

**Kalinga University Atal Nagar (C.G.)**



**SCHEME OF EXAMINATION  
& SYLLABUS**

**of**

**Diploma in Mechanical Engineering**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**w.e.f. Session 2021-22**

**RAIPUR**

**Kalinga University, Raipur**  
**Diploma in Mechanical Engg. (3 yrs Programme)**  
w.e.f 2021-22 session

SEMESTER - I (Common for all branches)						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME101	Communication Skills - I	3	70		30	100
DIME102	Applied Mathematics-I	3	70		30	100
DIME103	Applied Physics -I	3+1	70	50	30	150
DIME104	Applied Chemistry -I	3+1	70	50	30	150
DIME105	Engineering Drawing -I	3+1	70	50	30	150
DIME106	Computer Fundamentals and Applications	2+1	50	50		100
DIME107	Workshop Practice -I	1		50		50
	<b>Total</b>	<b>22</b>	<b>400</b>	<b>250</b>	<b>150</b>	<b>800</b>
Semester - II						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME201	Communication skills – II	3	70		30	100
DIME202	Applied Maths-II	3	70		30	100
DIME203	Applied Physics –II	3+1	70	50	30	150
DIME204	Applied Chemistry –II	3+1	70	50	30	150
DIME205	Applied Mechanics	3+1	70	50	30	150
DIME206	Engineering Drawing –II	3+1	70	50	30	150
	<b>Total</b>	<b>22</b>	<b>420</b>	<b>200</b>	<b>180</b>	<b>800</b>
Semester - III						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME301	Strength of Material	3+1	70	50	30	150
DIME302	Thermodynamic	3+1	70	50	30	150
DIME303	Basic of Electrical & Electronics Engg	3+1	70	50	30	150
DIME304	Workshop Technology & Practice-I	3+1	70	50	30	150
DIME305	Machine Drawing	2+1	70	50	30	150
DIME306 P	Computer Applications in Mechanical Engg	1		50		50
	<b>Total</b>	<b>20</b>	<b>350</b>	<b>300</b>	<b>150</b>	<b>800</b>

Semester - IV						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME401	Material & Meteorology	3+1	70	50	30	150
DIME402	Hydraulics & Hydraulics Machine	3+1	70	50	30	150
DIME403	Internal Combustion Engine	3+1	70	50	30	150
DIME404	Workshop Technology & Practice –II	3+1	70	50	30	150
DIME405	Machine Design & Drawing	3	70		30	100
DIME406	Environmental Engg.	3	70		30	100
	<b>Total</b>	<b>22</b>	<b>420</b>	<b>200</b>	<b>180</b>	<b>800</b>

Semester - V						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME501	Theory of Machines	3	70		30	100
DIME502	Refrigeration & Air conditioning	3+1	70	50	30	150
DIME503	Workshop Technology & Practice –III	3+1	70	50	30	150
DIME504	CNC Machine & Auto Machines	3	70		30	100
DIME505	Computer Integrated Manufacturing	3+1	70	50	30	150
DIME506 P	Industrial Training	2				150
	<b>Total</b>	<b>20</b>	<b>350</b>	<b>150</b>	<b>150</b>	<b>800</b>

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Semester - VI						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIME601	Industrial Management	3	70		30	100
DIME602	Inspection & Quality Control	3+1	70	50	30	150
DIME603	Automobile Engineering	3+1	70	50	30	150
DIME604	Entrepreneurship Development & Management	3	70		30	100
DIME605	Installation, Testing & Maintenance	3+1	70	50	30	150
DIME606	Project Work	6	100		50	150
	<b>Total</b>	<b>24</b>	<b>450</b>	<b>150</b>	<b>200</b>	<b>800</b>





# **SEMESTER-I**

RAIPUR

## COMMUNICATION SKILL-I

### UNIT-I

#### Passage for Comprehension:-

- (1) Language of Science
- (2) Robotic Revolution
- (3) Designing a Car
- (4) New Wonders of camera
- (5) Non-conventional sources of Energy
- (6) Our Environment
- (7) Entrepreneurship
- (8) Safety practices

### UNIT-II

#### Short-Stories :-

- (1) Selfish Giant-Oscar Wilde
- (2) A Letter to God-Gregario Lapex Y-Fuentes An astrologer's Day –R.K. Naragyan

### UNIT-III

#### Applied Grammar :-

- (1) Determiners
- (2) Auxiliaries
- (3) Tenses
- (4) Passive
- (5) Prepositions
- (6) Subject-verb Agreement

### UNIT-IV

#### Letter Writing:-

- (1) Application (For Job/Leave)
- (2) Letter of Enquiry and replies
- (3) Letter for Order Placement
- (4) Letter of Complaints (To Editor/ Appropriate Authorities)

### UNIT-V

#### Report Writing :-

- (1) Writing Progress – Report of a job
- (2) General outline for preparing A Project Report.

#### Reference Books

1. Communication Skill for Teaching Students Book-I. M/s Somalia Publications. Pvt. Ltd., Bhopal.
2. Living English Structure –W.S. Allen
3. Practical English Grammar (Exercises I by Thomson & Martinet)
4. English conversation practice by Grant Taylor.

## APPLIED MATHEMATICS-I

### UNIT-I

#### Algebra-

#### Determinants and Matrices-expansion

Determinants and Matrices-expansion of determinants(upto third order)using sarrus Rank, expansion method and pivotal condensation method. Properties of determinants ,solutions of equations (up to 3 unknowns)by Cramers's rule. Definition of matrix, addition, subtraction and multiplication of matrices(up to third order).inverse of a matrix by Adjoint method and elementary row transformations. Solution of equations(up to 3 unknowns)by Matrix method

### UNIT-II

#### Logarithm

general properties of logarithms

#### Partial fractions

(linear factors, repeated linear factors ,non reducible quadratic factors)

To resolve proper fraction into partial fraction with denominator containing non repeated linear factors to resolve improper fraction into partial fraction

### UNIT-III

#### Trigonometry

Trigonometric ratios of any angle relation between degree and radian

Fundamental identities examples based on fundamental identities factorization

And defactorization formulae inverse trigonometric ratios value of inverse trigonometric ratios

### UNIT-IV

#### Vectors

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

#### Circle

Equation of circle in standard form centre radius form diameter form

General equation of circle

### UNIT-V

#### Complex Numbers

Definition, Real and Imaginary parts of a complex number, polar and Cartesian representation of a complex number and conversion from one to the other, conjugate of a complex number, modules and argument of a complex number.

#### Reference Books:-

- Mathematics for Polytechnic Volume I, TTTI Publication
- Applied Mathematics, EEB Publication , Bhopal
- Differential Calculus, By Gorakh Prasad
- Integral Calculus, By Gorakh Prasad
- Coordinate Geometry, By. S.L. Loney



DIME103

### **APPLIED PHYSICS-I**

**UNIT-I** Units and Dimensions: Physical quantities, Fundamental and derived units, Systems of units (FPS, CGS, MKS and SI units) , Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) Principle of homogeneity , Dimensional equations and their applications, conversion



from one unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration ,  
Limitations of dimensional analysis

## **UNIT-II**

Force and Motion: Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors. Force, resolution and composition of forces – resultant, parallelogram law of forces. Equilibrium of forces, Lami's theorem. Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion conversion of momentum, impulse and impulsive forces, simple numerical problems based on third law. Projectile, horizontal and oblique projections and equation of trajectory . Derivation of time of flight, maximum height and horizontal range , Circular motion, Relation between linear and angular velocity and linear acceleration and angular acceleration, Centripetal force (derivation) and centrifugal force, Banking of roads

## **UNIT-III**

Work, Power and Energy: Work: definitions and its SI units, Work done in moving an object on horizontal and inclined plane (incorporating frictional forces). Power: definitions and its SI units, calculation of power in simple cases. Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation, Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another

Properties of Matter: Elasticity, definition of stress and strain , Different types of modulus of elasticity. Explanation of stress – strain diagram. Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Bourdon's pressure, manometers and barometer gauges. Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension . Fluid motion, stream line and turbulent flow, Reynolds number. Viscosity and coefficient of viscosity; derivation of terminal velocity; effect of temperature on viscosity.

## **UNIT-IV**

Waves and vibrations: Generation of waves by vibrating particles , Wave motion with examples, Types of wave motion, transverse and longitudinal wave motion with examples . Velocity, frequency and wave length of a wave (relationship  $v = \eta\lambda$ ). Sound and Light waves. Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Vibration of cantilever and beam, determination of time period of a cantilever. Free, forced and resonant vibrations with examples

Rotational Motion: Definitions of torque, moment of inertia, radius of gyration, Derivation of rotational kinetic energy and angular momentum, Conservation of angular momentum (qualitative). Theorems of parallel and perpendicular axes

Gravitation and satellites: Kepler's law of planetary motion, Newton's law of gravitation , Escape velocity (derivation), Satellites, Geo-stationary satellite

## **UNIT-V**

Temperature and its measurement: Principles of measurement of temperature and different scales of temperature, Difference between heat and temperature on the basis of K.E. of molecules, Bimetallic and Platinum resistance thermometer: their merits and demerits, Pyrometers – Disappearing filament optical pyrometer

Transfer of Heat: Modes of transfer of heat (conduction, convection and radiation with examples) Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method) , Properties of heat radiation, Stefan's law, Kirchhoff's law, Wien's law, Planck's black body radiation law, Prevost's theory of heat exchange

## **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 and verify the time period of cantilever by drawing graph between load (w) and depression (D)
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the coefficient of linear expansion of a metal rod
8. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

To find the coefficient of thermal conductivity of bakelite sheet (bad conductor) by Lee's Disc Method

### **RECOMMENDED BOOKS**

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi
11. Applied Physics Vol. I&II H.C. Saxena & Prabhakar Singh
12. Applied Physics Vol. I&II D.Halliday & R.Rasnick
13. Engineering Physics – BVN Rao
14. Principles of Physics – K.K. Mohindroo
15. Basic Principles of Physics – Brij Lal Subramanyam .

DIME104

## **APPLIED CHEMISTRY-I**

### **UNIT-I**

Language of Chemistry: Definition of symbol, formula, valency and chemical equation. Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound, Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method.

### **UNIT-II**

Chemical Bonding: Electronic concept of valency, 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

### **UNIT-III**

Water: 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. Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange process. Simple numerical problems related to soda lime process. Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply

### **UNIT-IV**

Solutions: Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples Strength of a solution (i) Normality (ii) Molarity (iii) Molarity as applied in relation to a solution. Simple numerical problems related to volumetric analysis, Definition of pH, and different industrial applications of pH

#### **UNIT-V**

Electrolysis: Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples. Faraday's Laws of Electrolysis. Simple numerical problems based upon the laws of electrolysis, Different industrial applications of 'Electrolysis'. Elementary account of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.

#### **LIST OF PRACTICALS**

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
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. Find the amount of chlorides in mg per liter in a sample of H<sub>2</sub>O with the help of a solution of AgNO<sub>3</sub>
6. Determine the degree of temporary hardness of water by O' Hehner's method
7. Estimate the amount of Cu in a sample of CuSO<sub>4</sub> using a standard solution of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>
8. Estimation of amount of iron in hematite ore volumetrically
9. Estimation of total alkalinity of water volumetrically
10. Determine conductance, pH of water sample using conductance bridge and pH meter

#### **RECOMMENDED BOOKS**

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Engineering Chemistry by O. P. Agrawal.
10. Physical Chemistry by Glosstone.
11. Organic Chemistry by Sarkar and Rakshit.
12. Engineering Chemistry by M. M. Uppal Revised by S. C. Bhatia.
13. Modern Text Book of Applied Chemistry by P.C. Jain, Dr. G. C. Saxena and Dr.A. K. Goswami.

DIME105



## ENGINEERING DRAWING-I

### UNIT-I

#### 1. Introduction

- Introduction to drawing equipments, instruments and their uses
- Planning of drawing sheet as per I.S. 696 – 1972
- Indian standard practices of laying out and folding of drawing
- Different types of lines used in engineering drawing
- Standard practice for writing single stroke vertical and inclined capital and lower cases letters (practice to be done on sketch book)
- Standard practice of writing numerals (practice to be done on sketch book)

#### 2. Dimensioning techniques and standard conventions

- Identification and representation of various symbols used in Mechanical and Electrical Drawing
- Drawing Identification and representation of various symbols of building elements, materials and sanitary fittings
- Principles, system and arrangement of dimensioning
- Practice problems of current method of dimensioning
- 

### UNIT-II

#### 1. Form associated with engineering curves

- Types of engineering curves
- Method of construction of Engineering Curves
- Practice problems of drawing various Engineering Curves.
- Importance of scale in Engineering drawing
- Types of scales- plain, diagonal etc.
- Practical problems for constructing various types of scale.

#### 2. Orthographic projection of points, lines and planes

- Definitions of various terms associated with orthographic projections.

- Planes of projections
- Concept of Quadrants
- First and third angle method of projection
- Projection of line in different positions with respects to H.P. V.P. and X-Y line
- Projection of planes in different position with respect to reference planes
- Practice problems on projection of points, lines and planes.

### **UNIT-III**

#### **1. Projections of simple machine parts and components**

- Procedure for drawing projections and sectional views of simple machine components
- Practice problems of sketching and drawing the projections and sections of simple machine components.

#### **2. Projections of solids**

- Types of solids and associated terminology
- Position of solid with respect to reference planes
- Drawing projections of solid in different position with respect to reference planes
- Practice problems to draw projections of solid in different positions.

### **UNIT-IV**

#### **1. Section of solids**

- Concept of sectioning planes
- Auxiliary planes and true shape of section
- Practice problems for drawing projections and section of solids.

#### **2. Development of surfaces**

- Concept and importance of surface development in engineering field
- Development of surfaces for the following
- Cube
- Cylinder
- Prism
- Cone and Frustum cone
- Practice problems.

### **UNIT-V**

#### **1. Isometric projections 8**

- Limitations of orthographic projections
- Definitions of the terms axonometric, oblique, Isometric and diametric projections
- Procedure for preparing isometric oblique
- Isometric view of geometrical solids and simple machine parts
- Practice problems.

#### **2. Basics of CAD**

- Computer hardware and software requirement for CAD
- Co-ordinate systems
- Set up for a CAD drawing
- Drawing objects like- Line, Circle, Arc, Ellipse, Regular Polygons, Polylines, Donuts etc.
- Editing Commands like- Move, Copy, Rotate, Scale, Fillet, Chamfer, Trim, Extend, Array, Mirror etc.
- Basic dimensioning, geometric dimensioning and tolerance

- Use CAD commands for simple orthographic and isometric drawings

### **Instructional Strategies**

- Lecture Method
- Demonstration and use of instrument used in drawing.
- Classroom practices for different typical exercises.
- Use of computer for developing drawing
- OHP Transparencies for complicated drawing objects

### **List of Practicals**

- Problems on Scales and Letterings (One sheet)
- Problems on Curves (One sheet)
- Simple Orthographic Projections- One for First Angle and One for Third Angle Projection (Two sheets)
- Orthographic projections with sections (One sheet)
- Isometric projection for two objects (One sheet)
- Projection of Points and Lines (One sheet)
- Projection of Planes (One sheet)
- Projection of Solids (Two sheets)
- Section of Solids (Two sheets)
- Development of surface (Two sheets)
- Use CAD for orthographic projection (Five problems)
- Use CAD for isometric projection (Three problems)

### **Reference Books**

1. I.S. 696. (Latest revision), BIS, India
2. Engineering Drawing, N.D. Bhatt, Charoter Publisher, Anand
3. Engineering Drawing & Machine Drawing, R. K. Dhawan, Kumar
4. Engineering Drawing , R.B. Gupta, Satya Prakashan, Delhi
5. Geometrical Drawing , P.S. Gill , ketson & Sons

RAIPUR

# Computer Fundamentals and Applications

## UNIT-I

### 1. INTRODUCTION TO COMPUTERS

#### Generations Of Computer-

-First, Second, Third and Fourth generation.

#### Classification & applications of computers-

- Micro, Mini, Mainframes and Super-Computers.
- Applications of computers.

### 2. MICROCOMPUTER

#### Structure & Working Of Micro Computers

- Central Processing Unit.
- Memory Unit.
- Input & Output Devices.

#### Evolution Of Micro-Computers

- Comparative study w.r.t. Micro-processor, clock speed, data bus, Register size, storage capacity, peripheral interface of PC to Pentium-IV computer systems.

## UNIT-II

### 1. DATA REPRESENTATION

#### Data Representation

-Bit, byte, Nibble, Word, Double word Codes: ASCII, Binary Coded Decimal (BCD) EBCDIC, GREY and EXCESS 3 code

#### .Number Systems

-Types of number systems-Binary, Octal, Decimal, Hexadecimal.

#### Conversions Of Number Systems And Its Operations

- Binary addition, subtraction
- .-BCD addition, subtraction.
- 1's complement and 2's complement methods of subtraction Floating point arithmetic.

## UNIT-III

### 1. COMPUTER LANGUAGES

#### Classification And Characteristics Of Languages

- Machine language.
- Assembly language.
- High level language.
- Hardware, Software And Firmware Computer Hardware Classification Of Software

### 2. INTRODUCTION TO DOS OPERATING SYSTEMS

- **Micro-Soft Disk Operating System (Ms-Dos)**
  - System files: BIOS, COMMAND.COM, CONFIG.SYS, Autoexec.bat file.
- **MS-DOS Commands**
  - Internal Commands – dir, cd, md, rd, del, ren, date, time, vol.
  - And copy External commands– attrib, format, edit, find, diskcopy, backup & restore.

## UNIT-IV

### 1. INTRODUCTION TO WINDOWS OPERATING SYSTEMS

#### Windows Operating System

-Concept of Windows-Arranging, Moving, Resizing, Opening, and Closing of windows  
.-Folder/File Management-Search, copy, delete and rename files and folders Windows Accessories:  
Notepad, Word Pad, Pad.

## 2. COMPUTER APPLICATIONS SOFTWARE.

- **Word Processing Software**  
MS Word
- **Data Analysis Software**  
MS Excel Introduction to Electronic Spreadsheet.
- **Presentation Software**  
MS Power Point

## UNIT-V

### 1. INTERNET APPLICATIONS

#### **Introduction To Internet -Different Services Of Internet**

- www
- Email
- Chat (textual/voice)
- Bulletin Boards
- Video conferencing
- FTP (uploading and downloading files)

#### **WEB-SITE ACCESS AND INFORMATION SEARCH**

- Browsers and search engines.

### 2. INTERNET CONNECTIVITY

#### **Internet Connectivity**

- Internet Service Provider (ISP)
- Internet accounts : Shell account, TCP/IP ISDN and Leased Line
- Account and its features.

#### **Hardware Required**

- MODEM and Terminal Adapters.
- System software: O.S. Loader, Linker, Interpreter, Compiler and Assembler Application Software.

### **List of Experiments/Demonstrations/Tutorials**

- Study Of Input And Output Devices
- Study Of Storage Devices
- Practice On Internal And External Ms-Dos Commands
- Practice On Windows 95/98/2000

Starting Windows, Exploring the desktop, Arranging windows, My Computer, The start button, Creating Shortcuts, Practice on moving and sizing of windows.

Study of file organization: creating, copying, moving, renaming and deleting. -Practice on Windows Accessories – Notepad, Word Pad and Paint. Editing document & formatting text, Previewing and printing document/Image file. -Practice on Windows Explorer.

Recycle bin, Shutting down windows.

### **PRACTICE ON MS-WORD**

Create and format document ,

Edit and Modify text-changing font size type and style.

Auto Text, AutoComplete, AutoCorrect, grammar and spellchecker, Find and replace of text.

Open save and print a document.



Insert, modify table.

### **PRACTICE ON MICROSOFT EXCEL**

Create, save & format worksheet

Open and save worksheet file.

Edit & modify data.

Use formula and functions.

Split windows and freeze pans.

Create, edit, modify, print worksheet/charts.

### **PRACTICE ON POWERPOINT**

Create, edit, insert, move, slides.

Open and save presentation.

Insert picture, slide layout, action button.

Present slide show.

### **PRACTICE ON INTERNET**

Identification of type of Account. Connecting to internet.

Dial up access

Web browsing

Searching websites

Email services

Creating email accounts & Receiving and sending mails

### **Reference Books**

1. Introduction to Computers, Iind Edition 1998 , Peter Norton's Tata McGraw Hills Publishing
2. The ABCs of Ms-Office 97 , Ist Edition, Gay Hart Davis
3. Computer Organization and architecture, IVth – Edition 1996 , William Stalling
4. Structured computer Organization , III rd – Edition 1997 , Andrews Tanenbaum Prentice Hall of India Pvt. Ltd, N. Delhi
5. Teach yourself..... windows 95, I st – Edition 1995 , A L Stevens Comer BPB Publication, N. Delhi
6. The Internet Book , II – Edition 200, Douglas E. Prentice Hall of India Pvt. Ltd, N. Delhi

DIME107

## **WORKSHOP PRACTICE -I**

### **1 Measurement, Identification and use of the various measuring tools & instruments.**

- Linear measurements and measuring devices.
- Angular measurements and measuring devices
- Other measuring tools such as surface plate, Surface gauge, plate Safety in different shop of workshops.

### **2. Wood working (carpentry shop)**

- 2.1 Identification of carpentry tools and their uses.
- 2.2 Perform various wood working operations.

### **3. Fitting shop.**

3. 1 Identification ofvarious tools used and the operations performed in fitting shop.

3.1.1 Perform various fitting operations.

- 3.1.2 Marking of job as per dimension.
- 3.1.3 Sawing.
- 3.1.4 Chipping .
- 3.1.5 Filling .
- 3.1.6 Taping .
- 3.1.7 Reaming.
- 3.1.8 Drilling.

### 3.2 Smithy Shop

- 3.2.1 identification of various tools and equipments used & their use.
- 3.2.2 Perform Various smithy operations.
- 3.2.3 Up setting .
- 3.2.4 Drawing down.
- 3.2.5 Bending
- 3.2.6 Setting down.
- 3.2.7 Welding.
- 3.2.8 Cutting .
- 3.2.9 Punching.
- 3.2.10 Fullering.

### 4. Sheet metal.

- 4.3.1 Identification and use of the various tools.
- 4.3.2 Perform various sheet-metal operations.
- 4.3.3 Shearing
- 4.3.4 Bending
- 4.3.5 Drawing
- 4.3.6 Squeezing.
- 4.3.7 Marking on sheet
- 4.3.8 Snipping.
- 4.3.9 Grooving

### 5 Welding Shop

- 5.1 Identification and use of the various tools and equipments.
- 5.2 Perform the arc welding and gas welding operations.
- 5.3 Perform the soldering and Brazing operations.

### 6 Machine shop

- 6.1 Identification and use of the various tools and equipments.
- 6.2 Classification of lathe and operation of lathe.
- 6.3 Plane turning
- 6.4 Taper turning
- 6.5 Treading
- 6.6 Drilling
- 6.7 Various attachment used in lathe.

### Reference Books

- (1) Workshop Technology (Vol-1) Hazra & choudhary .
- (2) Workshop Technology – (Vol-1 & 2) Chapman (3) Manufacturing process (Vol-1) Delela (4) Materials and Manufacturing Lindberg processes.



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# SEMESTER-II



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**DIME201**

## **COMMUNICATION SKILLS - II**

### **Course Objective-**

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

### **DETAILED CONTENTS**

#### **Unit-I**

Prose Text Book

The following six chapters of A Book of English published by Mc millan India

Uncle Podger Hangs a Picture

Subash Chandra Bose

A Pair of Mustachios

Guru Gobind Singh

With The Photographer

Sir Jagdish Chandra Bose

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

Precise writing (selected from the prescribed 6 chapters of Prose Text Book)

#### **Unit-II Grammar**

- Antonyms change of words into different parts of speech
- Correspondence

Business letters such as:

Registration as supplier

Floating quotations and tenders

Quarry for product specification, price and other details etc from a firm/Company

Covering letter for quoting prices against a quotation/tender

Placing supply order

- Note-Making
- Interview Skills

### Unit-III

Official letters such as:

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

### Unit-IV

- Report Writing
- Drafting a technical report of a visit to a factory, construction site, modern office, etc.
- Report writing on current general themes/topics related to economy, industry, social issues
- Elements of periodical progress report
- Inspection Note
- Write an inspection note after inspecting technical/industrial goods
- Write an inspection note after visiting a construction site or production shop
- Writing “Preface” and “acknowledgement” of a project report
- A paragraph on current topics/themes

Technology

Science

Economy

Politics

Social

General

- Drafting
- Press notes
- Memos/circulars
- Notices (lost and found: obituary/auction, etc)
- Telegrams
- Press releases
- Agenda and minutes of the meeting
- Personal resume/curriculum vitae

## Unit-V

### Communication Techniques

- Importance of communication
- Types of communication – verbal and non-verbal
- One way and two-way communication
- Process of communication – horizontal, vertical, upward, downward
- Essentials of good communication
- Level of communication – inter and intra personal, group to person, group to group
- Methods of effective oral, written and non-verbal communication, Horizons – tone, frequency, rate, volume, depth
- Barrier to communication and overcoming barriers
- Listening skill
- Use of audio visual aids for effective communication

### Reference Books

Essentials of Business Communication by Pal and Roruailling; Sultan Chand and Sons

The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India

New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

A Practical English Grammar by Thomson and Marlinet

Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill

English Conversation Practice by Grount Taylor; Tata McGraw Hill

Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi

Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi

Communication Skills by Ms. R Datta Roy and KK Dhir, Vishal Publication, Jalandhar

### Course Outcome –

1. Students will be better equipped in the skills essential for effective communication.
2. This course will instruct students about the in-depth knowledge of career oriented communication.

## APPLIED MATHEMATICS – II

### UNIT-I

#### Function and limit

**Function** –definition of variable constant interval such as open closed semi open etc

Definition of function value of a function and types of functions

**Limit** –definition of limit limits of algebraic trigonometric exponential and logarithmic function

### UNIT-II

#### Differentiation

Definition of differentiation

Differentiation by first principle of  $x^n$ ,  $(ax + b)^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\sec x$ ,  $\operatorname{cosec} x$  and  $\cot x$ ,  $e^x$ ,  $a^x$ ,  $\log x$ . Differentiation of a function of a function and explicit and implicit functions

Differentiation of sum, product and quotient of different functions

### UNIT-III

#### Integral Calculus

Integration as inverse operation of differentiation

Simple integration by substitution, by parts and by partial fractions

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

### UNIT-IV

#### Statistics

measures of control tendency. Mean, median, Mode

Measures of Dispersion mean Standard deviation

Mean deviation variance and coefficient of variation comparison of

Two sets

### UNIT-V

#### Differential Equation

Definition of differential equation

Order of differential equation

Explanation of order and degree

Solution of differential equation of first order and first degree

#### Reference Books:

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



9. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi
10. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi



## **APPLIED PHYSICS – II**

### **RATIONALE**

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

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Applications of sound waves**

- Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
- Ultrasonics – production (magnetostriction and piezoelectric) and their engineering applications

#### **Unit-II**

##### **Principle of optics**

- Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection.
- Defects in image formation by lenses and their correction
- Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case)
- Overhead projector and slide projector

#### **Unit-III**

##### **Electrostatics**

- Coulombs law, unit charge
- Gauss's Law
- Electric field intensity and electric potential
- Electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
- Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
- Dielectric and its effect on capacitors, dielectric constant and dielectric break down

#### **Unit-IV**

##### **Electricity**

- Ohm's law
- Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance
- Kirchoff's laws, wheatstone bridge principle and its applications
- Heating effect of current and concept of electric power

### **Semi conductor physics**

- Energy bands, intrinsic and extrinsic semi conductors, p-n junction diode and its characteristics
- Diode as rectifier – half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)

### **Unit-V**

#### **Modern Physics**

- Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
- Fibre optics: Introduction, optical fiber materials, types, light propagation and applications
- Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical field, type I and type II super conductors and their applications)
- Energy sources – conventional and non-conventional (wind, water, solar, bio, nuclear energy), only elementary idea.

### **LIST OF PRACTICALS**

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

### **Reference Books**

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and BrijLal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

## APPLIED CHEMISTRY-II

### RATIONALE

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

### DETAILED CONTENTS

#### Unit-I

##### Metallurgy

- 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
- Metallurgy of (i) Aluminium (ii) Iron with their physical and chemical properties
- Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar

#### Unit-II

##### Fuels

- Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
- 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
- Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel
- Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels
- Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

#### Unit-III

##### Corrosion

- Meaning of the term 'corrosion' and its definition
- Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
- **Prevention of corrosion by**
  - (a) Alloying
  - (b) Providing metallic coatings

### **Cathodic protections:**

- (a) Sacrificial
- (b) Impressed voltage method

### **Unit-IV**

#### **Lubricants**

- Definition of (i) lubricant (ii) lubrication \
- Classification of lubricants
- Principles of lubrication
  - (i) fluid film lubrication
  - (ii) boundary lubrication
  - (iii) extreme pressure lubrication
- Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.

### **Unit-V**

#### **Cement and Glass**

- Manufacture of Portland Cement
- Manufacture of ordinary glass and lead glass

### **Classification and Nomenclature of Organic Compounds**

Classification of Organic Compounds, functional group, Homologous Series, Nomenclature, Physical and Chemical properties, and industrial use of Organic Compounds, IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.

### **LIST OF PRACTICALS**

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

### **Reference Books:**

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. “A Text Book of Applied Chemistry-I” by SS Kumar; Tata McGraw Hill, Delhi
4. “A Text Book of Applied Chemistry-I” by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

**DIME205**

## **APPLIED MECHANICS**

### **Unit-I**

#### **Introduction**

- Concept of engineering mechanics, definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields
- Concept of rigid body

#### **Laws of forces**

- Different force systems (coplanar and non-coplanar), principle of transmissibility of forces .
- 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
- Free body diagram
- Equilibrium force and its determination
- Lami's theorem

### **Unit-II**

#### **Moment**

- Concept of moment
- Moment of a force and units of moment
- Varignon's theorem (definition only)
- Principle of moment and its applications
- Parallel forces (like and unlike) and calculating their resultant
- Concept of couple, its properties and effects
- General conditions of equilibrium of bodies under co-planar forces
- Position of resultant force by moment.

### **Unit-III**

#### **Friction**

- Definition and concept of friction, types of friction
- Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
- Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack
- 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

## **Unit-IV**

### **Centre of Gravity**

- Concept, definition of center of gravity and centroid of plain figure and symmetrical solid body
- Determination of centroid of plain and composite lamina using moment method, centroid of bodies with removed portion
- Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

### **Application of the laws of motion**

Simple problems on second law of motion, piles, lift, bodies tied with strings

## **Unit-V**

### **Simple machines**

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

- Simple and compound machine
- Definition of ideal machine, reversible and self locking machine
- Effort lost in friction, determination of maximum mechanical advantage and maximum efficiency
- System of pulley (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
- 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

### **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

## Reference 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 II 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





## **ENGINEERING DRAWING – II**

### **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**

#### **Unit-I**

##### **Detail and Assembly Drawing**

- Principle and utility of detail and assembly drawings
- 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 Tenon joint, Corner and Through halving joint, Closed Mortise and Tenon joint

##### **Threads**

- Nomenclature of threads, types of threads (metric), single and multiple start threads
- Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
- Simplified conventions of left hand and right hand threads, both external and internal threads

#### **Unit-II**

##### **Locking Devices**

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

##### **Nuts and Bolts**

- 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

##### **Screws, Studs and Washers**

- Drawing various types of machine screws
- Drawing various types of studs and set screws

#### **Unit-III**

##### **Keys and Cotters**

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

#### **Rivets and Riveted Joints**

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

#### **Unit-IV**

##### **Welded Joints**

- Various conventions and symbols of welded joints (IS 696)
- Practical applications of welded joints say joints on steel frames, windows, doors and furniture

##### **Couplings**

- Muff or Box coupling, half lap muff coupling
- Flange coupling (Protected and non-protected)
- Flexible coupling

##### **Symbols and Conventions**

- Civil engineering sanitary fitting symbols
- Electrical fitting symbols for domestic interior installations
- Building plan drawing with electrical and civil engineering symbols

#### **Unit-V**

##### **Development of Surfaces**

- Construction of geometrical figures such as square, pentagon, hexagon
- Development of surfaces of cylinder, square, pentagonal and hexagonal, Prism, Cone and Pyramid, Sequence pentagonal and hexagonal pyramid

##### **Interpenetration of**

- Cylinder to cylinder
- Cylinder to cone

##### **AUTO CAD**

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

**Note-** Practical Syllabus will be based on detailed syllabus

**Reference 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





**SEMESTER-III**

RAIPUR

## **STRENGTH OF MATERIALS**

### **Unit-I**

#### **Stresses and Strains**

- 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.

### **Unit-II**

#### **Resilience and Instantaneous Stress**

- 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

#### **Beams and Bending Stress**

- 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 contraflexure.
- Numerical problems

#### **Bending Stress**

- 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

### **Unit-III**

#### **Moment of Inertia**

- 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

#### **Unit-IV**

##### **Springs**

- 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

##### **Columns**

- 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

#### **Unit-V**

##### **Torsion**

- 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

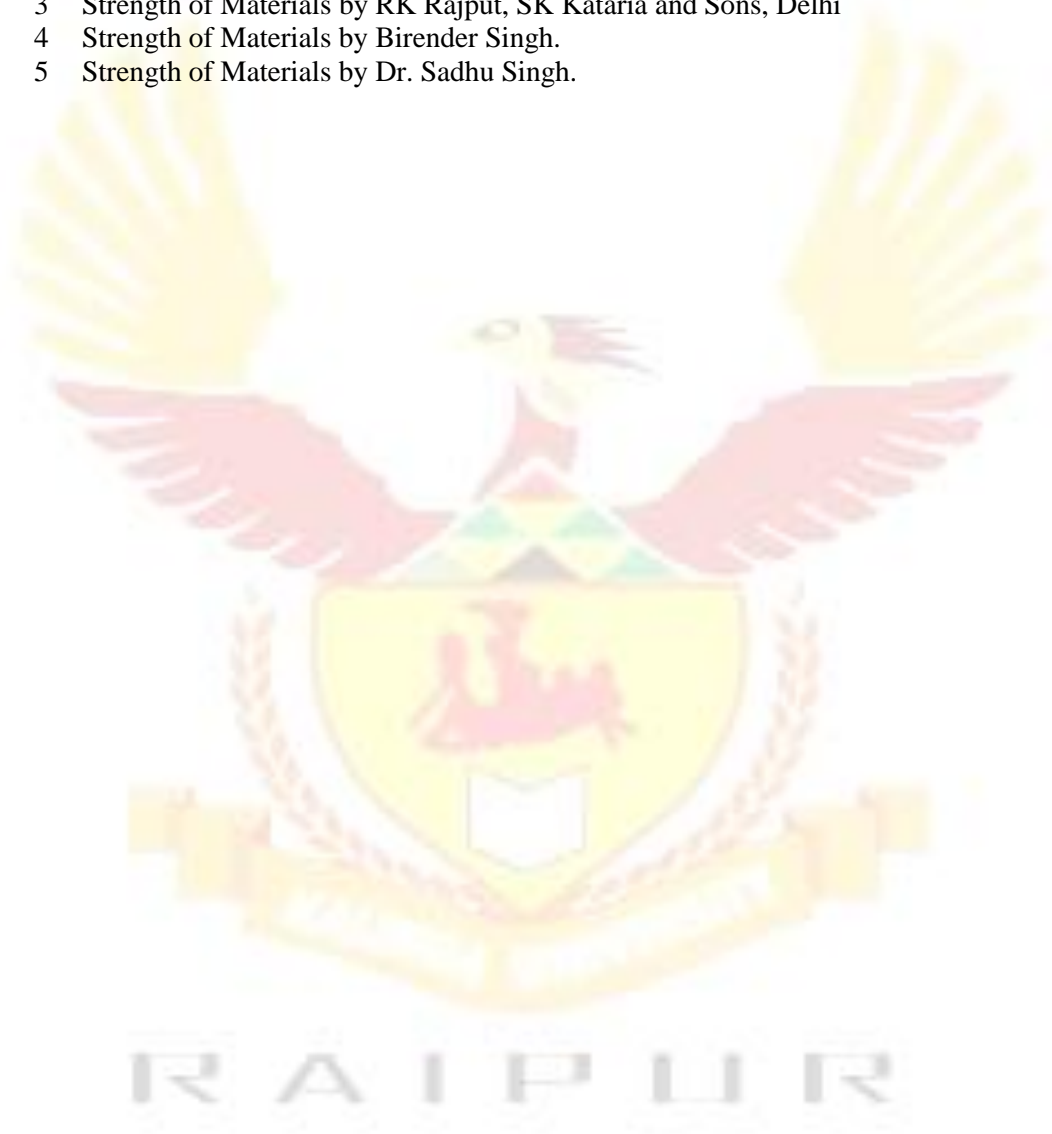
#### **LIST OF PRACTICALS**

- 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

**Reference 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.



## **DIME302**

# **THERMODYNAMICS**

### **RATIONALE**

A diploma holder in Mechanical Engineering is supposed to maintain steam generators, turbines and other power plant equipment. In addition he is required to maintain various types of automobiles. Therefore, it is essential to teach him concepts, principles and applications of basic thermodynamics, steam generators, steam turbine and other power plant equipment; non-conventional energy sources and about IC engines. Hence this subject.

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Fundamental Concepts**

Thermodynamic state and system, boundary, surrounding, universe, thermodynamic systems - closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system - intensive and extensive, thermodynamic equilibrium, quasi - static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy.

##### **Laws of Thermodynamics**

Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems - Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, evaporators, limitations Heat source and heat sinks, statement to second laws of thermodynamics; Kelvin Planck's statement, Clausius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, (PMM1, PMM2), Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy



## **Unit-II**

### **Thermodynamic Processes of Gases**

Types of thermodynamic processes - isochoric, isobaric, isothermal, hyperbolic, isentropic, polytropic and throttling processes, equations representing the

processes

Derivation of work done, change in internal energy, change in entropy, rate of

heat transfer for the above processes.

### **Laws of Perfect Gases**

Definition of gases, explanation of perfect gas laws - Boyle's law, Charle's law,

Avagadro's law, Regnault's law, Universal gas constant, Characteristic gas

constants, derivation

Specific heat at constant pressure, specific heat at constant volume of gas,

derivation of an expression for specific heats with characteristics, simple

problems on gas equation

## **Unit-III**

### **Steam Boiler**

Water and fire tube boilers, construction and working of Lancashire, Babcock and

Wilcox boilers. Various mounting and accessories of boilers.

### **Ideal and Real Gases**

Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas,  $P - V -$

$T$  surface of an ideal gas, triple point, real gases, Vander-Wall's equation,

Amagat's experiment, equation of states

Mass fraction, mole fraction, partial pressure, introduction to compressibility of

Gases

## **Unit-IV**

### **Properties of Steam**

Formation of steam and related terms, thermodynamics properties of steam, steam

tables, internal latent heat, internal energy of steam, entropy of water, entropy of steam, T- S diagrams, Mollier diagram (H - S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes  
Quality of steam (dryness fraction), measurement of dryness fraction, throttling  
calorimeter, separating and throttling calorimeter

## **Unit-V**

### **Air Standard Cycles**

Meaning of air standard cycle - its use, condition of reversibility of a cycle

Description of Carnot cycle, Otto cycle, Diesel cycle, simple problems on

efficiency, calculation for different cycles

Comparison of Otto, Diesel cycles for same compression ratio or same peak

pressure developed

Reasons for highest efficiency of Carnot cycle and all other cycles working

between same temperature limits

### **LIST OF PRACTICALS**

1. To find out the dryness fraction of steam by throttling calorimeter.
2. Determination of calorific value of fuel by bomb calorimeter.
3. To find out specific fuel consumption by gravimetric or volumetric fuel equipment.
4. To find out the viscosity index of lubricant by Orsat Apparatus.
5. To find out CO<sub>2</sub> value of exhaust from engine by CO<sub>2</sub> recorder (Smokemeter).
6. To study the construction and working of single stage air compressor.
7. To find out the flash point of fuel by flash point apparatus.
8. Study of various fire tube and water tube boiler by models or by visits.
9. Study of various mounting and accessories of boilers.

### **REFERENCE BOOKS**

1. Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi
2. Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi
3. Basic Thermodynamics by PB Joshi and US Tumne; Pune VidyarthiGrahPrakashan
4. Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi
5. A Treatise on Heat Engineering by VP Vasandani and DS Kumar; Metropolitan Book Company.



RAIPUR

**DIME303**

## **BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**

### **Unit-I**

#### **Application and Advantage of Electricity**

Difference between AC and DC, various applications of electricity, advantages of electrical energy over other types of energy

#### **Basic Quantities of Electricity**

Definition of voltages, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

### **Unit-II**

#### **Electromagnetic Induction**

Production of e.m.f., idea of a transformer and its working principle

#### **Distribution System**

Difference between high and low voltage distribution system, identification of three-phase wire, neutral wires and earth wire in a low voltage distribution system. Identification of voltages between phases and between one phase and neutral. Difference between three-phase and single-phase supply

### **Unit-III**

#### **Domestic Installation**

Distinction between light and fan circuits and single phase power circuit, subcircuits, various accessories and parts of electrical installation. Identification of wiring systems. Common safety measures and earthing

### **Unit-IV**

#### **Electric Motor**

Definition and various applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor

## Unit-V

### Electrical Safety

Electrical shock and precautions against shock, treatment of electric shock, concept of fuses and their classification, selection and application, concept of earthing and various types of earthing, applications of MCBs and ELCBs

### Basic Electronics

Basic idea of semiconductors - P and N type; diodes, zener diodes and their applications, transistor - PNP and NPN, their characteristics and uses, characteristics and application of a thyristor, characteristics and applications of servo motors.

### LIST OF PRACTICALS

1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation
2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation
3. Charging of a lead – acid battery
4. Troubleshooting in domestic wiring system
5. Connection and reading of an electric energy meter
6. Study of a distribution board for domestic installation
7. Use of ammeter, voltmeter, wattmeter, energy meter and multi-meter
8. Ohm's Law verification
9. Verification of law of resistance in series
10. Verification of law of resistance in parallel
11. Study of different types of fuses
12. Study of earthing practices

### Reference Books

1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi

5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi,  
New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi



**DIME304**

## **WORKSHOP TECHNOLOGY & PRACTICE**

### **Unit-I**

#### **Welding Process**

- Principle of welding
- Welding positions and techniques, symbols.

#### **Gas Welding**

- 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.

#### **Arc Welding**

- 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

### **Unit-II**

#### **Other Welding Processes**

- Principle of resistance welding, working and applications of spot welding, seam welding, projection welding and percussion welding.
- Welding defects and inspection of welded joints.

#### **Modern Welding Methods**

##### **Principle of operation, advantages, disadvantages and applications of:**

- Tungsten inert gas (TIG) welding
- Metal inert gas (MIG) welding
- Thermit welding
- Electro slag welding

#### **Pattern Making**

- 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

### **Unit-III**

#### **Moulding Sand**

- Properties of moulding sand, their impact and control of properties viz. permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility.
- Various types of moulding sand.

#### **Mould Making**

- 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 machinemoulding.

### **Special Casting Processes**

Principles, working and applications of

- Dies casting: hot chamber and cold chamber
- Centrifugal casting

### **Unit-IV**

#### **Gating and Riser System**

- Elements of gating system
- Pouring basin, sprue, runner, gates
- Types of risers, location of risers
- Directional solidification

#### **Casting Defects**

- Different types of casting defects
- Testing of defects: radiography, magnetic particle inspection, and ultrasonic inspection.

#### **Lathe**

- 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

### **Unit-V**

#### **Drilling**

- 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.

#### **Boring**

- 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.



## **Cutting Tools and Cutting Materials**

- 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.

## **Workshop Practice-I**

### **Unit-I 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 cupola 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-** Practical syllabus will be based on detailed syllabus.

### **Reference Books**

1. A Text Book of Welding Technology by O.P. Khanna.
2. Welding Technology by R.L. Agarwal and TahilMaghanani; Khanna Publishers, Delhi.
3. A Text Book on Foundry Technology by M.Lal and O.P.Khanna.
4. Foundry Engineering by TahilMaghnani.
5. Workshop Technology by B.S. Raghuvanshi; 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.

## **Machine Drawing**

### **Introduction**

- Limits and Fits: Limit system - tolerance, limits, deviation, allowance, basic size, design size. Tolerances-fundamental tolerances, fundamental deviation, method of placing limit dimensions.

**Fits:** Clearance fit, transition fit, interference fit, hole basis system, shaft basis system, tolerance grades. Calculating values of clearance/interference, hole tolerance and, shaft tolerance with given basic size for common assemblies like H7/g6, H7/m6, H8/u7.

- Surface Roughness Introduction-actual profile, reference profile, datum profile, mean profile, peak-to-valley height, mean roughness index, surface roughness number.

Use of machining symbols in production drawings, indication of surface roughness-indication of special surface roughness characteristics, indication of machining allowance, indication of surface roughness, symbols on drawings, method of indicating surface roughness on given components.

Indicating roughness on a component for: -

- i) Surface to be obtained by any production method.
- ii) Surface to be obtained without removal of material.

### **Shaft Couplings**

- Oldham coupling
- Universal coupling

### **Bearings**

- Bush bearing
- Foot step bearing
- Plummer block
- Self aligning bearing
- Brackets

### Pipe Joints

- Symbols for piping and layout plan of piping
- Flanged joint
- Socket and spigot joint
- Union joint
- Expansion pipe joint

### I. C. engine parts

- I. C. engine connecting rods
- I. C. engine pistons

### Screw Jack

**Note-** Practical syllabus will be based on detailed syllabus.

### **REFERENCE BOOKS: -**

1. Machine Drawing by P. S. Gill; S.K. Kataria and Sons, Delhi.
2. Machine Drawing by R.K. Dhawan; S. Chand and Company, Delhi.
3. Machine Drawing by R.B. Gupta; Satya Parkashan, New Delhi.
4. Machine Drawing by N.D. Bhatt; Charotar Publishing House.



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**DIME306**

## **Computer Applications in Mechanical Engg**

### **Unit-I**

#### **Computer Application Overview**

- Commercial and business data processing applications
- Engineering computation

#### **MS PowerPoint**

##### **Introduction**

- Elements of power point package- templates, wizards, views, color schemes
- Starting PowerPoint
- Exploring PowerPoint menus
- Starting a new slide
- Adding title, text and art
- Moving text area and resizing text box
- Starting a slide show
- Saving a presentation
- Printing slides
- Inserting and deleting slides
- Closing a presentation
- Exercise for making a presentation and slide show

### **Unit-II**

#### **Views**

- PowerPoint views – slide view, outline view, slide sorter view, notes view, slideshow view, slide setup
- Zoom in, zoom out
- Exercises on various views of presentation

#### **Formatting and Enhancing text**

- Formatting
- Changing format with a new layout
- Alignment of text and text spacing
- Enhancing text formatting – use of bullets, changing text font and size
- Selecting text style and color
- Applying design template
- Closing and applying the transition
- Spell checking
- To set header and footer
- Exercise on formatting text and applying design template.

#### **Slide with graphs**

- Creating a graph
- Adding graphic objects
- Adding clipart pictures
- Adding movies and sounds

- Adding multimedia to presentation
- Inserting excel worksheet or word table
- Exercise on inserting graphs, tables, movies and clipart.

### **Unit-III**

#### **MS - Access**

##### **Introduction to Microsoft access**

- Components of access

##### **Table creating**

- Starting access, creating tables, tool bars and views of tables
- Editing the design and contents of the table
- Creating relationship between tables
- Adding OLE objects to a table
- Use of import and export facility
- Exercise on table creating

##### **Query Handling**

- Creating a new query, use of criteria, expressions and operation
- Editing a query, print a query
- Exercise on creating and editing query

##### **Form designing**

- Introduction, creating a form, modify a form design, designing a form using design view.
- Sub – forms, printing the forms, exercise on form designing.

##### **Report designing**

- Creating a report, managing the different controls of the records, saving and printing the report, use of graphs in reports
- Exercise on report designing

### **Unit-IV**

#### **Programming fundamentals**

- Algorithm, pseudo language, flow charts: advantages and disadvantages
- Decision table – type, advantages and disadvantages
- Structured programming: structuring the control flow, modular programming
- Exercise on making algorithm and flow charts.

#### **C++ programming**

##### **Fundamentals**

- Introduction, oop, character set, C++ tokens, keywords, identifiers, constants, basic data type, declaration of variables, defining symbolic constants, assignment statement, comments in a programme, structure of C++ programme, output using COUT, output using CIN, manipulators.

#### **Operators and Expressions**

- Arithmetic operators, relational operators, logical operators, shorthand assignment operator, increment and decrement operators, conditional operators, bit wise operators, precedence in C++ operators, casting of data, standard mathematical functions.

## **Unit-V**

### **Control structures**

- IF statements, IF---ELSE statements, nested IF statements, switch statements, Go To statements, repetitive structures, while statements, do statement, for loop ,break statement, continue statement, nested loops.

### **Programs**

- Write a program to check if a number is even or odd.
- Write a program to find the smallest of 3 numbers.
- Write a program to find largest of 4 numbers
- Write a program to find the roots of quadratic equation.
- Write a program to find the sum of the first N natural numbers using a for - doloops.
- Write a program that reads in N numbers and finds the smallest number amongthem.
- Write a program to find the sum of squares of the digits of a number.

### **Demonstration of CNC machine.**

### **REFERENCE BOOKS: -**

1. MS Office 2000 for everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd.
2. MS Office 2000 by Steve Hill; BPB Publications.
3. Programming in C++ by B. Subharamanayam.
4. Programming in C by Abdul Khader; Ajanata Publications

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**SEMESTER-IV**

RAIPUR



## MATERIALS AND METALLURGY

### 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

#### Unit-I

##### 1. Importance of Materials

- 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.

#### Unit-II

##### Metallurgical Considerations

Solidification of metals from 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.

#### Unit-III

##### Ferrous Metals and Alloys

- 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.

#### **Unit-IV**

##### **Non-ferrous Metals and Alloys**

- 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, Yellowmetal, 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\

##### **Identification and Examination of Metals and Alloys**

Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure. Different types of etchants for preparation of surface structure.

#### **Unit-V**

##### **Other Important Materials**

- 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.

##### **Selection, specifications and commercial availability of materials**

- Practical considerations for selection of material for different purposes
- ISO/Bureau of Indian standard specifications for metals, non-metals, various components and materials.

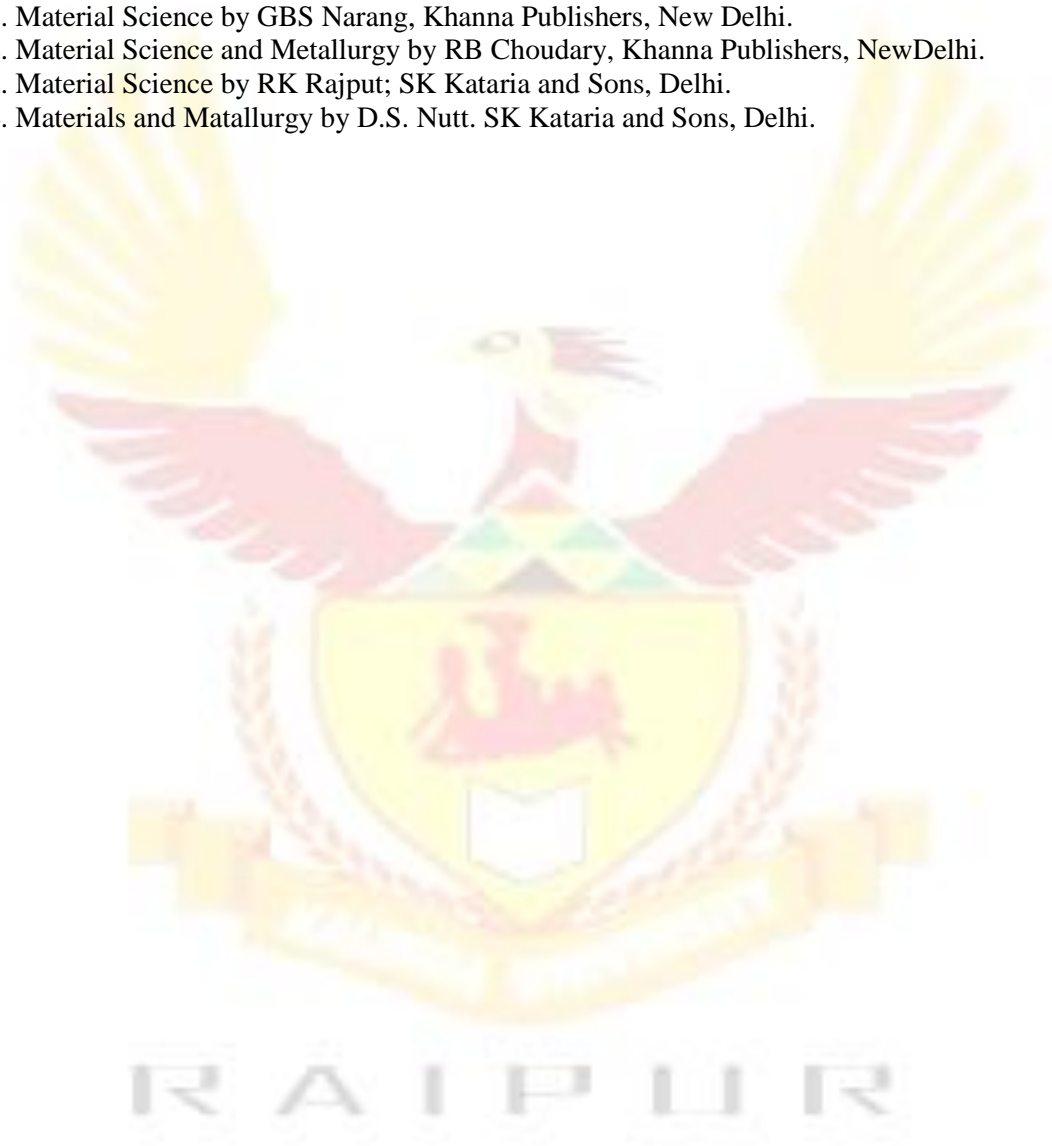
#### **LIST OF PRACTICALS**

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 microstructure 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

#### **REFERENCE 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 Metallurgy by D.S. Nutt. SK Kataria and Sons, Delhi.



**DIME402**

## **Hydrolics & Hydrolics Machine**

### **Unit-I**

#### **Introduction**

Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility.

### **Unit-II**

#### **Pressure and its Measurement**

- Concept of Pressure (Atmospheric Pressure, gauge pressure, absolute pressure)
- Pressure measuring devices: piezometer tube, manometers - simple U-tube, differential single column, inverted U-tube, micromanometer
- Bourdon pressure gauge
- Simple problems

### **Unit-III**

#### **Flow of Fluids**

Types of fluid flow-steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; Bernoulli's theorem (without proof) and its applications, Discharge measurement with the help of venturimeter, orifice meter and pitot tube, simple problems

### **Unit-IV**

#### **Flow through orifices**

$C_c$ ,  $C_v$ ,  $C_d$ , flow through drowned, partially drowned orifices, time for emptying a tank through a circular orifice. Simple problems

#### **Flow through pipes**

- Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; Chezy's equation and Darcy's equation of head loss.
- Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings, Simple problems

### **Unit-V**

#### **Hydraulic Devices**

Description, operation and application of hydraulic machines – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press,

#### **Water Turbines and Pumps**

- Concept of a turbine, types of turbines – impulse and reaction. Construction and working of pelton wheel, Francis turbine and Kaplan turbine
- Concept of hydraulic pump.
- Construction, working and operation of reciprocating pump and centrifugal pump.

## LIST OF PRACTICALS

1. Measurement of pressure head by employing
  - i) Piezometer tube
  - ii) Single and double column manometer
  - iii) Pressure gauge
2. To find out the value of coefficient of discharge for a venturimeter
3. Measurement of flow by using venturimeter
4. Verification of Bernoulli's theorem
5. To determine the coefficient of friction of pipe using Darcy's equation.
6. Study the working of a pelton wheel and Francis turbine
7. Dismantling and assembly of a single stage centrifugal pump to study its constructional details, operation including fault diagnosis.

## REFERENCE BOOKS: -

1. Hydraulics and Hydraulic Machines by RS Khurmi ;S.Chand& Co. Ltd., NewDelhi.
2. Hydraulics and Fluid Mechanics by JagdishLal; Metropolitan Book CompanyLtd., Delhi.
3. Fluid Mechanic, Hydraulics and Hydraulic Machines by K.K. Arora; StandardPublishers Distributors, Delhi.
4. Fluid Mechanics, Hydraulics and Fluid Machines by S. Ramamruthan; DhanpatRai and Sons, Delhi.



RAIPUR

## **Internal Combustion Engine**

### **Unit-I**

#### **IC Engines**

- Introduction and classification of IC engine
- Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, diesel cycle and dual cycle
- Location and functions of various parts of IC engines and materials used for them
- Concept of IC engine terms: bore, stroke, dead centre, crank throw, compression ratio, clearance volume, piston displacement and piston speed

#### **Fuel Supply and Ignition System in Petrol Engine**

- Concept of carburetion
- Air fuel ratio
- Simple carburetor and its application
- Working of Solex and Amal carburetor (line sketch) and its advantages over simple carburetor
- Description of battery coil and magneto ignition system
- Recent developments in fuel supply system - MPFI, electronic ignition system
- Increasing the efficiency by adopting super charging & turbo charging

### **Unit-II**

#### **Fuel System of Diesel Engine**

- Component of fuel system
- Description and working of fuel feed pump
- Fuel injection pump
- Injectors

#### **Cooling and Lubrications**

- Function of cooling system in IC engine
- Air cooling and water cooling system, use of thermostat, radiator and forced circulation in water cooling (description with line diagram)
- Function of lubrication
- Types and properties of lubricant
- Lubrication system of IC engine

### **Unit-III**

#### **Testing of IC Engines**

- Engine power - indicated and brake horse power
- Efficiency - mechanical, thermal, relative and volumetric
- Methods of finding indicated and brake power
- Morse test for petrol engine
- Heat balance sheet

- Concept of pollutants in SI and CI engines, pollution control, norms for two or four wheelers - EURO - I, EURO -II, their Indian version, methods of reducing pollution in IC engines alternative fuels like - CNG, LPG

#### **Unit-IV**

##### **Steam Turbines and Steam Condensers**

- Function and use of steam turbine
- Steam nozzles - types and applications
- Steam turbines - impulse, reaction, simple and compound, construction and working principle
- Governing of steam turbines\
- Function of a steam condenser, elements of condensing plant
- Classification - jet condenser, surface condenser
- Condenser vacuum, vacuum efficiency, condenser efficiency
- Cooling pond and cooling towers

#### **Unit-V**

##### **Steam Power Plant**

- Main parts and working of power plant with simple line diagram, coal handling system, pulverized coal firing system, ash handling and disposal system, cooling towers
- Use of feed water heater, economizer, air pre-heater, re-heating and regeneration and dust collector
- Heat balance and efficiency

##### **Gas Turbines and Jet Propulsion**

- Classification, open cycle gas turbine and closed cycle gas turbines, comparison of gas turbines with reciprocating IC engines, applications and limitations of gas turbines
- Open cycle constant pressure gas turbines - general layout. PV and TS diagram and working of gas turbines
- Closed cycle gas turbines, PV and TS diagram, working of gas turbines
- Principle of operation of ram-jet engine and turbo jet engine - application of jet engines
- Rocket engine - its principle of working and applications
- Fuels used in jet propulsion

#### **LIST OF PRACTICALS**

1. Dismantle a two stroke engine, note the function and material of each part, reassemble the engine
2. Dismantle a single cylinder diesel engine. Note the function of each part, reassemble the engine
3. Dismantle Solex, Amal carburetor, locate and note down the functions of various parts, reassemble
4. Study of battery ignition system of a multi-cylinder petrol engine stressing ignition timings, setting, fixing order and contact breaker; gap adjustment .
5. Study of lubricating system of IC engine
6. Determination of BHP by dynamometer
7. Morse test on multi-cylinder petrol engine
8. To prepare heat balance sheet for diesel/petrol engine
9. Local visit to roadways or private automobile workshops
10. Study of steam turbines through models and visit
11. Study of steam condensers through model and visits
12. Performance test of engine by full throttle and part throttle

**REFERENCE BOOKS: -**

1. Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, NewDelhi.
2. Thermal Engineering by PL.Ballaney; Khanna Publishers, New Delhi.
3. Engineering Thermodynamics by Francis F Huang; MacMillan Publishing Company.





## **WORKSHOP TECHNOLOGY & PRACTICE -II**

### **Unit-I**

#### **Milling**

- Specification and working principle of milling machine
- Classification, brief description and applications of milling machines
- Details of column and knee type milling machine
- Milling machine accessories and attachment – Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment, spiral milling attachment, slotting attachment and rack milling attachment.
- Milling methods - up milling and down milling
- Identification of different milling cutters and work mandrels
- Work holding devices
- Milling operations – face milling, angular milling, form milling, straddle milling and gang milling.
- Cutting speed and feed, depth of cut.
- Indexing on dividing heads, plain and universal dividing heads.
- Indexing methods: direct, Plain or simple, compound differential and angular indexing.
- Cutting fluids used in milling.

### **Unit-II**

#### **Grinding**

- Purpose of grinding
- Specifications of grinding wheel – Abrasive, Grade, structure, Bond
- Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.
- Truing, dressing, balancing and mounting of wheel.
- Grinding methods – Surface grinding, cylindrical grinding and centreless grinding.
- Grinding machine – Cylindrical grinder, surface grinder, internal grinder, centreless grinder, tool and cutter grinder.
- Selection of grinding wheel
- Cutting fluids used in grinding.

### **Unit-III**

#### **Shaping, Planing and Slotting**

- Working principle of shaper, planer and slotter.
- Quick return mechanism applied to shaper, slotter and planer machine.
- Specification of shaper, planer and slotting machine.
- Speeds, feeds and depth of cut.

### **Unit-IV**

#### **Broaching**

- Introduction

- Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.
- Elements of broach tool, broach teeth details – nomenclature, types, tool material.

## **Unit-V**

### **Metal Forming Process**

- Press Working
  - a) Press working – Types of presses, type of dies, selection of press die, die material
  - b) Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping
- Forging
  - a) Open die forging, closed die forging
  - b) Cold and hot forging
- Rolling
  - a) Elementary theory of rolling
  - b) Types of rolling mills
  - c) Rolling defects and remedies
- Extrusion and Drawing
  - a) Type of extrusion- Hot and Cold, Direct and indirect
  - b) Pipe drawing, tube drawing

## **Workshop Practice-II**

### **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**

1. Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter.
2. Gear manufacturing by some indexing device on a milling machine & gear hobber. Inspection of gear
3. Job on grinding using
  - Surface grinding
  - Cylindrical grinding
  - Centreless grinding
4. Milling cutter grinding on tool and cutter grinder.
5. Prepare a V-block to  $\pm 0.2$  mm accuracy on shaper machine.
6. Exercise on key way cutting and spline cutting.
7. Preparation of job through eccentric turning.
8. Practice of taper turning.
9. Exercise on EDM for preparation of electrodes (male and female).

### **REFERENCE BOOKS**

1. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons, Delhi.
2. Manufacturing Technology by M.Adithan and AB Gupta; New Age International (P) Ltd, Delhi.
3. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
4. Practical Handbook for Mechanical Engineers by Dr. AB Gupta; Galgotia Publications, New Delhi.
5. Workshop Technology by R.C Jindal; Ishan Publications, Ambala city.
6. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
7. Workshop Practice by R.K. Singal, S K Kataria and Sons, New Delhi.
8. A text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi.
9. Production Technology by HMT; Tata McGraw Publishers, New Delhi.



RAIPUR

**DIME405**

## **MACHINE DESIGN AND DRAWING**

### **RATIONALE**

A diploma holder in this course is required to assist in the design and development of prototype and other equipments. For this, it is essential, that he is made conversant with the principles related to design of components and application of these principles for designing and prepare drawing of the same and hence this subject.

### **DETAILED CONTENT**

#### **Unit-I**

##### **Introduction**

- Design - Definition, types of designs necessity of design.
- Comparison of designed and undersigned work.
- Design procedure.
- Practical examples related with design procedure.
- Characteristics of a good designer.
- Characteristics of environment required for a designer.
- Design terminology: stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit.,
- General design considerations.
- Codes and standards.

#### **Unit-II**

##### **Design of keys and shafts.**

Design of keys: Types of keys, materials of keys, and functions of keys. Design of keys.

Design of shafts: Types of shaft, type of loading on shafts, shaft materials, Effect of keyway on shaft strength, Design of shafts under various loading.

#### **Unit-III**

##### **Design of Joints**

- Types of joints: Temporary and permanent, utility of joints.
- Permanent joints.
- Welded joints.
- Types of welded joints, strength of parallel and transverse fillet welds.
- Strength of combined parallel and transverse welds.
- Axially loaded welded joints.
- Riveted joints: rivet materials, rivet heads, leak proofing of riveted joints –caulking and fullering.
- Different modes of rivet joint failure.
- Design of riveted joints: lap, butt, diamond (Lozenzo).
- Design of boiler joints i.e. circumferential and longitudinal boiler joints.

#### **Unit-IV**

##### **Design of Couplings**

- Necessity of a coupling, advantages of a coupling and types of couplings, design of flanged couplings.

**Assembly Drawing of the following**

- Tool post.
- Bench-vice.
- Safety valve.

**Unit-V**

**Cams**

- Cam profile nomenclature.
- Types of followers.
- Motions of followers.
- To draw cams with different followers with different motions.

**Gears**

- Types of gears.
- Nomenclature of gears.
- Conventional representation of gears.
- Draw profile of spur gear.

**REFERENCE BOOKS: -**

1. Machine Design by Pandya and Shah.
2. Machine Design by Sharma and Aggarwal; Katson Publishing House, Ludhiana.
3. Machine Design by R.S. Khurmi & J.K. Gupta; Eurasia Publishing House (Pvt.) Ltd.
4. Design of Machine elements by V.B. Bhandari; Tata Mc Graw Hill; Delhi.
5. Engineering Design by George Dieter; Tata Mc Graw Hill; Delhi.
6. Mechanical Engineering Design by Joseph Edward Shigley, Mc Graw Hill.
7. Machine Design by Sadhu Singh.
8. Machine Design by G.R. Nagpal.
9. Machine Design Data Book.

RAIPUR

**DIME406**

## **ENVIRONMENTAL ENGINEERING**

### **RATIONALE**

Civil Engineering diploma holders must have the knowledge of different types of environmental aspects related to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of the related 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**

#### **Unit: I**

##### **Study of Importance of Environmental Engineering**

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

##### **Environments and Ecology**

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

##### **Water Pollution**

Causes of pollution in surface and underground water eutrophication of lakes and its preventing measure; BIS standards for water quality.

#### **Unit: II**

##### **Air Pollution**

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, automobile pollution, BIS ambient air quality standards and measures to combat air pollution

##### **Noise Pollution**

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

##### **Effects of mining, blasting and deforestation**

Ill effects of mining, blasting and deforestation on the environment human life and wild life.

### **Unit: III**

#### **Land Use**

Effect of land use on environmental quality, land use and natural disasters,(land slides etc) soil degradation problems - erosion, water logging, soil pollution etc.

#### **Environmental Impact Assessment**

Definition and requirements, environmental impact assessment. Flow chart of environmental impact assessment methodology. Describe the need and importance of EIA.

#### **Legislation to Control Environmental Pollution (idea)**

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

### **Unit: IV**

#### **Global Issues of Environmental Engineering**

Global warming, ozone depletion, acid rain, oil pollution; radiation hazards and their control, concept of clean technology and carbon credits.

#### **Renewable Source of Energy**

Role of non-conventional sources of energy (biogas, solar, wind etc) in environmental protection. Conservation of energy resources like coal, oil etc., alternative fuels, bio-diesel etc.

### **Unit: V**

#### **INSTRUCTIONAL STRATEGY**

Students should be encouraged to undertake project work related to environmental problems. They should visit industrial effluent treatment plant, water treatment plant and environmental engineering laboratory and study the impact of utilization of reclaimed by products

#### **Reference Books:**

1. Deswal DS and Deswal SS “Environmental Engineering” Dhanpat Rai and Company (P) Ltd., Delhi
2. Odum EP, “Fundamentals of Ecology”, Amarind Publication Co., Delhi
3. Dhamija SK “Environmental Engineering and Management ; SK Kataria and Sons, Delhi
4. De AK, “Engineers Chemistry”, New Age Publication, Delhi
5. Kendeigh SC, “Ecology”, Prentice Hall of India, Delhi
6. Khitoliya, RK, “Environmental Pollution’, S Chand & Co. Ltd., New Delhi
7. Bhatia, HS, “A text book of Environmental Pollution and Control”, Galgotia. Publishers, Delhi



**SEMESTER-V**

**RAIPUR**



## **DIME501**

### **THEORY OF MACHINES**

#### **Unit-I**

##### **1. Basic Concepts**

- Definition of statics, kinetics, kinematics and dynamics
- Rigid body and resistant body
- Links
- Kinematics pairs and their types
- Degree of freedom
- Kinematics chain and their types
- Constrained motion and mechanisms
- Classification of mechanisms
- Equivalent mechanism
- Laws of inversion of mechanisms
- Single slider crank chain and its inversions
- Quick return mechanism and IC engine mechanism
- Double slider crank chain mechanism and its inversions like scotch yoke mechanism
- Indicator mechanism, pantograph
- Steering gear mechanism

#### **Unit-II**

##### **Fly Wheel**

- Functions of fly wheel
- Kinetic Energy of rotating masses, turning moment diagram.
- Types of fly wheels
- Co-efficient of energy & speed
- Simple problems.

##### **Governor**

- Functions of governor; comparison between a fly wheel and governor.
- Types of governor – Principle, construction and working of Watt governor

##### **Porter, governor, Hartnell governor.**

- Simple problems on watt and porter Governor
- Terminology used in Governors: Height, equilibrium speed, Hunting, isochronism, stability, sensitiveness (No numerical problem)

#### **Unit-III**

##### **Cams**

- Definition of cam
- Classification of cams
- Followers and their classification
- Brief description of different types of cams and followers with simple line diagram
- Simple cam profile for uniform velocity, SHM and uniform acceleration and deceleration with Flat, knife edge and roller type follower

#### **Unit-IV**

- **Power Transmission Devices (Belt, Rope and Chain Drive)**
- Introduction

- Belt and rope drives, open and crossed belt drives, actions of belt on pulleys, velocity ratio
- Material for belts and ropes
- Slip in belts & ropes
- Types of V Belt and Flat belt
- Types of pulleys – step pulley, flat pulley
- Crowning in pulley
- Laws of belting and length of belt (open & cross belt)
- Ratio of tensions
- Power transmitted and max power transmitted by belt
- Centrifugal effect on belt
- Initial tension
- Chain drive, classification of chains
- Selection of rope based on the load to be lifted

## **Unit-V**

### **Gear Drive**

- Functions of gear
- Classification of gears
- Gear nomenclature
- Forms of teeth, cycloid profile and involute profile teeth
- Simple, compound, reverted and epicyclic gear train
- Simple problems on gear trains

### **Friction & Clutches**

- Frictional torque in screws for both square and V-threads
- Screw jack
- Calculation of power required for raising a load
- Friction in collars & pivots.
- Friction in plate clutch & conical clutch
- Different types of bearings & their applications
- Derivation of formula for torque wasted in friction bearing and torque transmission capacity of clutches

### **Balancing**

- Need of balancing
- Concept of static and dynamic balancing
- Balancing of rotating mass by another mass in the same plane
- Concept of reference plane
- Simple problems pertaining to several masses rotating in different planes

### **Vibration**

- Introduction
- Types of vibration – longitudinal, transverse and torsional vibration
- Causes, remedial measures & harmful effects of vibrations

## **REFERENCE BOOKS**

1. JS Rao and Dukkipati; Mechanism and Machine Theory; Wiley Eastern, New Delhi
2. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press(Pvt) Ltd., New Delhi
3. MF Spotts: Design of Machine Elements; Prentice Hall of India Ltd., New Delhi
4. R.C Jindal; Theory of Machines & Mechanisms; Ishan Publications, Ambala City
5. S.S Rattan: Theory of Machines; Tata McGrawHill , New Delhi

**DIME502**

## **REFRIGERATION & AIR CONDITIONING**

### **RATIONALE**

There are different weather conditions around the year in our country. For human comfort, industrial production, safety of perishable food, storage of seasonal food, controlled temperature and humidity is required. As such the growth of refrigeration and air conditioning is expanding. This field creates opportunities for employment and entrepreneurship.

### **DETAILED CONTENT**

#### **Unit-I**

##### **Fundamental of Refrigeration**

Introduction to refrigeration and air conditioning, units of refrigeration, methods of refrigeration, natural system and artificial system of refrigeration, refrigeration effect. Rating of refrigeration, coefficient of performance. Difference between COP and efficiency. Introduction to air refrigeration cycle.

##### **Vapour Compression System**

Principle, function, parts and necessity of vapour compression system. P – H charts. Dry, wet, and super heated compression. Effect of subcooling and super heating, effect of moisture in vapour compression system. Comparison between air refrigeration and vapour compression system.

#### **Unit-II**

##### **Refrigerants**

Physical, chemical, thermodynamic and commercial properties of NH<sub>3</sub>, water, CO<sub>2</sub>, R-12, R-22 and R-134 A. Properties of ideal refrigerants used in refrigeration system.

##### **Vapour Absorption System**

Introduction, principle and working of electrolux refrigeration system, solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.

#### **Unit-III**

##### **Refrigeration Equipment**

- Compressor – Function, various types of compressor.
- Condenser – Function, Various types of condenser.
- Evaporators – Function, Various types of evaporators.
- Expansion Devices – Function, Different types such as capillary tube, thermostatic expansion valve, automatic expansion valve, low side float valve and high side float valve.

#### **Unit-IV**

##### **Psychrometry**

Definition of dry air, moisture, saturated air, unsaturated air, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT. Psychrometric charts, heating with humidification, cooling with dehumidification, by pass factor. Air conditioning systems. Window type air conditioner, split type air conditioner.

### **Unit-V**

#### **Miscellaneous**

- Study of Ice plant, cold storage, centrally air-conditioned plant, air conditioning of car.
- Insulating materials.
- Safety switches – thermostat, overload protector, low pressure high pressure cut out switch, oil pressure cut out switch

#### **LIST OF PRACTICALS**

1. Identify various tools of refrigeration kit and carry out following operations.
  - Cutting
  - Bending
  - Flaring
  - Swaging and brazing of copper tubes.
2. Study the following compressors used in refrigeration system.
  - Reciprocating compressor
  - Reciprocating hermetically sealed compressor.
3. Study of thermostatic switch, LP/HP cut out switch, overload protector, filters, strainers and filter driers.
4. Locating leaks and charging a refrigeration system.
5. To find COP of a refrigeration system.
6. Detect trouble/faults in a refrigerator and window air conditioner.
7. Visit to a cold storage plant.
8. Visit to a centrally air conditioned building.
9. Dismantling of window type A.C. and testing after assembly.

#### **REFERENCE BOOKS: -**

1. Refrigeration and Air conditioning by A.S Sarao; Satya Prakashan, New Delhi.
2. Refrigeration and Air conditioning by Mahohar Lal.
3. Refrigeration and Air Conditioning by R.S Khurmi & J.K Gupta; S. Chand, New Delhi.

RAIPUR

**DIME503**

## **WORKSHOP TECHNOLOGY & PRACTICE - III**

### **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**

#### **Unit-I**

##### **Modern Machining Processes**

- Mechanical Process: Ultrasonic machining (USM): Introduction, principle, process, advantages and limitations, applications.
- Electro Chemical Processes: Electro chemical machining (ECM) –Fundamental principle, process, applications.
- Electrical Discharge Machining (EDM): Introduction, principle parts of EDM machine, EDM terminology. Principal, metal removing rate, dielectric fluid and properties of electric fluid applications. Wire cut EDM.

#### **Unit-II**

##### **Plastic Moulding Techniques**

- Injection moulding – working principle, advantages and limitations
- Blow moulding – working principle, advantages and limitations
- Compression moulding – Working principle, advantages and limitations

##### **Metallic Coating Process**

- Metal spraying – Wire process, powder process, applications
- Electro plating, anodizing and galvanizing
- Organic Coatings- oil base paint, rubber base coating

#### **Unit-III**

##### **Gear Manufacturing and Finishing Processes**

- Gear hobbing
- Gear shaping
- Gear shaving
- Gear burnishing

#### **Unit-IV**

##### **Finishing Processes**

- Purpose of finishing surfaces
- Surface roughness – definition & units.
- Honing process and its applications.
- Description of hones.
- Brief idea of honing machines.

- Lapping process, its applications.
- Description of lapping compounds & tools.
- Brief idea of lapping machines.
- Super finishing process and its applications.
- Use of super finishing attachment on center lathe.
- Polishing.
- Buffing.

## **Unit-V**

### **Jigs & Fixtures**

- Importance and use of jigs & fixtures.
- Principle of location.
- Locating devices.
- Clamping devices.
- Types of jigs – Drilling jigs, bushes, template jigs, plate jigs, channel jig, leafjig.
- Fixture for milling.
- Advantages of jigs & fixtures.

## **Workshop Practice-III**

### **CNC Machine**

1. Plain turning, facing, step turning, taper turning.
2. Taper turning.
3. Concave and convex curves.
4. Threading.
5. Two surface at 90° on a square block.
6. Machine students' first name on an acrylic sheet on a CNC milling machine.
7. Demonstration of FMS & Wire cut EDM machine
8. Exercise for preparation of one female & one male electrode on EDM machine.
9. Exercise on profile cutting on EDM wire cut.
10. Various types of programming like polar programming, blue print programming and profile programming.

### **Milling & Shaper**

11. Machine of a square block of 100mm\*100mm. \*100mm on a shaper.
12. Cutting of a slot & V-groove on opposite faces of the block on the shaper.
13. Cutting of a slot and V-groove by a milling machine on a suitable block.
14. Cutting of a T slot by milling.
15. Milling of a spur gear.
16. Flute cutting of a tap or reamer.

### **Surface Finishing**

17. Exercise on hand lapping.
18. Honing of a hole.
19. Buffing practice
20. Electroplating of copper and nickel.
21. Barrel polishing and barrel plating for small pieces.

### **Grinding**

22. Grinding of surface at 45°, 60°, 75° on tool and cutter grinder.

23. Grinding and sharpening of lathe tool, drills.
24. Grinding of job on cylindrical grinder.
25. Grinding of job on centreless grinder.
26. Grinding of die plate on a surface grinder.
27. Grinding of a wedge shape job on a surface grinder.

### **Project Work**

The students will make preparations for the project to be undertaken by them in the final semester like detailed drawing, materials, cost analysis and all other prerequisites.

(A Foreman Instructor in consultation with HOD/Workshop Superintendent will handle this group.

**Note-** Practical Syllabus will be based on given syllabus.

### **REFERENCE BOOKS**

1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi
2. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi
3. Manufacturing Technology by M. Adithan and A.B. Gupta; New Age International(P) Ltd., New Delhi.
4. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi
5. Modern Machining Process by Pandey; Tata McGraw Publishers, New Delhi
6. A text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi



RAIPUR

**DIME504**

## **CNC Machine & Auto Machines**

### **RATIONALE**

Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development of knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Introduction**

- Basic concepts of NC, CNC & DNC, adoption controls.
- Advantages & Disadvantage of CNC Machines.
- Application of CNC Machines.
- Difference between conventional & CNC Machines.
- Profitable applications of CNC Machines.

#### **Unit-II**

##### **Construction of CNC Machines**

- Machine control unit.
- NC control.
- PLC control, its advantages & disadvantages.
- Application and limitations of PLC machines.
- Axis designation of CNC machines.
- Special constructional requirement of CNC machines.
- Slide ways, bolt screw & nut assembly.
- Lubrication & cooling of CNC machines.
- Spindle & spindle motors, axis drives motor.
- Swarf removal & safety provision of CNC machines.
- Feedback mechanism in CNC machines.

#### **Unit-III**

##### **Tooling of CNC Machines**

- Introduction.
- Various cutting tools for CNC machines.
- Work holding devices.
- Automatic tool changer.

#### **Unit-IV**

##### **Control System**

- Open & close loop control system



- Fundamental problem in control: Accuracy, resolution, repeatability, instability, response & damping,
- Type of position control:
  - i) Point to point
  - ii) Straight line
  - iii) Continuous

## **Unit-V**

### **Part Programming**

Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rational components, part programming using canned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation

### **Common Problems in CNC Machines**

Common problems in mechanical, electrical, pneumatic, electronic and PC components of NC machines, diagnostic study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines

### **Industrial Automation**

- What is automation?
- Need of automation.
- Different types of automation.
- Advantages/disadvantages of automation.

### **REFERENCE BOOKS**

1. CNC Machines – Programming and Applications by M Adithan and BSPabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc GrawHill, New Delhi.
3. Numerical Control of Machines Tools by YoremKorem and IB Uri; KhannaPublishers, New Delhi.
4. CNC Machine by Bharaj; Satya Publication, New Delhi.
5. Mechatronics by HMT, Bangalore.

RAIPUR

**DIME505**

## **COMPUTER INTEGRATED MANUFACTURING**

### **RATIONALE**

Manufacturing of this century belongs to computerized equipment & machine tools to manufacture a variety of components with high quality, high precision & low cost at a faster rate. Computer Aided Designing (CAD), Computer Aided Manufacturing (CAM), Numerical Control Machine Tools, Computer Aided Process Planning (CAPP), Automated Guided Vehicles (AGVs) & Flexible Manufacturing Systems-all are the part of Computer Integrated Manufacturing (CIM) which help to achieve the desired goals in manufacturing. After studying the subject, the students will be able to know about these integrated techniques which help a manufacturer to achieve his goal with in stipulated time.

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Introduction**

Fundamental of manufacturing, CAD-CAM Meaning, Activities of a CAD/CAM system, Manufacturing components of CAD/CAM integration, system approach in manufacturing, Introduction of Automation and Computer Integrated manufacturing, Concept of CIM

##### **Automation**

Automation in manufacturing, Basic concepts of automation, Hard automation, Soft automation, comparison of manual operation, hard automation and flexible (Soft) automation, Trends in manufacturing automation, composition of work force in conventional and automated manufacturing system.

#### **Unit-II**

##### **Computer System for CAD/CAM/CIM/FMS**

Selection of a computer, CAD/CAM Hardware, CAD/CAM system components, computer languages and CIM/FMS, software selection.

#### **NC Production System**

Introduction to Numerical Control, NC machine Tools, NC control unit, Tooling for NC machine, NC part Programming, Computer automated part programming, CNC/DNC and adaptive control, Components of a DNC system, Categories of adaptive control-adaptive control with optimization (ACO), adaptive control with constraints (ACC), Geometric adaptive control (GAC), benefits of adaptive control.

#### **Unit-III**

##### **Computer Aided Process Planning (CAPP)**

Concepts of group Technology, approaches to process planning-manual approach, variant process planning, Generative process planning; economic regions for different process planning system, role of process planning in computer integrated manufacturing, integrated process planning system, advantages of CAPP.

## **Unit-IV**

### **Automated Material Handling**

Introduction to material handling, Objectives of material handling, Types of materials to be moved, Integrated material handling, handling system selection, Introduction to Automated Guided Vehicles (AGV), Types of AGV-Wire Guided Vehicles, Painted Guided Vehicle, Free ranging AGVs; Different AGVs guidance system, components of an AGV, AGV's basic function, Advantages of using AGVs, Industrial application of AGVs; Automated storage/retrieval systems, Industrial applications.

## **Unit-V**

### **Flexible Manufacturing System (FMS)**

Introduction to FMS, manufacturing flexibility, FMS elements, FMS data Files, Software for FMS, Design aspects of flexible manufacturing, Sequencing & Scheduling in FMS, Computer aided Scheduling.

## **PRACTICAL EXERCISES**

### **1. Creating parts**

Sketching, selection of sketch plane, creating feature on work plane, extrude, dimensioning sketches, constraining sketches.

- Create Rectangle, Circle, and Polygons. Extrude these to make box, cylinder & prism and dimension the above part, change size by editing dimensions & using constraints.

### **2. Creating Drawing Views**

Planning and setting of drawings, creating drawing views, Hiding extraneous dimensions.

- Create various drawing views of the 3-D parts.

### **3. Advanced Modeling Techniques**

Extrudes to face/plane, intersect, face draft, 3D rounds, 3D fillets & 3D chamfers, setting & modifying feature dimensions, history based part modification.

- Use extrude commands to make holes through the above objects. Also face drafts a part on another part.

- Create 3-D rounds and fillets on box corners and Use history to modify above feature and their dimensions.

### **4. Assembly of Parts**

Basic concepts, starting assembly design, creating part instances, assembling the parts, checking for interference.

- Make cylinder and piston and assemble them.

## **PRACTICAL EXERCISES**

### **1. Creating parts**

Sketching, selection of sketch plane, creating feature on work plane, extrude, dimensioning sketches, constraining sketches.

- Create Rectangle, Circle, and Polygons. Extrude these to make box, cylinder & prism and dimension the above part, change size by editing dimensions & using constraints.

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### **4. Assembly of Parts**

Basic concepts, starting assembly design, creating part instances, assembling the parts, checking for interference.

- Make cylinder and piston and assemble them.

### **REFERENCE BOOKS: -**

1. "Computer Aided Manufacturing" By Surinder Kumar, Aditya Shah; Satya Parkashan, New Delhi
2. "Numerical Control & Computer Aided Manufacturing" By T.K. Kundra, P.N.Rao &N.K.Tewari; Tata McGraw Hills Pub. Co. New Delhi.
3. "System Approach to Computer Integrated Design & Manufacturing" By N.Singh; John Willey & Sons Inc.
4. "Computer Integrated Manufacturing Hand Book" By Teicholz, Orr; McGrawHillBook Co.



RAIPUR

**DIME506**

## **INDUSTRIAL TRAINING**

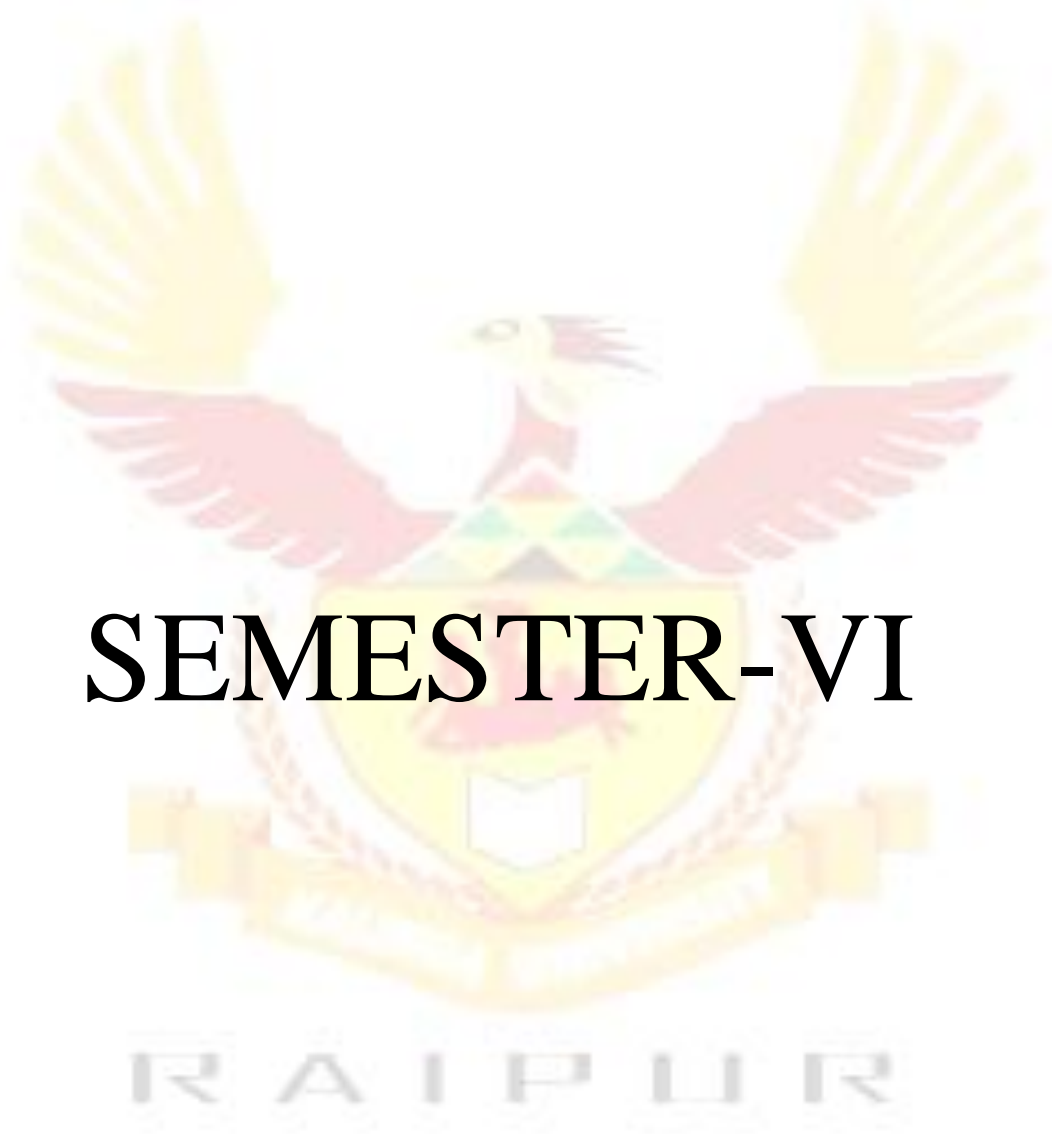
Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry. Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students. The teacher along with field supervisors will conduct performance assessment of students.

The components of evaluation will include the following.

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



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**SEMESTER-VI**

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**DIME601**

## **INDUSTRIAL MANAGEMENT**

### **RATIONALE**

The knowledge of this subject is required of all diploma holders who wish to choose industry/field as this career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial laws and management in different areas.

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Principles of Management**

- Management, different functions of management: Planning, organizing, coordination and control.
- Structure of an industrial organization.
- Functions of different departments. Relationship between individual departments.

##### **Human and Industrial Relations**

- Human relations and performance in organization.
- Understand self and others for effective behaviour.
- Behaviour modification techniques.
- Industrial relations and disputes.
- Relations with subordinates, peers and superiors.
- Characteristics of group behaviour and trade unionism.
- Mob psychology
- Grievance, handling of grievances.
- Agitations, strikes, lockouts, picketing and gherao
- Labour welfare.
- Workers' participation in management.

#### **Unit-II**

##### **Professional Ethics**

- Concept of ethics.
- Concept of professionalism.
- Need for professional ethics.
- Code of professional ethics.
- Typical problems of professional engineers.
- Professional bodies and their role

## **Motivation**

- Factors determining motivation
- Characteristics of motivation.
- Methods for improving motivation.
- Incentives, pay, promotion, rewards.
- Job satisfaction and job enrichment.

## **Leadership**

- Need for leadership.
- Functions of a leader.
- Factors for accomplishing effective leadership.
- Manager as a leader.

## **Unit-III**

### **Human Resource Development**

- Introduction.
- Staff development and career development.
- Training strategies and methods

### **Wage Payment**

- Introduction
- Classification of wage payment scheme.

### **Labour, Industrial and Tax Laws**

- Importance and necessity of industrial legislation.
- Types of labour laws and disputes.
- Brief description of the following Acts: The Factory Act 1948; Payment of Wages Act 1936; Workmen Compensation Act 1923; Industrial Dispute Act 1947; Employee' State Insurance Act, 1948; Provident Fund Act.
- Various types of Taxes-Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.
- Labour Welfare schemes.

## **Unit-IV**

### **Accidents and Safety**

- Classification of accidents; according to nature of injuries i.e. fatal, temporary; according to event and according to place.
- Causes of accidents-psychological, physiological and other industrial hazards.
- Effects of accidents.
- Accidents-prone workers.
- Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents.
- Safety consciousness & publicity.
- Safety procedures.
- Safety measures-Do's and don'ts & good housekeeping (5S).
- Safety measures during executions of Electrical Engineering works.

### **Environmental Management**

Basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise.

## **Unit-V**

### **Materials Management**



Material in industry, inventory control model, ABC Analysis, Safety stock, Reorder, level, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

### **Financial Management**

Important, ledger, Journal, Profit and Loss Account, Balance Sheet, Interpretation of Statements, Ratio Analysis, Project financing, Project appraisal, return on investments.

### **Marketing and Sales**

Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligopoly, perfect competition, Cost Elements of Cost, Contribution, Break even analysis, Budgets, Pricing Policies.

### **REFERENCE BOOKS: -**

1. Industrial Engineering and Management by TR Banga.
2. Industrial Engineering and Management by OP Khanna, Dhanpat Rai Publications, Delhi.
3. Industrial Management by VK Sharma, OP Harkut.
4. Sharma BR, Environmental and Pollution Awareness: Satya Prakashan, New Delhi.
5. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
6. Handbook of Small Scale Industry by P.M. Bhandari.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Principles of Management by Philip Kotler, TEE Publication.
9. Industrial Organisation and Management by Tara Chand, Nem Chand and Brothers, Roorkee



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## **INSPECTION AND QUALITY CONTROL**

### **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. Hence this subject.

### **DETAILED CONTENTS**

#### **Unit-I**

##### **Inspection**

- 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 standard 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 inspect? When to inspect? Who should inspect? Where to inspect?
- Types of inspection: remedial, preventive and operative inspection, incoming, in process and final inspection.
- Study of factors influencing the quality of manufacture.

#### **Unit-II**

##### **Measurement and Gauging**

- 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.

### **Unit-III**

#### **Statistical Quality Control**

- 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)

### **Unit-IV**

#### **Standards and Codes**

- National and International Codes.
- ISO-9000, concept and its evolution and implications.

### **Unit-V**

#### **Instrumentation**

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.

#### **REFERENCE 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

**DIME603**

## **AUTOMOBILE ENGINEERING**

### **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**

#### **Unit-I**

##### **Introduction**

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

##### **Transmission System**

- 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

#### **Unit-II**

##### **Steering System**

- 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

##### **Braking system**

- 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

#### **Unit-III**

##### **Suspension System**

- Function
- Types
- Working of coil spring, leaf spring Shock absorber
- Shock absorber

## **Battery**

- 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

## **Unit-IV**

### **Dynamo and Alternator**

- 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

### **Diagram of a Typical Wiring System**

## **Unit-V**

### **Lighting System and Accessories**

- 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

## **REFERENCE 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.

## **Entrepreneurship Development & Management**

### **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**

#### **Unit-I**

##### **Entrepreneurship**

- Concept/Meaning
- Need
- Competencies/qualities of an entrepreneur

##### **Entrepreneurial Support System**

- District Industry Centres (DICs)
- Commercial Banks
- State Financial Corporations
- 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

#### **Unit-II**

##### **Market Survey and Opportunity Identification (Business Planning)**

- How to start a small scale industry
- Procedures for registration of small scale industry
- List of items reserved for exclusive manufacture in small scale industry
- Assessment of demand and supply in potential areas of growth
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures

#### **Unit-III**

##### **Project Report Preparation**

- Preliminary Project Report
- Techno-Economic feasibility report
- Project Viability

##### **Managerial Aspects of Small Business**

- Principles of Management (Definition, functions of management viz planning, organisation, coordination and control)
- Operational Aspects of Production
- Inventory Management

- Basic principles of financial management
- Marketing Techniques
- Personnel Management
- Importance of Communication in business

#### **Unit-IV**

##### **Legal Aspects of Small Business**

- Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
- Factory Act and Payment of Wages Act

##### **Environmental considerations**

- Concept of ecology and environment
- Factors contributing to Air, Water, Noise pollution
- Air, water and noise pollution standards and control
- Personal Protection Equipment (PPEs) for safety at work places

#### **Unit-V**

##### **Motivation**

- Factors determining motivation
- Characteristics of motivation
- Methods of improving motivation
- Incentives – pay, promotion, rewards

##### **Leadership**

- Need for leadership
- Functions of a leader
- Factors to be considered for accomplishing effective leadership

#### **REFERENCE BOOKS**

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; AapgaPublications, 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 DeepPublications, 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

## INSTALLATION, TESTING & MAINTENANCE

### Unit-I

#### Introduction

- 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

#### Execution and Commissioning of Machines (Installation)

- Location, layout and positioning of machines
- Foundation – types of foundation, foundation plan, erection and leveling, grouping, vibration damping, vibration isolation – methods of isolation

### Unit-II

#### Inspection, Servicing, Repair & Overhauling of machines and equipment

- 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.

### Unit-III

#### Maintenance planning & stages of maintenance

- Maintenance planning
- Various stages of maintenance

#### Reliability, availability and Maintainability

#### Overhauling

- Frequent failure of common parts, their causes & remedial measures.
- Maintenance schedule.
- Parts which require frequent maintenance such as belts, couplings, nut, bolts, their repair & maintenance to avoid downtime.

### Unit-IV

#### Maintenance

- 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:

- 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 lifts, hydraulic 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.

### **REFERENCE 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; PrenticeHall of India Pvt., Ltd., New Delhi.



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## **PROJECT WORK**

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 strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. 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 months 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:

### **Range of maximum marks Overall grade**

- i) More than 80 Excellent
- ii) 79 <math>\diamond</math> 65 Very good
- iii) 64 <math>\diamond</math> 50 Good
- iv) 49 <math>\diamond</math> 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.