Engineering by S.C. Sharma; Khanna Publisher.
3. Industrial Engineering and Management by T.R. Banga.
4. Elements of work study by Suresh Dalela.
5. Production Management by Jain and Aggarwal.

# 5.3 POWER ELECTRONICS

L T P
4 - 2

## RATIONALE

Diploma holders in Electronics and Instrumentation and Control are required to handle a wide variety of power electronic equipment used in process control Industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further re-inforce the knowledge and skill of the students.

## DETAILED CONTENTS

### 1. Introduction to thyristors and other power electronics devices          (12 hrs)

a) Construction, Working principles of SCR, two transistor analogy of SCR, VI characteristics of SCR.
b) SCR specifications & ratings.
c) Different methods of SCR triggering.
d) Different commutation circuit for SCR.
e) Series & parallel operation of SCR.
f) Construction & working principle of DIAC, TRIAC & their V-I characteristics.
g) Construction, working principle of UJT, VI characteristics of UJT. UJT as rrelaxation oscillator.
h) Brief introduction to Gate Turn off thyristor (GTO), Programmable uni-function transistor (PUT), MOSFET, IGBT.
i) Basic idea about the selection of Heat sink for thyristors.
j) Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

### 2. Controlled Rectifiers                                      (06 hrs)

a) Single phase half wave controlled rectifier with load (R, R-L)
b) Single phase half controlled full wave rectifier (R, R-L)
c) Fully controlled full wave bridge rectifier.
d) Single phase full wave centre tap rectifier.

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

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

### 4. Tyristorised Control of Electric drives                       (08 hrs)

a) DC drive control
i) Half wave drives.
ii) Full wave drives

iii) Chopper drives (Speed control of DC motor using choppers)
b) AC drive control
i) Phase control (Speed control of induction motor using variable frequency)
ii) Constant V/F operation
iii) Cycloconverter/Inverter drives.
iv) Slip power control of AC drives.

5. **Uninterrupted Power supplies**                  **(04 hrs)**
**i**) UPS, on-line, off line & its specifications
ii) Concept of high voltage DC transmission

**LIST OF PRACTICALS**
1. To plot VI characteristic of an SCR.
2. To plot VI characteristics of TRIAC.
3. To plot VI characteristics of UJT.
4. To plot VI characteristics of DIAC.
5. Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
6. Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
7. Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.
8. Observation of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
9. Varying lamp intensity of AC fan speed control.
10. Installation of UPS system and routine maintenance of batteries.
11. Speed control of motor using SCRs
**RECOMMENDED BOOKS**
1. Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi
2. Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi
3. Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
4. Power Electronics by MH Rashid
5. Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi
6. Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
7. Power Electronics by Sugandhi and Sugandhi
8. Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi

# 5.4 MAINTENANCE OF COMPUTER SYSTEM (MOCS)

L T P
3 - 3

## RATIONALE

PCs have become a necessity in Industry, offices & becoming popular in homes too. This course gives organization structure and principles of working of various other components like visual display, keyboard drives & printers etc. Diploma holders will find employment in computer industry, Repair & maintenance field.

## DETAILED CONTENTS

### 1. CRT Display Device                                    (06 hrs)

Block Diagram, Principle of operation of Computer Monitor, Difference between TV & Computer Monitor. Video Display Adopters (Monocrome & Colour Graphic Adopter)

### 2. Printers                                               (06 hrs)

Printing Mechanism, Construction and working principles and Dot Matrix Printer, Inkjet Printer, Laser Printer, Printer Controller, Concentric Interface, Signals from PC to Printer & Printer to PC.

### 3. Keyboard & Mouse                                       (06 hrs)

Block Diagram of keyboard Controller, keyboard switches, keyboard faults, mouse, common faults with mouse. Introduction to scanner, digitizer.

### 4. Buses & Ports                                          (06 hrs)

Different type of Buses PCI, ISA, SCSI & Ports COM 1, COM 2, LPTI, USB.

### 5. Secondary Memory                                       (08 hrs)

Principle & Construction of Floppy Disk Drive & hard disk device (HDD). Floppy disk Controller & Hard disk controller. Pen Drives, common faults with hard disk drive & floppy disk drive.

### 6. Mother Board                                           (06 hrs)

Introduction to different type of mother boards, Single Board Based System, Block diagram of motherboard. Installation of Computer System.

### 7. Network Devices                                        (05 hrs)

Brief Introduction & working of following HUBS, Routers, Bridges, Switches, LANS, WANS

## LIST OF PRACTICALS

Operation, Maintenance, Installation & Testing of the following devices:
1 Keyboard
2 Mouse
3 Monitors

4 FDD
5 HDD
6 DOT Matrix Printer
7 Laser Printer
8 Mother board
9 CD-ROM
10 Connectors & Cables

**RECOMMENDED BOOKS**

1. PC Organisation by S. Chowdhury, Dhanpat Rai & Sons, Delhi
2. IBM PC Colours by Govinda Rajalu, Tata McGraw Hill Publishers, New Delhi
3. Text Book by Mark Mirasi

## 5.5 NON CONVENTIONAL ENERGY SOURCES

L T P
4 - -

**RATIONALE**

Energy is a crucial input in the process of economic, social and industrial development. High energy consumption has traditionally been associated with higher quality of life, which in turn is related to Gross National Project ( GNP). Since the conventional energy resources are under depletion, it is high time to tape the non conventional energy sources. The electrical diploma holder will have to face this challenges in future life. Therefore this subject is offered in diploma programme for future benefit.

**DETAILED CONTENTS**

**1. Introduction** **(6 hrs)**

Importance of Non conventional sources of energy, Present Scenario, Future Prospects, Economic Criteria

**2. Solar Energy** **(10 hrs)**

Physical Principal of the conversion of Solar radiation into heat, Photo-voltaic cell, Electricity generation, Solar water heaters, Solar Furnaces, Solar cookers, Solar Stills solar pumping.

**3. Hydro Energy** **(8 hrs)**

Hydro-electric Power Plants, Mini and Micro hydro-electric power generation. Magneto Hydro Dynamic (MHD) Power Generation.

**4. Bio-energy** **( 8 hrs)**

Bio-mass Conversion Technologies- wet and dry processes. Methods for obtaining energy from Biomass. Power Generation by using gassifiers

**5. Wind Energy** **(6 hrs)**

Wind Energy Conversion, Wind mills, Electricity generation from wind- Types of wind mills, local control, energy storage

**6. Geo-thermal and Tidal Energy** **( 10 hrs)**

Geo-thermal sources, Ocean thermal electric conversion, open and closed cycles, hybrid cycles. Prime movers for geo-thermal energy conversion. Steam Generation and electricity generation.

**7. Chemical Energy Sources** **(10 hrs)**

Design and operating principles of a fuel cell, conversion efficiency, work output and emf of fuel cells, applications storage battery characteristics, types, applications, maintenance of batteries.

**8. Thermo Electric Power** ( 6 hrs)

Basic principle, performance analysis of thermo electric power generation, thermoelectric materials and their application.

**RECOMMENDED BOOKS :**

1. Solar Energy – Principles of thermal collection and Storage SP Sukhatme, Tata McGraw Hill Publication, New Delhi.
2. Solar Energy Utilization; GD Rai ; Khanna Publishers, New Delhi.
3. Reviews of Renewable Energy Sources, Vol. 3, Edited by MS. Sodha, S.S. Mathur, MAS Malik, TC Kandpal ; Wiley Eastern Limited, New Delhi.
4. Renewable Energy Sources and Conversion Technology by NK Bansal,Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delhi.
5. Energy Today and Tomorrow; Maheshwar Dayal; Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi.
6. Energy Technology (non-conventional, renewable and conventional) by S Rao and BB Parulekar, Khanna Publishers, New Delhi

## 5.6  INTERNET AND WEB DESIGNING

L T P
3 - 4

**RATIONALE**

This course will enable the students to understand the basics of internet and various application of internet like e-mail, FTP, Telnet, Newsgroups and video conferencing In addition, this course develops competency amongst the students to design professional web sites and interactive web pages. They will have overview of different technologies like of HTML, DHTML, XML, CGI, ASP, JSP, Java Scripts, VB Scripts.

**Note:**

**Since this subject is practice-oriented, theoretical instructions may be given during the practical sessions/class. The detailed contents have been given to have an idea about the exercises to be done in practical class.**

**DETAILED CONTENTS**

**1. Internet Basics**                                                       (6 hrs)

Concept of internet and its evolution, Application and use of internet in various fields of Science and Technology, Specification and technical details for establishing Internet. Types and functions of modems, IP addressing, internet domains, domain name server, TCP/IP protocols, Internet service providers, Intranets

**2. Internet Connectivity**                                               (4 hrs)

Telephone line, cable, leased line, ISDN, VSAT, RF link

**3. World Wide Web (WWW)**                                            (6 hrs)

World Wide Web and its evolution, web page, web server, HTTP protocol. Examples of web servers. Navigation Tools: Netscape and Internet Explorer to surf Internet, Uniform Resource Locator (URL) Hypertext, hyperlinks and hypermedia, URL, its registration, browsers, search engines, proxy servers

**4. Internet Applications**                                              (4 hrs)

E-mail, Telnet, FTP, IRC, NNTP, Video conferencing, e-commerce

**5. Developing Portals Using HTML**                                     (6 hrs)

Basic structure of HTML, designing a web page, inserting links images, horizontal rules, comments. Formatting text, title, headings, colours, fonts, sizes, simple tables and forms. HTML tags, hyperlinks. Adding graphics and images, image maps, image files. Using tables, forms, style sheets and frames

**6. Using Front Page**                                                   (4 hrs)

Front page editor, Front page explorer

**7. Client-side Scripting: VB Scripting Vs Java Script,**              (4 hrs)

**8. Introduction to Java Scripts, event handling, verifying forms, working with browser windows, cookies, embedding with HTML**

**9. Server-side Scripting: Scripting methods**             **(4 hrs)**

**10. Java Server Pages (JSP)**             **(4 hrs)**

**11. Active Server Pages (ASP)**             **(4 hrs)**
Text processing using ASP, Handling server/Client requests, Accessing databases, using IIS web server; ASP Objects

**12. Developing Interactive Web Pages using Java scripts/VB Scripts/Java script/ASP/ JSP/CGI**         **(6 hrs)**

**LIST OF PRACTICALS**
1. Configuring computer system to access internet
2. Using e-mail
3. Using WWW for accessing relevant information
4. Using Telnet
5. Using FTP
6. Using IRC
7. Creating Web pages using HTML
8. Creating web pages using front page
9. Demonstration of audio-video conferencing
10. Demonstration of e-commerce transaction
11. Design of Forms using Java Script or Visual Basic Script
12. Validation of user queries and responses in the Forms using Java Script or VB script
13. Create a Homepage with frames, animation, background sound and hyperlinks
14. Design Shopping Cart for e-commerce applications
15. Develop hitometer for each client i.e. number of visitors. Visit to a site.
16. Designing simple server side program which accept some request from the client and respond
17. Establishing sessions between servers and clients
18. Design fill-out form with text, check box, radio buttons etc and embed Java script or VB script to validate users input.
19. Develop simple server side program in ASP (Active server pages) which accept some request from the client and respond.
20. Develop interface with database (MS-Access etc) for online retrieval and storage of data through HTML form.

**RECOMMENDED BOOKS**
1. Internet 6-in-1 by Kraynak and Habraken, Prentice Hall of India Pvt. Ltd., New Delhi
2. Using the Internet IV edition by Kasser, Prentice Hall of India Pvt. Ltd., New Delhi
3. Using the World Wide Web, (IInd edition) by Wall, Prentice Hall of India Pvt. Ltd., New Delhi

4. Internet for Everyone by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., New Delhi

5. Practical Guide and Internet by AB Tiwana; Galgotia Publications Pvt. Ltd., New Delhi

6. HTML – 4 for World Wide Web by Castro Addison Wesley (Singapore) Pvt. Ltd., New Delhi

7. Principles of Web Designing Joel Sklar, Web Warrior Series Available with Vikas Publishing House Pvt. Ltd., New Delhi

8. HTML 4.0 Unleashed by Rick Dranell; Tech Media Publications

9. Teach Yourself HTML 4.0 with XML, DHTML and Java Script by Stephanie, Cottrell, Bryant; IDG Books India Pvt. Ltd., New Delhi

10. Dynamic Web Publishing – Unleashed Tech Media

11. Using Active Server Pages by Johnson et.al. Prentice Hall of India, New Delhi

12. Web Development with Visual Basic with CD ROM by Chapman; Prentice Hall of India, New Delhi

13. Java Server Pages (JSP) by Pekowsky Addison Wesley (Singapore) Pvt. Ltd., New Delhi

14. Active Server Pages (ASP) by Keith Morneau Jill Batistick Web Warrier Series Available with Vikas Publishing House Pvt. Ltd., New Delhi

15. ASP Unleashed Tech Media Publication

16. JSP O'Reilly SPD Publishers Hans Bergsten

17. Java Script in 24 hrs Tech Media Publications

18. Java Servlets by O'Reilly SPB Publishers

## ELECTIVE-II
## 5.6  COMPUTER NETWORKS

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**RATIONALE**

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. It is important to understand the function of computer networks. Knowledge about hardware and software requirements of networks is essential. The emphasis of the course is towards the various components and software required to make a network operational.

**DETAILED CONTENTS**

**1. Networking Basics**                                                                 **(8 hrs)**

Definition of network, Models of network computing, Network models, LAN, MAN and WAN, needs and goals of networking topology, network architecture, need for protocols, OSI Reference Model, layer services, primitives and service access points.

**2. Data Link Layer**                                                                   **(5 hrs)**

DLL design issues, elementary data link protocols, sliding window protocols

**3. Network Layer**                                                                     **(5 hrs)**

Brief discussion on need for network layer, routing algorithm, congestion and its control methods, internetworking

**4. Transport Layer**                                                                   **(5 hrs)**

Transport service primitives, quality of service, barkeley sockets, elements of transport protocols

**5. Session Layer**                                                                     **(5 hrs)**

Functioning of session layer, OSI primitives, retrotic procedure calls

**6. Data Compressing**                                                                  **(4 hrs)**

Huffman arithmetic codes, data encryption, public encryptography and its uses

**7. Presentation Layer**                                                                **(4 hrs)**

Presentation layer primitives, function of presentation layer

**8. Application Layer**                                                                  **(6 hrs)**

Application layer design issue, file transfer and management, E-mail, virtual terminal

**9. Network Connectivity**                                                              **(6 hrs)**

- NICs, hubs, switches, repeaters, multiplexers, modems, routers

**LIST OF PRACTICALS**
1. Identification of various networks components
- connections, BNC, RJ-45, I/O box
- Cables, Co-axial, twisted pair, UTP
- NIC (network interface card)
- Switch, hub
2. Sketch wiring diagrams of network cabling considering a computer lab of 20 systems
3. Interfacing with the network card (Ethernet)
4. Preparing of network cables
5. Establishment of a LAN
6. Use of protocols in establishing LAN
7. Trouble shooting of networks
8. Installation of network device drivers
9. Installation of networks (Peer to Peer Networking client server interconnection)
10. Use/installation of proxy server

**RECOMMENDED BOOKS**
1. Computer Networks by Tanenbaum, Andrew S, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Foronzan, Tata McGraw Hill, New Delhi
3. Local area Networks by Peter Hudson
4. Understanding Local area Network by Neil Jenkins

# 6.1 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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## RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

## DETAILED CONTENTS

### (1) Entrepreneurship                                                        (4 hrs)
1.1 Concept/Meaning
1.2 Need
1.3 Competencies/qualities of an entrepreneur

### (2) Entrepreneurial Support System                                          (6 hrs)
2.1 District Industry Centres (DICs)
2.2 Commercial Banks
2.3 State Financial Corporations
2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

### (3) Market Survey and Opportunity Identification (Business Planning)     (6 hrs)
3.1 How to start a small scale industry
3.2 Procedures for registration of small scale industry
3.3 List of items reserved for exclusive manufacture in small scale industry
3.4 Assessment of demand and supply in potential areas of growth
3.5 Understanding business opportunity
3.6 Considerations in product selection
3.7 Data collection for setting up small ventures

### (4) Project Report Preparation                                             (6 hrs)
4.1 Preliminary Project Report
4.2 Techno-Economic feasibility report
4.3 Project Viability

### (5) Managerial Aspects of Small Business                                   (8 hrs)
5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control

5.2 Operational Aspects of Production
5.3 Inventory Management
5.4 Basic principles of financial management
5.5 Marketing Techniques
5.6 Personnel Management
5.7 Importance of Communication in business

**(6) Legal Aspects of Small Business** (6 hrs)
6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
6.2 Factory Act and Payment of Wages Act

**(7) Environmental considerations** (6 hrs)
7.1 Concept of ecology and environment
7.2 Factors contributing to Air, Water, Noise pollution
7.3 Air, water and noise pollution standards and control
7.4 Personal Protection Equipment (PPEs) for safety at work places

**(8) Miscellaneous** (6 hrs)
8.1 Human relations and performance in organization
8.2 Industrial Relations and Disputes
8.3 Relations with subordinates, peers and superiors
8.4 Motivation – Incentives, Rewards, Job Satisfaction
8.5 Leadership
8.6 Labour Welfare
8.7 Workers participation in management

**RECOMMENDED BOOKS**
1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

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## RATIONALE

Diploma holders in this course required to measure and inspect for ensuring quality of product. For this purpose, knowledge and skills about standards of measurement, limits, fits and tolerances, types of inspection and various measuring instruments, SQC & quality standards are necessary.

## DETAILED CONTENTS

### 1. Inspection                                                                                    (8 hrs)

- Introduction, units of measurement, standards for measurement and interchangeability.
- International, national and company standard, line and wavelength standards.
- Limits fits and tolerances: study of natural variability of process. Indian standards on limits, fits and tolerances including terminology, guide for selection of fits, clearance, transition and interference. Positional tolerances: maximum material condition usage of standards for deciding tolerance.
- Planning of inspection: what to insect? When to inspect? Who should inspect? Where to inspect?
- Types of inspection: remedial, preventive and operative inspection, incoming, inprocess and final inspection.
- Study of factors influencing the quality of manufacture.

### 2. Measurement and Gauging              (18 hrs)

- Basic principles used in measurement and gauging, mechanical, optical, electrical and electronic.
- Study of various measuring instruments like: calipers, micrometers, dial indicators, surface plate, straight edge, try square, protectors, sine bar, clinometer, comparators – mechanical, electrical and pneumatic. Slip gauges, tool room microscope, and profile projector, talysurf. Limit gauges: plug, ring, snap, taper, thread, height, depth, form, feeler, wire and their applications for linear, angular, surface, thread and gear measurements, gauge tolerances.
- Geometrical parameters & errors: Errors & their effect on quality, concept of errors, measurement of geometrical parameter such as straightness, flatness & parallelism.
- Study of procedure for alignment tests on lathes, drilling and milling machines.
- Testing and maintenance of measuring instruments.

### 3. Statistical Quality Control                                            (12 hrs)

- Basic statistical concepts, empirical distribution and histograms, frequency, mean, mode, standard deviation, normal distribution, binomial and Poisson (No mathematical derivations).

- Introduction to control charts, namely X, R, P and C charts and their applications.
- Sampling plans, selection of sample size, method of taking samples, frequency of samples.
- Inspection plan format and test reports
- Concept of total quality management (TQM)

## 4. Standards and Codes                                    (4 hrs)
- National and International Codes.
- ISO-9000, concept and its evolution and implications.

## 5. Instrumentation                                        (6 hrs)
Measurement of mechanical quantities such as displacement, vibration, frequency, pressure temperature, humidity by electro mechanical transducers of resistance, capacitance & inductance type.

## LIST OF PRACTICALS
1. Use of dial indicator for measuring taper.
2. Use of combination set, bevel protector and sine bar for measuring taper.
3. Measurement of thread characteristic using vernier and gauges.
4. Measurement of all elements of gauges by using flange micrometer, gear roller tester, gear tooth vernier and profile projector.
5. Use of slip gauge in measurement of center distance between two pins.
6. Use of tool maker's microscope and comparator.
7. Verify that when random samples are taken from a universe with a certain percentage of defectives same percentage tends to appear in random samples by using (Shewart's plastic kit box).
8. Plot frequency distribution for 50 turned components.
9. With the help of given data, plot X, R, P and C charts.

## LIST OF RECOMMENDED BOOKS
1. Statistical Quality Control by M.Mahajan: Dhanpat Rai and Sons, Delhi
2. Engineering Metrology by RK Jain
3. Engineering Metrology by RK Rajput; SK Kataria and Sons
4. Production Planning Control and Management by KC Jain & Aggarwal; Khanna Publishers, New Delhi

# 6.3 INSTALLATION, TESTING & MAINTENANCE

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**RATIONALE**

A diploma engineer comes across installation, maintenance and testing of various machines and equipment in industries. The layout of different machines, their foundations is an important phenomenon of an industry. He should know the various methods of testing & maintenance. This subject will enable the diploma holders to deal with such aspects.

**DETAILED CONTENTS**

**1. Introduction**                                                     **(4 hrs)**
- Necessity of testing, repair and maintenance
- Economic aspects, manpower planning and materials management
- Fits and tolerances – common fits and tolerances used for various machine parts

**2. Execution and Commissioning of Machines (Installation)**        **(4 hrs)**
- Location, layout and positioning of machines
- Foundation – types of foundation, foundation plan, erection and leveling, grouping, vibration damping, vibration isolation – methods of isolation

**3. Inspection, Servicing, Repair & Overhauling of machines and equipment (8 hrs)**
- Inspection of various machines and equipment
- Servicing of various machines and equipment
- Repair of various machines and equipment
- Overhauling of various machines and equipment
- Recalibration of various measuring instruments, testing the speed of machines, accuracy of machines, alignment and performance of machines.

**4. Maintenance planning & stages of maintenance**    **(6 hrs)**
- Maintenance planning
- Various stages of maintenance

**5. Reliability, availability and Maintainability**                    **(4 hrs)**

**6. Overhauling**                                                      **(6 hrs)**
- Frequent failure of common parts, their causes & remedical measures.
- Maintenance schedule**.**
- Parts which require frequent maintenance such as belts, couplings, nut, bolts, their repair & maintenance to avoid downtime.

**7. Maintenance**                           **(10 hrs)**
- Meaning of maintenance, advantages & disadvantages
- Types of maintenance

- Preventive, predictive & breakdown maintenance.
- Maintenance organization.
- Centralized maintenance & decentralized maintenance.
- Computerization of maintenance.

**8. Storage of parts** **(6 hrs)**
- Storage of parts used frequently for replacement and parts which are not easily available in local market.
- History cards of different machines.
- Machines repair/replacement decision.

**LIST OF PRACTICALS**
1. Preparation of prevention maintenance check.
2. Condition monitoring by NDT.
3. Case study on trouble free maintenance.
4. Project on maintenance of utility equipment like compressors, pumps, driers, and actuator type valves.
5. Equipment/machine leveling and alignment.
6. Maintenance of material handling equipment – pulley blocks, hand operated cranes, fork fits, hydraulics jacks, mobile cranes, and winches.
7. Use of lubrication equipment like oil gun, grease gun.
8. Removing old lubricant, cleaning and replenishing and machine with fresh lubricant.
9. Case study on computerized maintenance schedule.
10. Reconditioning of machine parts.
11. Visit to maintenance department of an industry & prepare a report.

**RECOMMENDED BOOKS**
1. Industrial Maintenance by HP Garg; S. Chand and Company.
2. Plant Maintenance Engineering by RK Jain; Khanna Publishers.
3. Installation, Servicing and Maintenance by SN Bhattacharya; S. Chand and Company.
4. Installation, Maintenance, Servicing by AR Basu; M Dutta and Co., Calcutta.
5. Maintenance Engineering and Management by RC Mishra and K Pathak; Prentice Hall of India Pvt., Ltd., New Delhi.

# 6.4 ENVIRONMENTAL ENGINEERING

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## RATIONALE

Civil Engineering diploma holders must have the knowledge of different types of environmental aspects due to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of the environmental laws for effectively combating environmental pollution. The class room instructions should be supplemented by field visits to show the pollution caused by urbanization and the combatment measures being adopted at site. Extension lectures by experts may be encouraged.

## DETAILED CONTENTS

### 1. Environment and Ecology (4 hrs)

Definition and understanding of environment and ecology concept, ecosystem and types of ecosystems, energy flow in an ecosystem, food chain, ecological pyramids, consortium and ecological balance, important biogeo chemical and material cycles, (water, carbon, sulphur, oxygen and nitrogen etc)

### 2. Protection of Environment (2 hrs)

Importance of clean environment, control of environmental pollution with respect to air, land and water. Conservation of natural resources, environmental education and awareness

### 3. Water Pollution (8 hrs)

Causes of pollution in surface and underground water; BIS standards for water quality, preventive measures to control water pollution, harmful effects of domestic wastes and industrial effluent, BIS standards for waste water disposal, measures to combat pollution due to waste water, eutrophication of lakes

### 4. Air Pollution (6 hrs)

Definition, principal air pollutants, atmospheric parameters influencing air pollution, types of air contaminants and their sources, effects of air pollution on human beings, plants, animals and economic effects, automobile pollution, BIS ambient air quality standards and measures to combat air pollution

### 5. Noise Pollution (2 hrs)

Definition, unit of measurement of noise, sources and effects of noise pollution and control of noise pollution

## 6. Effects of mining, blasting and deforestation                    (6 hrs)

Environmental deterioration due to mining, open cast mining; land damage by subsidence, blocking of land by refuse heaps; effects of deforestation and killing of wild animals. Case studies on mining, blasting and deforestation

## 7. Land Use                                                          (6 hrs)

Effect of land use on environmental quality, land use and natural disasters, soil degradation problems - erosion, salinization and water logging, soil pollution, planning for land use and environmental improvement, environmental consideration in housing and city planning, Land reclaimation - waste land and wet land development and case studies

## 8. Environmental Impact Assessment                                   (4 hrs)

Definition and requirements, environmental impact assessment as a result of constructional activities – housing, dams, multi-storeyed buildings, roads, etc, case studies, environmental auditing - basic concepts, sustainable development – concept of carrying capacity

## 9. Legislation to Control Environmental Pollution                    (4 hrs)

Indian legislative acts for water, land and air pollution control – provisions, scope and implementation

## 10. Global Issues of Environmental Engineering                       (4 hrs)

Global warming, ozone depletion, acid rain, oil pollution; radiation hazards and their control

## 11. Renewable Source of Energy                                       (2 hrs)

Role of non-conventional sources of energy (biogas, solar, wind etc) in environmental protection

## INSTRUCTIONAL STRATEGY

Students should be encouraged to undertake project work related to environmental problems. They should visit at least three industrial effluent treatment plants and study the impact of utilization of reclaimed by products

## RECOMMENDED BOOKS

1. Environmental Engineering by Deswal and SS Deswal; Dhanpat Rai and Company (P) Ltd., Delhi
2. Odum EP, "Fundamentals of Ecology", Amarind publication Co., Delhi
3. Environmental Engineering and Management by SK Dhamija; SK kataria and Sons, Delhi
4. De AK, "Engineers Chemistry", New Age Publication, Delhi
5. Kendeigh SC, "Ecology", Prentice Hall of India, Delhi

# 6.5 AUTOMOBILE ENGINEERING

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## RATIONALE

These days, automobiles has become a necessity instead of luxury. There has been phenomenal development of Automobile industry. The Diploma holders in Mechanical Engineering are required to supervise production and repair and maintenance of vehicles. For this purpose, knowledge and skills are required to be imparted to them regarding automobile industry as a whole. This subject aims at developing required knowledge and skills in this area:

## DETAILED CONTENTS

### 1. Introduction                                               (4 hrs)

- Components of an automobile
- Classification of automobiles
- Layout of chassis
- Types of drives-front wheel, rear wheel, four wheel, left hand, right hand

### 2. Transmission System                                        (12 hrs)

- Clutch Function, Constructional details and working of single plate and multiplate friction clutches, Centrifugal and semi centrifugal clutch
- Gear Box – Function, construction and working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive, fluid coupling
- Function of Universal joint, propeller shaft, Function and construction of differential, Rear axle drives. Function of rear axle and different types of rear axles
- Wheels and Tyres-Types of wheels - disc wheels and wire wheel, Types of tyres used in Indian vehicles, Toe in, toe out, camber, caster, kingpin inclination, Tubeless tyres

### 3. Steering System                                            (5 hrs)

- Function and principle
- Ackerman and Davis steering gears
- Types of steering gears - worm and nut, worm and wheel, worm and roller, rack and pinion type

### 4. Braking system                                             (5 hrs)

- Constructional details and working of mechanical, hydraulic and vacuum brake
- Details of master cylinder, wheel cylinder
- Concept of brake drum, brake lining and brake adjustment

## 5. Suspension System                                              (4 hrs)
- Function
- Types
- Working of coil spring, leaf spring Shock absorber
- Shock absorber

## 6. Battery                                                        (6 hrs)
- Constructional details of lead acid cell battery
- Specific gravity of electrolyte - effect of temperatures on specific gravity
- Capacity and efficiency of battery
- Battery charging, chemical reactions during charge and discharge.
- Maintenance of batteries
- Checking of batteries for voltage and specific gravity

## 7. Dynamo and Alternator                                          (6 hrs)
- Dynamo - Function and details, Regulators - voltage current and compensated type, Cutout - construction, working and their adjustment
- Alternator-Construction and working, Charging of battery from alternator

## 8. Diagram of a Typical Wiring System                             (2 hrs)

## 9. Lighting System and Accessories                                (4 hrs)
- Lighting system
- Wiring circuit
- Headlight, aiming of headlights
- Lighting switches
- Direction indicators
- Windscreen wiper
- Horn
- Speedometer
- Heater
- Air conditioning

## LIST OF PRACTICALS
1. Fault and their remedies in (i) Battery Ignition system (ii) Magneto Ignition system
2. Study and sketch of (i) Head Light Model (ii) Wiper and Indicators
3. Study and sketch of (i) AC Pump (ii) SU Pump (iii) Master Cylinders
4. Study and sketch of (i) rear axle (ii) differential (iii) steering system
5. Fault finding practices on an automobile - four wheelers (petrol and diesel vehicles)
6. Assembly and disassembly of petrol and diesel engine of an automobile.
7. Tuning of an automobile engine.
8. Driving practice on a four wheeler.

9. Charging of an automobile battery and measuring cell voltage and specific gravity of electrolyte.

10. Phasing and calibration of fuel injection pump

11. Checking and adjusting clutch pedal play and brake pedal play, tightness of fan belt plate and brake shoe

12. Rotation of wheels and inflation of tyres, alignment of wheels

13. Measuring spark gap, valve clearance and ring clearance

14. Cleaning and adjusting a carburetor

15. Nozzle cleaning, testing and adjustment

**RECOMMENDED BOOKS**
1. Automobile Engineering Vol. I by Kirpal Singh; Standard Publishers, New Delhi.
2. Automobile Engineering Vol. I by GBS Narang; Khanna Publishers, Delhi.
3. Automobile Engineering by RB Gupta; Satya Parkashan, New Delhi.

## 6.6     PROJECT WORK

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Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The Students have various aptitudes and strength. Project work, therefore, should match the strength of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignment. 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 for a group. The students should identify or given project assignment at least two to three month in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

-Projects related to increasing productivity

-Projects related to quality assurance

-Projects related to estimation and economics of production

-Projects connected with repair and maintenance of plant and equipment

-Projects related to identification of raw material thereby reducing the wastage

-Any other related problems of interest of host industry

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

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

The overall grading of the practical training shall be made as per following table:

| Sr.No. | 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 |

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8-10 weeks of project oriented professional training in the same industry and re-evaluated 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.

**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 100 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 near by industries are approached for instituting such awards.**

The teachers are free to evolve another 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 organizations in such an exhibition. 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 institute. It would be better if specific industries are approached for instituting such awards.