

# **GURU KASHI UNIVERSITY**



**Diploma in Mechanical Engineering**

**Session: 2025-26**

**Department of Mechanical Engineering.**

### Program Structure

Semester: I									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int	Ext	Total Marks
DME101	Applied Chemistry – I	Core	3	0	0	3	30	70	100
DME102	Applied Mathematics - I	Core	3	0	0	3	30	70	100
DME103	Applied Physics – I	Core	3	0	0	3	30	70	100
DME104	English and Communication Skills-I	Skill based	3	0	0	3	30	70	100
DME105	Engineering Drawing – I	Core	3	0	0	3	30	70	100
DME106	Applied Chemistry – I Lab	Skill based	0	0	2	1	30	70	100
DME107	Applied Physics – I Lab	Skill based	0	0	2	1	30	70	100
DME108	English and Communication Skills-I Lab	Skill based	0	0	2	1	30	70	100
DME109	General Workshop Practice – I	Skill based	0	0	4	2	30	70	100
DME110	Basics of information Technology Lab	Skill based	0	0	2	1	30	70	100
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>	<b>300</b>	<b>700</b>	<b>1000</b>

Semester: II									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int	Ext	Total Marks
DME201	English and Communication Skills – II	Core	3	0	0	3	30	70	100
DME202	Applied Mathematics -II	Core	3	0	0	3	30	70	100
DME203	Applied Physics-II	Core	3	0	0	3	30	70	100
DME211	Basic Electrical & Electronics Engineering.	Core	3	0	0	3	30	70	100
DME205	English and Communication Skills – II Lab	Skill based	0	0	2	1	30	70	100
DME206	Applied Physics-II Lab	Skill based	0	0	2	1	30	70	100
DME212	Basic Electrical & Electronics Engineering Lab	Skill based	0	0	2	1	30	70	100
DME209	Engineering Drawing-II	Skill based	3	0	0	3	30	70	100
DME210	General Workshop Practice -II	Skill based	0	0	4	2	30	70	100
<b>Total</b>			<b>15</b>	<b>0</b>	<b>10</b>	<b>20</b>	<b>270</b>	<b>630</b>	<b>900</b>

Semester: III									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int	Ext	Total Marks
DME302	Applied Mechanics	Core	3	0	0	3	30	70	100
DME303	Elements of Electrical and Electrical Engineering	Core	3	0	0	3	30	70	100
DME304	Workshop Technology -I	Core	3	0	0	3	30	70	100
DME312	Engineering Materials	Core	3	0	0	3	30	70	100
DME307	Applied Mechanics Lab	Skill based	0	0	2	1	30	70	100
DME308	Elements of Electrical and Electrical Engineering Lab	Skill based	0	0	2	1	30	70	100
DME309	Workshop Technology -I	Skill based	0	0	4	2	30	70	100
DME313	Engineering Materials Lab	Skill based	0	0	2	1	30	70	100
DME311	Mechanical Engineering Drawing-I	Skill based	0	0	6	3	30	70	100
<b>Total</b>			<b>12</b>	<b>0</b>	<b>16</b>	<b>20</b>	<b>270</b>	<b>630</b>	<b>900</b>

Semester: IV									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int	Ext	Total Marks
DME401	Generic Skills Entrepreneurship Development	Core	3	0	0	3	30	70	100
DME402	Hydraulics and Pneumatics	Core	3	0	0	3	30	70	100
DME403	Thermodynamics-I	Core	3	0	0	3	30	70	100
DME404	Strength of Materials	Core	3	0	0	3	30	70	100
DME405	Workshop Technology -II	Core	3	0	0	3	30	70	100
DME411	Environment Studies	Core	2	0	0	2	30	70	100
DME406	Hydraulics and Pneumatics Lab	Skill based	0	0	2	1	30	70	100
DME408	Strength of Materials Lab	Skill based	0	0	2	1	30	70	100
DME409	Workshop Technology – II	Skill based	0	0	4	2	30	70	100
DME410	Mechanical Engineering Drawing -II	Skill based	0	0	6	3	30	70	100
<b>Total</b>			<b>17</b>	<b>0</b>	<b>14</b>	<b>24</b>	<b>300</b>	<b>700</b>	<b>1000</b>

Semester: V									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int	Ext	Total Marks
DME511	Basic of Management	Core	3	0	0	3	30	70	100
DME502	Refrigeration and Air-conditioning	Core	3	0	0	3	30	70	100
DME503	Thermodynamics-II	Core	3	0	0	3	30	70	100
DME504	Workshop Technology-III	Core	3	0	0	3	30	70	100
DME505	Theory of Machines	Core	3	0	0	3	30	70	100
DME506	Refrigeration and Air-conditioning Lab	Skill based	0	0	2	1	30	70	100
DME507	Thermodynamics-II Lab	Skill based	0	0	2	1	30	70	100
DME508	Workshop Technology-III Lab	Skill based	0	0	4	2	30	70	100
DME509	Computer Aided Drafting Lab	Skill based	0	0	4	2	30	70	100
DME510	Industrial Training	Skill based	-	-	-	4	30	70	100
Total			15	0	12	25	300	700	1000

<b>Semester: VI</b>									
<b>Course Code</b>	<b>Course Title</b>	<b>Type of Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>No. of Credits</b>	<b>Int</b>	<b>Ext</b>	<b>Total Marks</b>
DME601	Production Management	Core	3	0	0	3	30	70	100
DME602	Metrology and Instrumentation	Core	3	0	0	3	30	70	100
DME603	Automobiles Engineering	Core	3	0	0	3	30	70	100
DME604	Machine Design	Core	4	0	0	4	30	70	100
DME605	CNC Machines and Automation	Core	3	0	0	3	30	70	100
DME606	Metrology and Instrumentation Lab	Skill based	0	0	2	1	30	70	100
DME607	Automobiles Engineering Lab	Skill based	0	0	2	1	30	70	100
DME608	CNC Machines and Automation Lab	Skill based	0	0	2	1	30	70	100
DME609	Project Work	Skill based	0	0	8	4	30	70	100
<b>Total</b>			<b>16</b>	<b>0</b>	<b>14</b>	<b>23</b>	<b>270</b>	<b>630</b>	<b>900</b>

**SEMESTER: I****COURSE TITLE: APPLIED CHEMISTRY –I****COURSE CODE: DME101**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Total Hours: 45****COURSE CONTENT:****UNIT-I****15 Hours**

**Basic Concepts of Chemistry:** Units and Dimensions, dimensional formulas-dimensional analysis principle of homogeneity of dimensions and their limitations, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity, thermodynamic parameters-significance and applications), Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone (recapitulation only), Mole concept, solution, standard solution, methods to express concentration of solution molar mass, molar volume of gases, strength of solutions in grams per liter, molarity (M), molality (m), mass and volume percentages and mole fraction, Chemical equations, thermo-chemical equations, balancing of chemical equations and simple stoichiometric calculations. Numerical problems based on mole concept and molarity.

**Atomic Structure, Periodic Table and Chemical Bonding:** Fundamental particles-electrons, protons and neutrons, Bohr's model of atom and its limitations (qualitative treatment only). Wave particle duality and Heisenberg's uncertainty principle (elementary idea only), Modern concept of atom, definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers (significance only), electronic configuration of elements up to atomic number 30 on the basis of Aufbau Principle, Pauli's Principle and Hund's Rule, Modern periodic law and periodic table, groups and periods. Classification of elements into s, p, d, and f blocks (periodicity in properties are excluded), Chemical bond and cause of bonding. Ionic bond, valence bond approach of covalent bond, hybridization (sp<sup>3</sup>, sp<sup>2</sup> and sp) sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds. Metallic bonding – electric, magnetic and dielectric properties based on Band model.



**UNIT-II****10 Hours**

**Water:** Sources of water, impurities in water (dissolved –gases, salts and suspended), Hardness of water, types of hardness, degree of hardness, units of hardness-ppm,  $^{\circ}\text{Cl}$ ,  $^{\circ}\text{Fr}$  – numerical problems. Disadvantages of using hard water in domestic and in industries: Laundry work (action of soap on water), paper, textile and beverage industries. Boiler feed water and its quality - causes and prevention of Scale and sludge formation, Priming and foaming, Boiler corrosion, Caustic embitterment, Softening of hard water by Ion exchange process- dematerialized water advantages and limitations of this method, Desalting of sea water by reverse osmosis (RO) method, Calgon process, Characteristics of drinking water and ICMR, ISI –quality criteria, Water analysis: Quantitative analysis of hardness by EDTA method, alkalinity, and estimation of total dissolved solids (TDS)-numerical problems, Enlist applications of various kinds of water in engineering and chemical industry.

**UNIT-III****10 Hours**

**Gas laws, Terminology of Thermodynamics and Equilibrium:** Definition of gas and perfect gas, gas laws- Boyle's Law, Charles law & Avagadro's law, Gas constant (R), Terminology of Thermodynamics- thermodynamic system, surroundings, types of systems, extensive and intensive properties, state of a system, state functions, isothermal, adiabatic reversible, irreversible spontaneous and non spontaneous processes, meaning of  $\Delta E$ ,  $\Delta H$ ,  $\Delta S$  and  $\Delta G$ , free energy of spontaneous and non spontaneous processes (mathematical derivations are excluded), Elementary idea of zeroth, 1st, 2nd, and 3rd laws of thermodynamics (without mathematical derivation), Applications of free energy change ( $\Delta G$ ) criteria (in metallurgy and electric work without any mathematical derivation), Equilibrium state and its significance statement of Le-Chatelier's principle, equilibrium constant (K) and its applications, Electrolytes, non electrolytes, ionization in aqueous solutions, degree of ionization, ionic product of water ( $K_w$ ), Concept of pH, pH- scale and industrial applications of pH, Definitions - acids, bases, neutralization and acid base titrations, indicators and choice of indicators for acid base titration., Buffer (acidic, basic and neutral) solutions, enlist applications of buffer solution, Simple numerical problems (only on 4.1, 4.5. 4.6 and 4.7 sections)

**UNIT-IV****10 Hours**

**Electrochemistry:** Electronic concept of oxidation and reduction, redox reactions, Electrolytes, non-electrolytes and electrolysis, Faraday's Laws of electrolysis and applications in electrometallurgy and electroplating in automobile, Standard reduction potential (SRP), activity series, electrochemical cell and their e.m.f. , Chemistry of commercial electrochemical cells, primary cells - Daniel cell and dry cell, secondary cell - lead acid storage cell, Wetson-cadmium cell, nicad battery, LiI battery, Hg – button cell

and Ag- button cell, Fuel cells, Simple numerical problems related (to only 5.1, 5.3 and 5.4 sections)., secondary cell - lead acid storage cell, Wetson-cadmium cell, nicad battery, LiI battery, Hg – button cell and Ag- button cell, Fuel cells, Simple numerical problems related (to only 5.1, 5.3 and 5.4 sections).

**Organic Chemistry:** Tetra covalency of carbon in carbon compounds, catenation (definition only), Classification of organic compounds on the bases of functional group, IUPAC nomenclature of simple organic compounds (containing one functional group only) and their common names (if any)

**Suggested Readings:**

- Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
- Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
- Engineering Chemistry by Shashi Chawla.
- Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.
- Applied Chemistry-I by Dr.P.K. Vij&ShikshaVij, Lords Publications, Jalandhar

**Course Title: APPLIED MATHEMATICS-I**  
**Course Code: DME102**

L	T	P	Credits
3	0	0	3

**Total Hours: 45**

## **Course Content**

### **UNIT-I**

**10 Hours**

**Algebra:** Complex Numbers: Complex number, representation, modulus and amplitude. De-moivre's theorem, its application in solving algebraic equation. Basics and properties of logarithms and its applications in solving problems related to basic logarithmic formulas. Geometrical progression, its  $n$ th term and sum of  $n$  terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem such as maximum possible output of the machine, vibration of the spring, finding out capacity of tank etc. Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)

### **UNIT-II**

**10 Hours**

Permutations and Combinations: Value of  ${}^n P_r$  and  ${}^n C_r$ . Simple problems of formulation of words from given alphabets (with and without repetition), circular permutations etc.

Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems.

### **UNIT-III**

**10 Hours**

**Trigonometry:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Applications of angles such as angle subtended by an arc, diameter of moon etc. T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles ( $2A$ ,  $3A$ ,  $A/2$ ). Graphs of  $\sin x$ ,  $\cos x$ ,  $\tan x$  and  $\cot x$ . Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

### **UNIT-IV**

**15 Hours**

**Co-ordinate Geometry:** Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae. Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple

problems on locus. Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics. To find the equation of a circle, given: Centre and radius, three points lying on it, Coordinates of end points of a diameter. Equation(s) of a straight line, circle, and conics (ellipse, parabola and hyperbola) and their application in solving engineering problems.

**Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

**Suggested Readings**

- Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
- Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar.
- Applied Mathematics by RD Sharma.
- Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar.
- Comprehensive Mathematics, Vol. I & II by Luxmi Publications.

**Course Title: APPLIED PHYSICS-I**  
**Course Code:DME103**

L	T	P	Credits
3	0	0	3

**Total Hours: 45**

## **COURSE CONTENTS:**

### **UNIT-I**

**10 Hours**

**Units and Dimensions:** Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units), dimensional formulae of physical quantities, Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, Error in measurement, random and systematic errors, Application of units and dimensions in measuring length, diameter, Circumference, volume, surface area etc. of metallic and non-metallic blocks, wires, pipes etc (at least two each).

**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, Newton's laws of motion and their engineering applications, derivation of force equation from Newton's second law of motion; conservation of momentum, impulse. Simple numerical problems, Circular motion: angular displacement, angular velocity and angular acceleration, Relation between linear and angular variables (velocity and acceleration), Centripetal force (derivation) and centrifugal force with their applications.

### **UNIT-II**

**10 Hours**

**Waves and Vibrations:** Wave motion: transverse and longitudinal wave motion with examples, velocity, frequency and wave length of a wave (relationship  $v = n\lambda$ ) and their applications, Wave equation,  $y = r \sin t$ , phase, phase difference, superposition of waves and their applications, Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Free, forced and resonant vibrations with examples, Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

### **UNIT-III**

**12 Hours**

**Rotational Motion:** Definitions of torque, angular momentum and their relationship, Conservation of angular momentum (qualitative) and its examples, Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only), Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

**Work, Power and Energy:** Work: definition and its SI units, Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application, Power: definition and its SI units, calculation of power with numerical problems, Energy: Definition and its SI units: 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 with its application, Friction: concept, types and its engineering applications, Application of Friction in brake system of moving vehicles, trains, aero planes and other objects.

## UNIT-1V

**13 Hours**

**Properties of Matter:** Elasticity: definition of stress and strain, stress – strain diagram, Hooke's law with its applications, Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, U-tube, manometers and barometer gauges and their applications, Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension, Fluid motion, Equation of Continuity, Bernoulli's Theorem and their applications. Viscosity and coefficient of viscosity: Buoyant force, buoyancy, Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity and its application in hydraulic systems.

**Thermometry:** Difference between heat and temperature, Principles of measurement of temperature and different scales of temperature and their Relationship, Resistance thermometers and Pyrometers with their field applications, Expansion of solids, liquids and gases and the respective , coefficients along with relation amongst them, various modes of transfer of heat with examples, Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method)

## Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### **Suggested Readings**

- Suggested Readings of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
- Suggested Readings of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
- Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
- Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
- Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi

**Course Title: English and Communication Skills – I****Course Code:DME104**

L	T	P	Credits
3	0	0	3

**Total Hours: 45****COURSE CONTENTS:****UNIT-I****10 Hours**

**Introduction:** Definition, Introduction and Process of Communication, Objectives of Communication, Essentials of Communication, Media and Modes of Communication, Channels of Communication, Barriers to Communication, Body language, Humour in Communication, Silence in Communication

**Listening:** Significance, Essentials, barriers and effectiveness of Listening.

**Speaking:** Significance, essentials, barriers and effectiveness of Speaking, Introduction to phonetics (Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics)

**UNIT-II****15 Hours**

**Reading:** Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading, Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings.

**Section-I:** Homecoming – R.N. Tagore, the Selfish Giant - Oscar Wilde, the Stick – Justice Surinder Singh.

**Section-II:** I Have a Dream – Martin Luther King, My struggle for An Education- Booker T Washington, Life Sketch of Sir Mokshagundam Visvesvarayya.

**Section-III:** Ozymandias – P.B. Shelley, Daffodils – William Wordsworth, Stopping by Woods on a Snowy Evening – Robert Frost.

Comprehension exercises on unseen passages, Exercises on interpretation of tables, charts, graphs, signs and pictures etc.

**UNIT-III****10 Hours**

**Writing:** Significance, essentials and effectiveness of writing, Paragraph of 100-120 words.



**UNIT-1V****10 Hours**

**Vocabulary:** Vocabulary of commonly used words, Pair of words (Words commonly confused and misused).

**Grammar:** Identification of parts of speech, using a word as different parts of speech, Correction of in-correct sentences, Tenses, Voice.

**Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

**Suggested Readings**

- Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw
- Hills, New Delhi.
- Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd;
- New Delhi.
- Spoken English –A foundation course (Part-I & Part-II) By KamleshSadanand&Susheela
- Punitha; Published by Orient BlackSwan, Hyderabad
- Practical Course in English Pronunciation by J Sethi, KamleshSadanand& DV Jindal;

**SEMESTER-1**

**Course Title: ENGINEERING DRAWING - I**

**Course Code:DME105**

L	T	P	Credits
1	0	4	3

**Total Hours: 45**

**COURSE CONTENTS:****UNIT-I****10 Hours**

**Introduction to Engineering Drawing:** Introduction to drawing instruments, materials and layout of drawing sheets.

**Free Hand Sketching and Lettering:** Different types of lines in Engineering drawing as per BIS specifications, Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments. Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments. Free hand lettering (Alphabet and numerals) – lower case and upper case, single stroke, vertical and inclined at 75 degrees in different standards, series of 3,5,8 and 12 mm heights in the ratio of 7:4

## **UNIT-II**

**10 Hours**

**Dimensioning Technique:** Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions), Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

**Scales:** Scales - their need and importance (Theoretical instructions), Drawing of plain and diagonal scales.

## **UNIT-III**

**10 Hours**

**Projection:** Theory of projections (Elaborate theoretical instructions), Projection of Points: Production of a point in the first quadrant, Projection of a point in the third quadrant. Projection of Straight Line: Line parallel to both the planes, Line perpendicular to any one of the reference planes, Line inclined to any one of the reference planes. Drawing 3 views of given objects (non-symmetrical objects may be selected for this exercise). Drawing 6 views of given objects (non-symmetrical objects may be selected for this exercise). Identification of surfaces on drawn views and objects drawn, Exercises on missing lines and views.

**Note:** At least one sheet in third angle projection.

## **UNIT-IV**

**15 Hours**

**Sections:** Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections, Exercises on sectional views of different

objects.

**Isometric Views:** Fundamentals of isometric projections (Theoretical instructions), Isometric views of combination of regular solids like cylinder, cone, cube and prism.

### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### **Suggested Readings**

- A Suggested Readings of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi.
- Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi.
- Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House.
- Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar.

## SEMESTER-I

**Course Title: APPLIED CHEMISTRY –I LAB**

**Course Code:DME106**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### List of Practicals

1. Introduction to volumetric analysis, apparatus used in volumetric analysis and molarity based calculations.
2. Preparation of standard solution of oxalic acid  $\{(COOH)_2 \cdot 2H_2O\}$  or potassium permanganate ( $KMnO_4$ ) or potassium dichromate ( $K_2Cr_2O_7$ )
3. To verify the physical (state, colour, odour solubility, boiling and melting points) properties and few chemical properties of ionic (e.g. NaCl) and covalent (kerosene oil or any other such compound may be given) compounds.
4. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
5. To determine total acid number of given oil volumetrically
6. To prepare cup ammonium  $\{Cu(NH_3)_4SO_4\}$  and estimate cupric ion in the given solution of copper sulphate solution by spectrophotometric method..
7. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)
8. To verify the first law of electrolysis. (Electrolysis of copper sulphate solution using copper electrode).
9. To prepare iodoform from ethanol or acetone
10. To prepare Bakelite.
11. To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.
12. Estimation of hardness of water by EDTA method.
13. Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid
14. Determination of pH of given solution using pH meter.

## SEMESTER-I

**Course Title: APPLIED PHYSICS-I LAB**

**Course Code:DME107**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### List of Practicals

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
3. To determine the thickness of glass strip and radius of curvature using a spherometer
4. To verify parallelogram law of forces
5. To find the time period of a simple pendulum and determine the length of second's pendulum.
6. To find the frequency of a tuning fork by a sonometer
7. To find the velocity of sound by using resonance apparatus at room temperature.
8. To find the Moment of Inertia of a flywheel about its axis of rotation
9. To find the surface tension of a liquid by capillary rise method
10. To determine the atmospheric pressure at a place using Fortin's Barometer
11. To determine the viscosity of glycerin by Stoke's method
12. To determine the coefficient of linear expansion of a metal rod
13. To find the coefficient of thermal conductivity of Bakelite sheet (bad conductor) by Lee's Disc Method
14. To determine the coefficient of thermal conductivity of a copper strip using Searle's Thermal Conductivity apparatus.

## SEMESTER-I

**Course Title: ENGLISH AND COMMUNICATION SKILLS –I LAB**  
**Course Code:DME108**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### List of Practicals

#### 1. LISTENING

- ✓ Using pre-recorded CDs/DVDs with pre-listening exercise to prepare students about what they are going to hear and comprehension based on the audio
- ✓ Note-taking
- ✓ Listening for the main ideas
- ✓ Assessing listening proficiency

#### 2. SPEAKING

- ✓ Exercises on pronunciation of common words as given in the standard dictionary using symbols of phonetics
- ✓ Greetings for different occasions
- ✓ Introducing oneself, others and leave taking (talking about yourself)
- ✓ Just a minute (JAM) sessions: Speaking extempore for one minute on given topics
- ✓ Paper reading before an audience (reading unseen passages)
- ✓ Situational Conversation/role-playing with feedback, preferably through video recording
- ✓ Reading aloud of Newspaper headlines and important articles
- ✓ Improving pronunciation through tongue twisters

#### 3. READING

- ✓ Paper reading
- ✓ Poetry recitation

- ✓ Reading newspaper headlines

**4. WRITING**

- ✓ Exercises on spellings

- ✓ Group exercises on writing paragraphs on given topics

**5. VOCABULARY**

- ✓ To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
- ✓ To seek information from an Encyclopedia

## SEMESTER-1

**Course Title: GENERAL WORKSHOP PRACTICE -I**  
**Course Code:DME109**

L	T	P	Credits
0	0	4	2

**Total Hours: 30**

### **COURSE CONTENTS:**

The following shops are included in the syllabus:

The following shops are included in the syllabus:

1. Welding Shop –I
2. Fitting Shop–I
3. Sheet Metal Shop –I
4. Electric Shop-I
5. Carpentry Shop–I
6. Smithy Shop–I

#### **1. WELDINGSHOP– I**

1.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

1.2 Jobs to be prepared

Job I Practice of striking arc (Minimum 4 beads on 100mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).

Job III Preparation of lap joint using arc welding process.

Job IV Preparation of butt joint using arc welding process.(100mm long).

Job V Preparation of T Joint using gas or arc welding(100mmx6mm M.S. Flat).

#### **2. FITTINGSHOP– I**

2.1 Use of personal protective equipment and safety precautions while working.

2.2 Basic deburring processes.

2.3 Introduction to fitting shop tools, marking and measuring devices/equipment.

2.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

2.5 Identification of various steel sections (flat, angle, channel, bar etc.).

2.6 Introduction to various fitting shop operations/processes (Hacksawing,



Drilling, Chipping and Filing).

Job I Marking \_\_\_\_\_ of \_\_\_\_\_ job,  
use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer  
and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions with in an  
accuracy of  $\pm 0.25$  mm.

Job III Making a cut-out from a square piece of MS flat using hand  
Hacksaw and chipping.

### **3. SHEET METAL SHOP-I**

3.1. Introduction to sheet metal shop, use of hand tools and accessories  
e.g. different types of hammers, hard and soft mallet, sheet and wire  
gauge, necessary allowance required during job fabrication, selection of material.

3.2 Introduction and demonstration of hand tools used in sheet metal shop.

3.3 Introduction and demonstration of various machines and equipment used in sheet  
metal shop. e.g. Shearing Machine, Bar Folder, Burring Machine,  
Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

3.4 Introduction and demonstration of various raw materials used in sheet metal  
shop e.g. black-plain sheet, galvanized-iron plain sheet,  
galvanized corrugated sheet, aluminium sheet etc.

3.5 Study of various types of nuts, bolts, rivets, screws etc.

Job I Shearing practice on a sheet using hand shears.

Job II Practice on making Single riveted lap joint / Double riveted lap joint.

Job III Practice on making Single cover plate chain type, zig-zag type \_\_\_\_\_ and  
single riveted Butt joint.

### **4. ELECTRIC SHOP-I**

4.1 Study, demonstration and identification of common electrical materials with  
standard ratings and specifications such as wires, cables,  
switches, fuses, cleats, clamps and allied items, tools and accessories.

4.2 Study of electrical safety measures and protective devices.

Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical  
appliances and their connection to three pin plugs.

Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc.  
in batten or P.V.C. casing-capping.

4.3 Study of common electrical appliances such as auto electric iron,  
electric kettle, ceiling/table fan, desert cooler etc.

4.4 Introduction to the construction of lead acid battery and its working.

Job III Installation of battery and connecting two or three batteries in series and parallel.

4.5 Introduction to battery charger and its functioning.

Job IV Charging a battery and testing with hydrometer and cell tester

## 5. CARPENTRYSHOP- I

### 5.1 GeneralShopTalk

5.1.1 Nameanduse ofrawmaterialsusedincarpentryshop:wood&alternativematerials

5.1.2 Names, uses, care and maintenance of hand tools such as differenttypes of Saws,C-Clamp, Chisels, Mallets, Carpenter's vices,Marking gauges, Try-squares, Rulers and other commonly usedtoolsandmaterials used in carpentryshop bysegregatingas cuttingtools,supportingtools, holdingtools , measuringtools etc.

5.1.3 Specificationoftoolsused incarpentryshop.

5.1.4 DifferenttypesofTimbers,their properties,uses&defects.

5.1.5 Seasoningof wood.

5.1.6 Estimation.

### 5.2 Practice

5.2.1 PracticesforBasic CarpentryWork

5.2.2 Sawingpracticeusingdifferent typesofsaws

5.2.3 Assembling jack plane — Planning practice including sharpeningofjack plane cutter

5.2.4 Chisellingpracticeusingdifferenttypesofchisels includingsharpeningofchisel

5.2.5 Makingofdifferenttypesofwoodenpinandfixingmethods.Markingmeasuringand inspection ofjobs.

### 5.3 JobPractice

Job 1 Marking,sawing,planningandchisellingandtheirpracticeJob II HalfLap Joint (cross,LorT– anyone)

JobIII Mortise and Tenon joint (T-Joint)JobIV DovetailJoint(LaporBridleJoint)

## 6. SMITHYSHOP-I

### 6.1 GeneralShopTalk

6.1.1 PurposeofSmithyshop

6.1.2 Differenttypes of Hearthsused in Smithyshop

6.1.3 Purpose, specifications, uses, care and maintenance of various toolsandequipmentsused inhandforging by segregating ascuttingtools,supportingtools, holdingtools, measuringtools etc.

6.1.4 Typesoffuelusedandmaximumtemperatureobtained

6.1.5 Typesof rawmaterials used inSmithyshop

6.1.6 UsesofFire Bricks &Claysin Forgingworkshop.

### 6.2 Practice

6.2.1 Practiceof firingofhearth/Furnace,CleaningofClinkers andTemperatureControl ofFire.

6.2.2 Practice on different basic Smithy/Forging operations such as Cutting, Upsetting, Drawing down, Setting down, Necking, Bending, Fullering, Swaging, Punching and Drifting

a) Demonstration—Making cube, hexagonal cube, hexagonal bar from round bar

6.2.3 Practice of Simple Heat treatment processes like Tempering, Normalizing Hardening etc

JobPractice:Job Preparation

JobIMaking a cold/hot, hexagonal/octagonal flat chisel including Tempering of edges.

JobII Production of utility goods e.g. hexagonal bolt / square shank boring tool, fan hook (long S-type) [Two jobs are to be done by the students].

JobIII To prepare a cube from a M.S. round by forging method.

### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### **Suggested Readings**

- Workshop Technology I, II, III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
- Workshop Technology by Manchanda Vol. I, II, III India Publishing House, Jalandhar.
- Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
- Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
- Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
- Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

## SEMESTER-I

**Course Title: BASICS OF INFORMATION TECHNOLOGY LAB**

**Course Code:DME110**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### List of Experiments:

1. Various Components of a Computer.
2. Introduction to Microsoft Word & Presentation
3. Make a simple presentation on your college,
4. use 3D effects , on prescribed presentation
5. Applications of Ms-Office Ms-Word
6. Ms-Excel
7. Ms-PowerPoint
8. Create web pages for your college using different tags.
9. Web Browser and E- Mail
10. Conversion of a word documents into PDF/ Image conversion using image file format.

### Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### Suggested Readings

- Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
- Information Technology for Management by Henery Lucas, 7<sup>th</sup> edition, Tata Mc Graw Hills, New Delhi
- Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
- Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
- MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi

## SEMESTER-II

**Course Title: ENGLISH AND COMMUNICATION SKILLS -II**

**Course Code: DME201**

L	T	P	Credits
3	0	0	3

**Total Hours: 45**

The curriculum aims to develop the use of English for three major purposes social interaction, academic achievement and professional use. Listening, speaking, reading, and writing skills cannot be thought of as independent skills. They are generally perceived as interdependent where one skill often activates the other skills as well as the paralinguistic skills required for the achievement of effective communication. It is believed that the most effective way to achieve these purposes is through the adoption of a thematic, integrated, content-based approach to teaching and learning.

### **COURSE CONTENTS:**

#### **UNIT-I**

**10 Hours**

**Reading:** Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

**Section-I:** The Portrait of a Lady - Khushwant Singh, the Lost Child by Mulk Raj Anand, The Refugees – Pearl S. Buck.

**Section-II:** Life Sketch of Dr. Abdul Kalam, Abraham Lincoln's letter to his son's Headmaster.

**Section-III:** All The World's A Stage – W. Shakespeare, Say Not, The Struggle Nought Availeth – A.H. Clough, Pipa's Song – Robert Browning, A Viewpoint – RP Chaddah. Comprehension exercises on unseen passages

#### **UNIT-II**

**15 Hours**

**Writing:** The Art of Précis Writing, Correspondence: Business and Official, Drafting: Report Writing: Progress report and Project report, Inspection Notes, Notices: Lost and found; Obituary; Auction, Memos and Circular, Notices, Agenda and Minutes of Meetings, Use of internet and E-Mails, Press Release, Applying for a Job: Resume writing; forwarding letter and follow-up. Writing Telephonic messages, Filling-up different forms such as Banks and on-line forms for Placement etc.

#### **UNIT-III**

**10 Hours**

**Vocabulary:** Vocabulary of commonly used words, Glossary of Administrative Terms (English and Hindi), One word substitution, Idioms and Phrases, Prefixes and Suffixes, Punctuation, Narration, Forms of verbs: Regular and irregular.

#### **UNIT-IV**

**10 Hours**

**Employable skills:** Importance of developing employable and soft skills; List and tips for developing of employable skills.

#### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

#### **Suggested Readings**

- Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
- Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
- Spoken English –A foundation course (Part-I & Part-II) By KamleshSadanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
- Practical Course in English Pronunciation by J Sethi, KamleshSadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
- A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.

## SEMESTER-II

**Course Title: APPLIED MATHEMATICS -II**

**Course Code: DME202**

L	T	P	Credits
3	0	0	3

**Total Hours: 45**

### COURSE CONTENTS:

#### UNIT-I

**10 Hours**

**Algebra:** Determinants: Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule. Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables. Application of Matrix in computer programming.

**Differential Calculus:** Definition of function; Concept of limits.

Four standard limits

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \quad \lim_{x \rightarrow 0} \frac{\sin x}{x}, \quad \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \quad \lim_{x \rightarrow 0} (1+x)^{1/x}$$

Differentiation of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$  (Please take one example of differentiation by definition), Differentiation of sum, product and quotient of functions. Differentiation of function of a function, Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation, Successive differentiation (excluding nth order), Application of differential calculus in: Rate Measures, Errors and increments, Maxima and minima, Equation of tangent and normal to a curve (for explicit functions only).

#### UNIT-II

**15 Hours**

**Integral:** Integration as inverse operation of differentiation with simple examples. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Evaluation of definite integrals (simple problems)-

Evaluation of  $\int_0^{\pi/2} \sin^n x \cdot dx$ ,  $\int_0^{\pi/2} \cos^n x \cdot dx$ ,  $\int_0^{\pi/2} \sin^m x \cdot \cos^n x \cdot dx$

using formulae without proof (m and n being positive integers only)

Applications of integration for: Simple problem on evaluation of area bounded by a curve

and axes. Calculation of volume of a solid formed by revolution of an area about axes. (Simple problems). To calculate average and root mean square value of a function and Area by Trapezoidal Rule and Simpson's Rule.

### **UNIT-III**

**10 Hours**

**Statistics and Probability:** Measures of Central Tendency: Mean, Median, Mode with example of daily life, Measures of Dispersion: Mean deviation, Standard deviation. Probability definition and addition law of probability, theorem and simple numerical problems, General view of normal probability curve (No numericals), Explanation of different sampling techniques (No numericals).

### **UNIT-IV**

**10 Hours**

**Differential Equations:** Solution of first order and first degree differential equation by variable separation method (simple problems). Differential equations of homogeneous equation.

### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### **Suggested Readings**

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta



## SEMESTER-II

**Course Title: APPLIED PHYSICS-II**

**Course Code: DME203**

L	T	P	Credits
3	0	0	3

**Total Hours: 45**

### **COURSE CONTENTS:**

#### **UNIT-I**

**10 Hours**

**Optics:** Review of basic optics laws: Reflection and Refraction, Refractive index and magnification, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection and their applications, Simple concepts of interference, diffraction, Polarization and their applications like Commercial equipment, optic glasses and its manufacturing and use of Polari meter in sugarcane industry and distilleries (No explanation required), Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case) and their applications.

#### **UNIT-II**

**10 Hours**

**Electrostatics:** Coulombs law, unit charge and electric lines of force, Electric flux and Gauss's Law, Electric field intensity and electric potential, Electric field due to point charge, straight charged conductor, plane charged sheet and charged sphere (Inside and outside the sphere), Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down, Pollution, different types of pollution and polluting agents, Use of Electronics in reducing Air and Water pollution e.g. precipitation of microbes and moisture reparation from air and gases in industry (small explanation only).

#### **UNIT-III**

**15 Hours**

**DC Circuits:** Concept of electricity, various applications of electricity, Current, voltage, resistance, potential difference and e.m.f, power, electrical energy and their units, advantages of electrical energy over other forms of energy and Alternating Current and Direct Current, Ohm's law and its applications, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors an Resistance, Definitions of Conductance and Super Conductor's, Kirchhoff's laws, Wheatstone bridge principle and its applications, Heating effect of current and concept of electric power, energy and their units, related numerical problems and their applications, Examples of DC Circuits e.g. Various electrical and electronic equipment CRO, T.V., Audio system, Computers (Only examples, no explanations).

**Electromagnetism:** Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Permeability and susceptibility and their applications. Electromagnetic Induction, Lenz's law and its uses like dynamo, Right hand and left hand rules, Magnetic lines of force due to straight conductor, Solenoid and Circular coil. Force on a current carrying rectangular coil placed in magnetic field and its uses in moving coil galvanometer, electric motor (Concept only). Lorentz force, Force on a current carrying conductor (straight and rectangular), Moving coil galvanometer its principle, construction and working.

#### **UNIT-IV**

**10 Hours**

**Semiconductor physics:** Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics, Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only).

**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 their engineering and medical applications, Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

#### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

#### **Suggested Readings**

- Suggested Readings of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
- Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
- Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
- Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi.
- Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series.

**Course Title: BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

**Course Code: DME211**

L	T	P	Credits
3	0	0	3

**SEMESTER-II**

**Total Hours: 45**

**COURSE CONTENT:**

**UNIT-I**

**10 Hours**

**Application and Advantage of Electricity:** Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

**Basic Electrical Quantities:** Definition of voltage, 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**

**10 Hours**

**AC Fundamentals:** Electromagnetic induction- Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

**UNIT III**

**10 Hours**

**Transformers**

Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

**Electric Motor**

Description and 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. Motors used for driving pumps, compressors, centrifuge, dyers etc. Totally enclosed submersible and flame proof motors

## UNIT-IV

**10 Hours**

**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 applications of a thyristor, characteristics and applications of stepper motors and servo motors in process control. Logic Gates i.e. AND gate, OR Gate, NOT gate, NOR gate, NAND gate, XOR gate and their truth tables.

### Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

### Suggested Readings

- Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
- A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
- Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
- Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
- Experiments in Basic Electrical Engineering by SK Bhattacharya and KMRastogi, New Age International Publishers Ltd., New Delhi

## SEMESTER-II

**Course Title: ENGLISH AND COMMUNICATION SKILLS –II LAB**

**Course Code: DME205**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### List of Practicals:

#### 1. LISTENING

- ✓ Pre-recorded CDs of famous speeches and dialogues: Comprehension exercises based on the audio
- ✓ Note-taking
- ✓ Drawing inferences
- ✓ Summarizing

#### 2. SPEAKING

- ✓ Voice Modulation: Horizons (pitch, tone, volume, modulation) \
- ✓ Word stress, rhythm, weak and strong form, pauses, group-sense, falling sounds, accent, influence of mother tongue etc.
- ✓ Situational Conversation/role-playing with feedback, preferably through video recording
- ✓ Telephonic Conversation: Types of calls, agreeing and disagreeing, making and changing appointments, reminding, making complaints and handling complaints, general etiquettes,
- ✓ A small formal and informal speech
- ✓ Seminar
- ✓ Debate

### **3. VOCABULARY**

- ✓ Vocabulary of commonly used words, Glossary of Administrative Terms (English and Hindi),
- ✓ One word substitution,
- ✓ Idioms and Phrases
- ✓ Prefixes and Suffixes
- ✓ Punctuation
- ✓ Narration
- ✓ Forms of verbs: Regular and irregular

### **4. EMPLOYABLE SKILLS**

- ✓ Group discussions
- ✓ Presentations, using audio-visual aids (including power-point)
- ✓ Interview techniques: Telephonic interviews, Group interviews, face to face Interviews.
- ✓ Mannerism and etiquette etc.

## **SEMESTER-II**

**Course Title: APPLIED PHYSICS-II LAB**

**Course Code: DME206**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Total Hours: 15**

### **List of Practicals**

1. To find the focal length of convex lens by displacement method.
2. To determine the magnifying power of an astronomical telescope
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To find resistance of galvanometer by half deflection method
6. To measure very low resistance and very high resistance using Wheat Stone bridge.
7. To determine the capacity of a parallel plate capacitor by discharging through a voltmeter and also find out the time constant of the given capacitor.

8. To draw characteristics of a pn junction diode and determine knee and break down voltages.
9. To find wave length of He Ne semiconductor LASER.
10. Use of CRO in plotting AC/DC

## SEMESTER-II

**Course Title: BASIC ELECTRICAL & ELECTRONICS  
ENGINEERING LAB  
Course Code: DME212**

L	T	P	Credits
0	0	2	1

**Total Hours: 15**

### **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. Connection and reading of an electric energy meter
4. Use of ammeter, voltmeter, wattmeter, and multi-meter
5. Measurement of power and power factor in a given single phase ac circuit
6. Study of different types of fuses, MCBs and ELCBs
7. Study of zener as a constant voltage source and to draw its V-I characteristics
8. To draw V-I characteristics of a (i) NPN transistor (ii) thyristor (SCR)
9. Study of construction and working of a (i) stepper motor and (ii) servo moto



## SEMESTER-II

**Course Title : ENGINEERING DRAWING-II**  
**Course Code: DME209**

L	T	P	Credits
1	0	4	3

**Total Hours: 45**

### **COURSE CONTENT:**

#### **Note:**

1. First angle projection is to be followed
2. Minimum 15 sheets to be prepared
3. BIS Code SP 46 -1988 should be followed

Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

1. 20 percent of drawing sheets to be prepared on the third angle projection
2. Punjab State Board of Technical Education may recommend any of the CAD software viz. Solid Works, Pro Engineer, CATIA, NX, Inventor-AutoCAD etc.
3. The State Directorate of Technical Education may allocate funds for the purchase of computer systems and CAD software for drawing classes.
4. Continuous evaluation be done by the teachers for exercises/work done on CAD software. For this proper record may be maintained for its inclusion in the internal assessment.

### **1. Detail and Assembly Drawing**

- 1.1. Principle and utility of detail and assembly drawings
- 1.2. Introduction to CAD Software
- 1.3. Practical exercise on drawing from detail to assembly or vice versa using

wooden joints as example with CAD Software

**2. Threads (Min.02 sheets)**

- 2.1 Nomenclature of threads, types of threads (metric). Single and multiple start threads
- 2.2 Forms of various external thread sections such as V, Square, Acme, Knuckle, Metric, Seller and Buttruss thread
- 2.3 Simplified conventions of left hand and right hand threads, both external and internal threads
- 2.4 Draw at least one sheet using CAD Software

**3. Nuts and Bolts (Min.02 sheets)**

- 3.1 Different views of hexagonal and square headed bolts and nuts
- 3.2 Assembly of nuts and bolts with washers
- 3.3 Draw at least one sheet using CAD Software

**4. Locking Devices (01 sheet)**

- 4.1 Lock nuts, Castle nuts, Sawn nuts, Split pin lock nut
- 4.2 Spring washers, locking plates.
- 4.3 Draw different locking devices using CAD Software

**5. Screws, Studs and Washers (01 sheet)**

- 5.1 Drawing various types of machine screws
- 5.2 Drawing various types of studs
- 5.3 Drawing various types of washers
- 5.4 Redraw the above sheet using CAD Software

**6. Keys and Cotters (Min.03 sheets)**

- 3.3 Various types of keys and their application. Preparation of drawings of various keys and cotters
- 1. Various types of joints (a) Sleeve and Cotter joint (b) Kunckle joint (c) Spigot and Socket joint
- 2. Draw any one joint using CAD Software

**7. Rivets and Rivetted Joints (02 sheets)**

- 7.1 Types of general purpose rivet heads
- 7.2 Types of rivetted joints - lap, butt (single cover plate and double cover plate),

chain and zig-zag riveting.

7.3 Caulking and fullering of rivetted joints.

7.4 Draw any one type of rivetted joint using CAD Software

### **RECOMMENDED BOOKS**

- A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., New Delhi
- Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
- Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House
- Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar
- AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo & D. Sarvanan, Wiley India Pvt. Ltd., Delhi

## SEMESTER-II

**Course Title : GENERAL WORKSHOP PRACTICE -II**

**Course Code: DME210**

L	T	P	Credits
0	0	4	2

**Total Hours: 30**

### COURSE CONTENTS

1. Carpentry and painting shop-II
2. Fitting shop -II
3. Welding shop -II
4. Electric shop -II
5. Smithy shop -II or Electronic shop-II
6. Sheet Metal Shop -II

### Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering,

Mechanical (RAC), Production and Industrial Engineering will do **Smithy Shop -II** instead of Electronic shop- II

**and**

2. The branches e.g. Electronics and Communication Engineering, Electronics (with Specialization in Microprocessor), will do **Electronic shop- II** instead of Smithy Shop-II .
3. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1. **Carpentry and Painting Shop - II**

- 1.1 Introduction to joints, their relative advantages and uses. Job I Preparation of Dovetail joint and glued joint.

Job II Preparation of Mitre Joint

Job III Preparation of a lengthening Joint

Job IV Preparation of atleast one utility job with and without lamination.

- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.
- 1.3 Demonstration of job on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.
- 1.4 Importance and need of polishing wooden items, Introduction to polishing materials.

Job V Preparation of surface before polishing including prime coat. Job VI Polishing on wooden items.

## **2 Fitting Shop – II**

- 2.1 Introduction to various types of threads (internal, external)-single start, multi- start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies Selection of dyes for threading, selection of drills and taps for tapping operations.

Job I Making internal and external threads on a job by tapping and dieing operations (manually)

- 2.3 Precautions while drilling soft metals, e.g. Copper, Brass, Aluminium etc.  
Job II Drilling practice on soft metals (Aluminum, Brass and Copper)

- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count.

Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of 0.1mm

Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps, etc

### **3. Welding Shop – II**

- 3.1 Introduction to gas welding, spot welding and seam welding and machinery and equipment used. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment. Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice on simple jobs.

- 3.2 Common welding joints generally made by gas welding.

Job II Preparation Butt joint by gas welding.

Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.

Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).

Job V Exercise of preparing a job on spot/seam welding machine.

### **4 Electric Shop – II**

- 4.1 Importance of three-phase wiring and its effectiveness.

Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.

### 1.1 Estimating and costing of power connection.

Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.

Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.

Job IV Dismantling, servicing and reassembling of any of the above electrical appliances.

Job V Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.

Job VI Reversing the rotation of a motor.

## 5. Smithy Shop – II

5.1 Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.

5.2 Description of various types of power hammers and their usage (Demonstration only).

Job I To forge a ring to acquaint the students with forge welding

Job II To forge a chisel and acquaint the students with simple idea of hardening and tempering

Job III To forge squares on both ends of a circular rod

Job IV To forge a single/double ended spanner

Job V To prepare a job involving drawing down process

**OR**

## **6.2 Electronic Shop- II**

Demonstrate the jointing methods. mounting and dismantling as well as uses of the items mentioned below:

Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

Various types of plugs, sockets connectors suitable for general purpose audio

and video use, 2 and 3 pin mains plug and sockets.

Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

c) Various types of switches such as: normal/ miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.

d) Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

6.3 Identification and familiarisation with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, switches (SPDT, DPDT, etc.) connectors, micro switches, read relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

### **6.3 Demonstrate the following:**

1) To make perfect solder joints and soldering on PCBs



- 2) To remove components/wires by unsoldering.
- 3) To assemble components on boards, chassis, tape strips.
- 4) Various laying methods of cables
- 5) Exposure to modern soldering and de-soldering processes
- 6) Field visits to relevant work-places

Job I De-solder, remove and clean all the components, wires from given equipment, a PCB or a tap strip using the following:

Job II Soldering Iron

Job III Temperature Control Soldering Iron

Job IV De-soldering Pump

Job IV De-soldering Strip

Job V Wiring of a small circuit on a PCB/tag st

Job VI Rip involving lacking, sleeving and use of identifier tags

## **6. Sheet Metal Shop-II**

- 6.1 Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing
- 6.2 Introduction to soldering and brazing.
- 6.3 Introduction to metal spinning process.

Job I Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.

Job II Exercise on job involving brazing process

Job III Spinning a bowl/cup/saucer

Job IV Visit to a sheet metal industry e.g. coach builders etc.

### **Transaction Modes**

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

### **Suggested Readings**

- Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
- Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
- Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd. New Delhi .
- Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
- Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
- Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

### SEMESTER: III

**COURSE TITLE: APPLIED MECHANICS**

**COURSE CODE: DME302**

L	T	P	Credits
3	0	0	3

### COURSE CONTENTS

#### 1. Introduction

(04hrs)

- 1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.
- 1.2 Definition, basic quantities and derived quantities of basic units and derived units
- 1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration
- 1.4 Concept of rigid body, scalar and vector quantities

#### 2. Laws of forces

(9 hrs)

- 2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force
- 2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position
- 2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components
- 2.4 Free body diagram
- 2.5 Equilibrant force and its determination
- 2.6 Lami's theorem (concept only) [Simple problems on above topics]

#### 3. Moment

(9 hrs)

- 1. Concept of moment
- 2. Moment of a force and units of moment
- 3. Varignon's theorem (definition only)
- 4. Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)
- 5. Parallel forces (like and unlike parallel force), calculating their resultant

6. Concept of couple, its properties and effects
7. General conditions of equilibrium of bodies under coplanar forces
8. Position of resultant force by moment  
[Simple problems on the above topics]

#### **4. Friction** (9 hrs)

1. Definition and concept of friction, types of friction, force of friction
2. Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
3. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.
4. Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:
  - a) Acting along the inclined plane Horizontally
  - b) At some angle with the inclined plane

#### **5. Centre of Gravity** (8 hrs)

- 5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies
- 5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion
- 5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed  
[Simple problems on the above topics]

#### **6. Simple Machines** (9 hrs)

- 6.1. Definition of effort, velocity ratio, mechanical advantage and efficiency of - a machine and their relationship, law of machines
- 6.2. Simple and compound machine (Examples)
- 6.3. Definition of ideal machine, reversible and self locking machine
- 6.4. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
- 6.5. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
- 6.6. Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application  
[Simple problems on the above topics]

## RECOMMENDED BOOKS

- 3.2 A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
- 3.3 Applied Mechanics By, Col. Harbhajan Singh, TL Singha and Parmod Kumar Singla Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
- 3.4 A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
- 3.5 A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
- 3.6 Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

**SEMESTER: III**  
**COURSE TITLE: ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING**  
**COURSE CODE: DME303**

L	T	P	Credits
3	0	0	3

## COURSE CONTENTS

### 1. Application and Advantage of Electricity

(03 hrs)

Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

### 2. Basic Electrical Quantities

(04 hrs)

Definition of voltage, current, power and energy with their units, name of

instruments used for measuring above quantities, connection of these instruments in an electric circuit

**3. AC Fundamentals** (04 hrs)

Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

**4. Transformers** (06 hrs)

Working principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

**5. Distribution System** (06 hrs)

Difference between high and low voltage distribution system, identification of three-phase wires, neutral wire 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

**6. Electric Motor** (08 hrs)

Description and 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. Motors used for driving pumps, compressors, centrifuge, dyers etc. Totally enclosed submersible and flame proof motors

**7. Domestic Installation** (06 hrs)

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

**8. Electrical Safety** (04hrs)

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

**9. Batteries**

(02 hrs)

Construction, charging and maintenance of lead acid batteries, maintenance free batteries

**10. Basic Electronics**

(05 hrs)

Basic idea of semiconductors – P and N type; diodes, zener diode and their applications, transistor – PNP and NPN, their characteristics and uses. Characteristics and applications of a thyristor, characteristics and applications of stepper motors and servo motors in process control.

**RECOMMENDED BOOKS**

1. Basic Electrical Engineering by PS Dhogal; 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
8. Basic electronics and Linear circuits by NN Bhargava and Kulshreshta, Tata Mc Graw Hill New Delhi.
9. Electronic principles by SK Sahdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama Raddy Narora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi

**SEMESTER: III**

**COURSE TITLE: WORKSHOP TECHNOLOGY-I**

**COURSE CODE: DME304**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Welding**

(22 hrs)

**5.1 Welding Process**

Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols.

**5.2 Gas Welding**

Principle of operation, Types of gas welding flames and their applications, Gas welding equipment - Gas welding torch, Oxy acetylene cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes

**5.3 Arc Welding**

Principle of operation, 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

**5.4 Other Welding Processes**

Resistance welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding, Atomic hydrogen welding, Shielded metal arc welding, submerged arc welding, Welding distortion, welding defects, methods of controlling welding defects and inspection of welded joints.



### 5.5 Modern Welding Methods

Methods, Principle of operation, advantages, disadvantages and applications of, Tungsten inert gas (TIG) welding, Metal inert gas (MIG) welding, Thermit welding, Electro slag welding, Electron beam welding, Ultrasonic welding, Laser beam welding, Robotic welding

## 2. Pattern Making

(05 hrs)

Types of pattern, Pattern material, Pattern allowances, Pattern codes as per B.I.S., Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores

## 3. Moulding and Casting

(22 hrs)

### 3.1 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, Testing of moulding sand.

### 3.2 Mould Making

Types of moulds, Step involved in making a mould, Molding boxes, hand tools used for mould making, Molding processes: Bench molding, floor molding, pit molding and machine molding, Molding machines squeeze machine, jolt squeeze machine and sand slinger.

### 3.3 Casting Processes

Charging a furnace, melting and pouring both ferrous and non ferrous metals, cleaning of castings, Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, Centrifugal casting

### 3.4 Gating and Riser System

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

### 3.5 Melting Furnaces

Construction and working of Pit furnace, Cupola furnace, Crucible furnace – tilting type, Electric furnace

### 3.6 Casting Defects

Different types of casting defects, Testing of defects: radiography, magnetic

particle inspection and ultrasonic inspection.

**4. Metal Forming Processes** (10 hrs)

- 4.1 Press Working - Types of presses, type of dies, selection of press die, die material. Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping
- 4.2 Forging - Open die forging, closed die forging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging
- 4.3 Rolling - Elementary theory of rolling, Types of rolling mills, Thread rolling, roll passes, Rolling defects and remedies
- 4.4 Extrusion and Drawing - Type of extrusion- Hot and Cold, Direct and indirect. Pipe drawing, tube drawing, wire drawing

**5. Plastic Processing** (05 hrs)

- 5.1 Industrial use of plastics, situation where used.
- 5.2 Injection moulding-principle, working of injection moulding machine.
- 5.3 Compression moulding-principle, and working of compression moulding machine.
- 5.4 Potential and limitations in the use of plastics

**LIST OF RECOMMENDED BOOKS**

- 1. Workshop Technology by BS Raghuvanshi :Dhanpat Rai and Sons Delhi
- 2. Elements of Workshop Technology by SK Choudhry and Hajra : Asia Publishing House
- 3. Manufacturing Technology by M Adithan and A.B. Gupta; Wiley Eastern India Ltd. New Delhi.
- 4. Welding Engineering by RL Aggarwal and T Manghnani; Khanna Publishers, Delhi
- 5. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi
- 6. Foundry Technology by KP Sinha and DB Goel; RoorkeePublishng House, Roorkee.
- 7. A Text Book of Manufacturing Science and Technology by A Manna, Prentice Hall of India, Delhi.

**SEMESTER: III**

**COURSE TITLE: ENGINEERING MATERIALS**

**COURSE CODE: DME312**

L	T	P	Credits
3	0	0	3

**COURSE CONTENTS**

Introduction

(07hrs)

Material, History of Material Origin, Scope of Material Science, Overview of different engineering materials and applications, Classification of materials, Thermal, Chemical, Electrical, Mechanical properties of various materials, Present and future needs of materials, Overview of Biomaterials and semi-conducting materials, Various issues of Material Usage- Economical, Environment and Social.

Crystallography

(07hrs)

Fundamentals: Crystal, Unit Cell, Space Lattice, Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals, Number of atoms per unit Cell, Atomic Packing Factor.

Deformation: Overview of deformation behaviour and its mechanisms, behaviour of material under load and stress-strain.

Failure Mechanisms: Overview of failure modes, fracture, fatigue and creep.

## Metals And Alloys

(14 hrs)

Ferrous Materials: Different iron ores, Raw materials in production of iron and steel, Basic process of iron-making and steel-making, Classification of iron and steel.

Cast Iron: Different types of Cast Iron, manufacture and their use. Classification of Grey cast iron and S.G. iron

Steels: Steels and alloy steel, Classification of plain carbon steels, Properties and usage of different types of Plain Carbon Steels, Effect of various alloys on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel)

Non Ferrous Materials: Properties and uses of Aluminium, Copper and Zinc and their alloys

## Heat Treatment

(08 hrs)

Purpose of heat treatment, Solid solutions and its types, Formation and decomposition of Austenite, Martensitic Transformation – Simplified Transformation Cooling Curves. Various heat treatment processes – hardening, tempering, annealing, normalizing, Case hardening and surface hardening, Hardenability of steels, Selection of case carburizing and induction hardening steels. Types of heat treatment furnaces (only basic idea)

## Plastics

(03 hrs)

Important sources of plastics, Classification – thermoplastic and thermoset and their uses, Various trade names of plastics, Plastic coatings, food grade plastics. Applications of plastics in automobile and domestic use.

Rubber classification – Natural and synthetic. Selection of rubber

## Advanced Materials

(03 hrs)

Composites – Classification, properties, applications  
Ceramics – Classification, properties, applications  
Adhesives – Classification, properties and applications  
Smart materials – properties and applications.

## Miscellaneous Materials

(06 hrs)

Overview of Tool and Die materials, Materials for bearing metals, Materials for Nuclear Energy, Refractory materials.

## RECOMMENDED BOOKS

1. Text book of Material Science by R.K. Rajput; Katson Pubs, Ludhiana

2. Text book of Material Science by Varinder Kumar, Eagle Publisher, Jalandhar
3. Text book of Material Science by V.K. Manchanda; India Publishing House, Jalandhar.
4. Engg. Metallurgy by R.A. Higgins, Standard Publishers, New Delhi  
Introduction to Material Science by A.R. Gupta, Satya Prakashan, New Delhi

**SEMESTER: III**  
**COURSE TITLE: APPLIED MECHANICS LAB**  
**COURSE CODE: DME307**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**LIST OF PRACTICALS**

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of 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.
  - 3.1 To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
  - 3.2 To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
  - 3.3 To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
  - 3.4 To find out center of gravity of regular lamina.
  - 3.5 To find out center of gravity of irregular lamina.
  - 3.6 To determine coefficient of friction between three pairs of given surface.

**SEMESTER: III**  
**COURSE TITLE: ELEMENTS OF ELECTRICAL AND**  
**ELECTRONICS ENGINEERING LAB**  
**COURSE CODE: DME308**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**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 and testing of a lead – acid battery
4. Troubleshooting in domestic wiring system, including distribution board
5. Connection and reading of an electric energy meter
6. Use of ammeter, voltmeter, wattmeter, and multi-meter
7. Measurement of power and power factor in a given single phase ac circuit
8. Study of different types of fuses, MCBs and ELCBs
9. Study of zener as a constant voltage source and to draw its V-I characteristics
10. Study of earthing practices
11. To draw V-I characteristics of a (i) NPN transistor (ii) thyristor (SCR)
12. Study of construction and working of a (i) stepper motor and (ii) servo motor

**INSTRUCTIONAL STRATEGY**

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

**SEMESTER: III**  
**COURSE TITLE: WORKSHOP TECHNOLOGY-I LAB**  
**COURSE CODE: DME309**

L	T	P	Credits
0	0	4	2

**LIST OF PRACTICALS**

General introduction to hand tools used in foundry, welding and pattern making and smithy shop.

**1. Welding Shop**

Job 1. Preparing gas welding joint in vertical position joining M.S. Plates

Job 2. Exercise on gas cutting of mild steel plate with oxy-acetylene gas torch. Job 3. Exercise on gas welding of cast iron and brass part or component.

Job 4. Exercise on preparation of T Joint by arc welding

Job 5. Exercise on spot welding/seam welding

Job 6. Exercise on MIG and TIG welding

**2. Pattern making**

Job 1. Preparation of solid/single piece pattern.

Job 2. Preparation of two piece/split pattern

Job 3. Preparation of a pattern on wooden lathe

Job 4. Preparation of a self cored pattern

Job 5. Preparation of a core box.

**3. Foundry Shop**

Job 1. Preparation of mould with solid pattern on floor.

Job 2. Preparation of floor mould of solid pattern using cope.

Job 3. Preparation of floor mould of split pattern in cope and drag of moulding box.

Job 4. Moulding and casting of a solid pattern of aluminum

Job 5. Preparing a mould of step pulley and also preparing core for the same.



Job 6. A visit to cast iron foundry should be arranged to have first hand knowledge of cast iron melting pouring and casting.

Job 7. Testing of moisture contents and strength of moulding sand.

#### **4. Forging Shop/Fitting Shop/Sheet Metal Shop**

Job 1. Preparation of single ended spanner by hand/machine forging. Job 2. Preparation of simple die

Job 3. Demonstration of spinning process on lathe and spinning a bowl on a lathe machine.

Job 4. Demonstration of grinding process on lathe machine and grinding a job on a lathe machine

Job 5. Preparation of utility item out of G.I. sheet.

Job 6. Preparation of drilling Jig.

#### **INSTRUCTIONAL STRATEGY**

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations.

**SEMESTER: III**  
**COURSE TITLE: ENGINEERING MATERIALS LAB**  
**COURSE CODE: DME313**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**LIST OF PRACTICALS**

1. Classification of about 25 specimens of materials/machine parts into
  - (i) Metals and non metals
  - (ii) Metals and alloys
  - (iii) Ferrous and non ferrous metals
  - (iv) Ferrous and non ferrous alloys
2. Given a set of specimen of metals and alloys (copper, brass, aluminium, cast iron, HSS, Gun metal); identify and indicate the various properties possessed by them.
3.
  - a) Study of heat treatment furnace.
  - b) Study of a thermocouple/pyrometer.
4. Study of a metallurgical microscope and a specimen polishing machine.
5. To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials:
  - i) Brass ii) Copper iii) Grey iv)Malleable v)Low carbon steel vi)High carbon steel vii) HSS
6. To anneal a given specimen and find out difference in hardness as a result of annealing.
7. To normalize a given specimen and to find out the difference in hardness as a result of normalizing.
8. To harden and temper a specimen and to find out the difference in hardness due to tempering.

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of engineering materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Heat Treatment Processes in the industry.

**SEMESTER: III**  
**COURSE TITLE: MECHANICAL ENGINEERING**  
**DRAWING-I**  
**COURSE CODE: DME311**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	4	3

**COURSE CONTENTS**

**1. Limits and fits** (03 sheets)

Maximum limit of size, minimum limit of size, tolerance, allowance, deviation, upper deviation, lower deviation, fundamental deviation, clearance, maximum clearance, minimum clearance. Fits – clearance fit, interference fit, transition fit. Hole basis system, shaft basis system, tolerance grades, calculating values of clearance, interference, hole tolerance, shaft tolerance with given basic size for common assemblies like H<sub>7</sub>/g<sub>6</sub>, H<sub>7</sub>/m<sub>6</sub>, H<sub>8</sub>/p<sub>6</sub>

**2. Intersection of following solids: -** (02 sheets)

- (a) Cylinder with cylinder (equal and different diameters; axis at right angles)
- (b) Cylinder with cylinder (axis inclined)

**3. Drawing of the following with complete dimensions, tolerances, materials and surface finish marks.**

3.1 Universal coupling (Assembly) (01 Sheets)

3.2 Bearings (05 sheets)

3.2.1 Bushed Bearing (Assembled Drawing)

3.2.2 Ball Bearing and Roller Bearing (Assembled Drawing)

3.2.3 Plummer Block (Detailed Drawing)

3.2.4 Plummer Block ( Assembled Drawing)

3.2.5 Foot step Bearing (Assembled Drawing)

3.3 Bracket (01 sheets)

3.3.1 Wall bracket (orthographic views)

3.4 Pulleys (03 sheets)

3.4.1 Stepped Pulley

3.4.2 V. Belt Pulley

3.4.3 Fast and loose pulley (Assembled Drawing)

3.5 Pipe Joints (02 sheets)

3.5.1 Expansion pipe joint (Assembly drawing)

3.5.2 Flanged pipe and right angled bend joint (Assembly Drawing)

3.6 Lathe Tool Holder (Assembly Drawing) (01 sheets)

3.7 Reading of mechanical component drawing (01 sheets)

3.8 Sketching practice of bearings, bracket and pulleys. (02 sheets)

**4. Electrical Circuit Diagram (01 sheet)**

4.1 Electrical circuit diagrams for house hold appliances (bulb, fan, tube, provision for plug and switch with voltmeter and energy meter connected in the circuit.

4.2 Electrical connections for lathe machine

**Note:-**(1) First angle projection should be followed, 20% of drawings may be prepared in third angle projection.

(2) SP-46-1988 should be followed

(3) The drawing should include discussion with tolerances, whenever necessary and material list as per BIS / ISO specifications.

**INSTRUCTIONAL STRATEGY**

1. Teachers should show model of the components/part whose drawing is to be made
2. Emphasis should be given to cleanliness, dimensioning, layout of sheet
3. Teachers should ensure use of IS codes related to drawing
4. Focus should be on the proper selection of drawing instrument and its proper use

**LIST OF RECOMMENDED BOOKS**

1. Machine Drawing by P.S. Gill; S.K. Kataria and Sons; Ludhiana
2. A Text Book of Machine Drawing by R.K. Dhawan; S. Chand and Co. Ltd New Delhi.
3. Machine Drawing by N.D. Bhatt; Charotar Book Depot. Anand.

**SEMESTER: IV**

**COURSE TITLE: GENERIC SKILLS AND  
ENTREPRENEURSHIP DEVELOPMENT  
COURSE CODE: DME401**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS:**

**Introduction to Generic Skills:** Importance of Generic Skill Development (GSD), Global and Local Scenario of GSD, Life Long Learning (LLL) and associated importance of GSD.

**Managing Self:** Knowing Self for Self Development- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc., Managing Self – Physical- Personal grooming, Health, Hygiene, Time Management, Managing Self – Intellectual development -Information Search: Sources of information, Reading: Purpose of reading, different styles of reading, techniques of systematic reading, Note Taking: Importance of note taking, techniques of note taking, Writing: Writing a rough draft, review and final draft. Managing Self – Psychological, Stress, Emotions, Anxiety-concepts and significance, Techniques to manage the above.

**Managing in Team:** Team - definition, hierarchy, team dynamics, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills.

**Task Management:** Task Initiation, Task Planning, Task execution, Task close out, Exercises/case studies on task planning towards development of skills for task management

**Problem Solving:** Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving, Different approaches for problem solving. Steps followed in problem solving. Exercises/case studies on problem solving.

**Entrepreneurship:** Introduction , Concept/Meaning and its need, Competencies/qualities of an entrepreneur, Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level. 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. Project Report Preparation- Preliminary Project Report, Techno-Economic Feasibility Report, Exercises regarding "Project Report Writing" for small projects.

#### **REFERENCE/TEXT BOOKS:**

1. Generic skill Development Manual, MSBTE, Mumbai.
2. Lifelong learning, Policy Brief ([www.oecd.org](http://www.oecd.org)).
3. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
4. Towards Knowledge Society, UNESCO Paris Publication
5. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
6. Human Learning, Ormrod
7. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
8. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
9. Handbook of Small Scale Industry by PM Bhandari.

**SEMESTER: IV**

**COURSE TITLE: HYDRAULICS AND  
PNEUMATICS  
COURSE CODE: DME402**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

- 1. Introduction** (03 hrs)  
Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility, surface tension, kinematic viscosity and dynamic viscosity and their units.
- 2. Pressure and its Measurement** (06 hrs)
  - 1.1 Concept of pressure (Atmospheric Pressure, gauge pressure, absolute pressure)
  - 1.2 Pressure measuring devices: peizometer tube manometers - simple U-tube, differential single column, inverted U-tube, micromanometer including simple problems
  - 1.3 Bourdon pressure gauge, Diaphragm pressure gauge, dead weight pressure gauge
- 3. Flow of Fluids** (07 hrs)  
Types of fluid flow – steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; potential energy of a flowing fluid; total head; Bernoulli's theorem (statement and proof) and its applications. Discharge measurement with the help of venturi-meter, orifice meter, pitot-tube, limitations of Bernoulli's theorem simple problems.
- 4. Flow through Pipes** (10 hrs)
  - 4.1 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 (without proof), Reynold's number and its effect on pipe friction; siphon, Nozzle - definition, velocity of liquid flowing through the nozzle, power developed. Water hammer, anchor block, syphon, surge tank (concept only). Loss of head in pipes due to sudden enlargement, sudden contraction,
  - 4.2 obstruction on flow path, change of direction and pipe fittings (without proof)

5.     **Hydraulic System** (05 hrs)  
Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic door accumulator, closer, hydraulic press, selection of specification of above systems for different applications
6.     **Water Turbines and Pumps** (14 hrs)
  - 2.1    Concept of a turbine, types of turbines –impulse and reaction type (concept only), difference between them. Construction and working of pelton wheel, Francis turbine, Propeller and Kaplan turbines. Unit speed, unit power, unit discharge, specific speed of turbines, selection of turbines based on specific speed.
  - 2.2    Concept of hydraulic pump, single acting reciprocating pump (construction and operation only), vane, screw and gear pumps.
  - 2.3    Construction, working and operation of centrifugal pump. Performance, efficiencies and specifications of a centrifugal pump. Trouble shooting and problems in centrifugal pumps and remedial measures, pitting, cavitation, priming.
7.     **Introduction to Oil Power Hydraulics and Pneumatics** (03 hrs)
  6.      Introduction to oil power hydraulics and pneumatic system
  7.      Statement of Pascal law and its applications
  8.      Industrial applications of oil power hydraulics and pneumatic system
  9.      Cavitation
8.     **Components of Hydraulic Systems** (08 hrs)
  - 3.1    Basic components of hydraulic system, function of each component in a hydraulic circuit.
  - 3.2    Oil reservoirs, couplings, motors and pumps – definition and functions of the parts,
  - 3.3    Filters- definition and purpose, classification
  - 3.4    Seals and packing- classification of seals, sealing materials.
9.     **Components of Pneumatic Systems** (08 hrs)
  - 1.4    Basic components – function of each component
  - 1.5    Air compressors – type, working
  - 1.6    Air cylinder – types, function, single acting, double acting, rotating, non-rotating, piston type, diaphragm type, tandem cylinder, double ended cylinder, duplex cylinder.



1.7 Air filter, regulator and lubricator – their necessity in pneumatic circuit.

1.8 Installation, maintenance and application of air cylinders.

**RECOMMENDED BOOKS**

1. Fluid Mechanics by KL Kumar; S Chand and Co Ltd., Ram Nagar, New Delhi.
2. Hydraulics and Fluid Mechanics Machine by RS Khurmi ;S.Chand& Co. Ltd., New Delhi.
3. Fluid Mechanics through Problems by RJ Garde; Wiley Eastern Ltd., New Delhi.
4. Fluid Mechanics by Dr AK Jain, Khanna Publishers, New Delhi.
5. Hydraulic and Pneumatic Control by K ShammugaSundaram, S. Chand & Co. Ltd., New Delhi
6. Hydraulics and Hydraulic Machinery by Dr. Jagadish Lal; Metropolitan Book Company Ltd., Delhi.
7. Hydraulic and Pneumatic Power and Control Design, Performance and Application by Yeaple, McGraw Hill, New York..
8. Pneumatic Controls by Festo Didactic; Bangalore.

**SEMESTER: IV**

**COURSE TITLE: THERMODYNAMICS - I**

**COURSE CODE: DME403**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Fundamental Concepts (06 hrs)**

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.

**2. Laws of Perfect Gases (05 hrs)**

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

**3. Thermodynamic Processes on Gases (08 hrs)**

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

**4. Laws of Thermodynamics (12 hrs)**

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 of second laws of thermodynamics: Kelvin

Planck's statement, Clausius statement, equivalence of statements, Perpetual

motion Machine of first kind, second kind, Carnot engine, Introduction of third

law of thermodynamics, concept of irreversibility, entropy.

## **5. Ideal and Real Gases** (06 hrs)

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

## **6. Properties of Steam** (05 hrs)

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),

## **7. Steam Generators** (05 hrs)

Uses of steam, classification of boilers, comparison of fire tube and water

tube

boilers. Construction features of Lancashire boiler, nestler boiler, Babcock &

Wilcox Boiler. Introduction to modern boilers.

**8. Air Standard Cycles** (06 hrs)

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

**9. Air Compressors** (08 hrs)

Functions of air compressor – uses of compressed air, type of air compressors

Single stage reciprocating air compressor, its construction and working,

representation of processes involved on P – V diagram, calculation of work done.

Multistage compressors – advantages over single stage compressors, use of air

cooler – condition of minimum work in two stage compressor (without proof),

simple problems

Rotary compressors – types, descriptive treatment of centrifugal compressor,

axial

flow compressor, vane type compressor

**10. Introduction to Heat Transfer**

(03 hrs)

Modes of heat transfer, Fourier's law, steady state conduction, composite structures, Natural and forced convection, thermal radiation

**RECOMMENDED BOOKS**

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

**SEMESTER: IV**  
**COURSE TITLE: STRENGTH OF MATERIALS**  
**COURSE CODE: DME404**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Stresses and Strains** (08 hrs)

- 1.1. Concept of load, stresses and strain
- 1.2. Tensile compressive and shear stresses and strains
- 1.3. Concept of Elasticity, Elastic limit and limit of proportionality.
  - 1.3.1. Hook's Law
  - 1.3.2. Young Modulus of elasticity
  - 1.3.3. Nominal stress
  - 1.3.4. Yield point, plastic stage
  - 9. Ultimate strength and breaking stress
  - 5. Percentage elongation
  - 6. Proof stress and working stress
  - 7. Factor of safety
  - 1.3.9 Shear modulus
- 1. Longitudinal and circumferential stresses in seamless thin walled cylindrical shells (derivation of these formulae not required)

**2. Resilience** (04 hrs)

- 1. Resilience, proof resilience and modulus of resilience
- 2. Strain energy due to direct stresses
- 3. Stresses due to gradual, sudden and falling load.

**3. Moment of Inertia** (10 hrs)

- 3.1. Concept of moment of inertia and second moment of area
- 3.2. Radius of gyration

- 3.3 Theorem of perpendicular axis and parallel axis (without derivation)
- 3.4 Second moment of area of common geometrical sections :Rectangle, Triangle, Circle (without derivation); Second moment of area for L,T and I section
- 3.5 Section modulus

**4. Bending Moment and Shearing Force (10 hrs)**

- 4.1 Concept of beam and form of loading
- 4.2 Concept of end supports-Roller, hinged and fixed
- 4.3 Concept of bending moment and shearing force  
B.M. and S.F. Diagram for cantilever and simply supported beams with
- 4.4 and without overhang subjected to concentrated and U.D.L.

**5. Bending stresses (06 hrs)**

- 5.1 Concept of Bending stresses
- 5.2. Theory of simple bending
- 5.3. Use of the equation  $f/y = M/I = E/R$
- 5.4. Concept of moment of resistance
- 5.5. Bending stress diagram
- 5.6. Calculation of maximum bending stress in beams of rectangular, circular, and T section.
- 5.7 Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.

**6 Columns (08 hrs)**

- 6.1. Concept of column, modes of failure
- 6.2. Types of columns
- 6.3. Buckling load, crushing load
- 6.4. Slenderness ratio
- 6.5. Factors effecting strength of a column
  - 1. End restraints
  - 2. Effective length

- 3. Strength of column by Euler Formula without derivation
- 10. Rankine Gourdan formula ( without derivation)
- 7. **Torsion** (10 hrs)

12. Concept of torsion- difference between torque and torsion.

- 13. Use of torque equation for circular shaft
- 14. Comparison between solid and hollow shaft with regard to their strength and weight.
- 15. Power transmitted by shaft
- 16. Concept of mean and maximum torque

- 8. **Springs** (8 hrs)

- 8.1. Closed coil helical springs subjected to axial load and impact load
- 8.2 Stress deformation
- 8.3 Stiffness and angle of twist and strain energy
- 8.4 Proof resilience
- 8.5 Laminated spring (semi elliptical type only)
- 8.6 Determination of number of plates

#### **RECOMMENDED BOOKS**

- 4. SOM by BirinderSingh,;Katson Publishing House, New Delhi.
- 5. SOM by RS Khurmi; S.Chand& Co; New Delhi
- 6. Elements of SOM by D.R. Malhotra &H.C.Gupta; Satya Prakashan, New Delhi.



**SEMESTER: IV**  
**COURSE TITLE: WORKSHOP TECHNOLOGY-II**  
**COURSE CODE: DME405**

L	T	P	Credits
3	0	0	3

**COURSE CONTENTS**

**1. Cutting Tools and Cutting Materials**

- 2 Cutting Tools - Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect
- 3.1 Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.

**2. Lathe**

- 3.2 Principle of turning
- 3.3 Description and function of various parts of a lathe
- 3.4 Classification and specification of various types of lathe
- 3.5 Drives and transmission
- 3.6 Work holding devices
- 3.7 Lathe tools: Parameters/Nomenclature and applications
- 3.8 Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.
- 3.9 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.
- 3.10 Speed ratio, preferred numbers of speed selection.
- 3.11 Lathe accessories:- Centers, dogs, different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment, tool post grinder, milling attachment, Quick change device for tools.
- 4.1 Brief description of capstan and turret lathe, comparison of capstan/Turret lathe, work holding and tool guiding devices in capstan and turret lathe.

**3. Drilling**

- 5.1 Principle of drilling.

- 5.2 Classification of drilling machines and their description.
- 5.3 Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.
- 5.4 Speeds and feeds during drilling, impact of these parameters on drilling, machining time.
- 5.5 Types of drills and their features, nomenclature of a drill
- 5.6 Drill holding devices.
- 5.7 Types of reamers.
- 4. Boring** (06 hrs)
- 6.1 Principle of boring
- 6.2 Classification of boring machines and their brief description.
- 6.3 Specification of boring machines.
- 6.4 Boring tools, boring bars and boring heads.
- 6.5 Description of jig boring machine.
- 5. Shaping, Planing and Slotting** (10 hrs)
- 1. Working principle of shaper, planer and slotter.
- 2. Type of shapers
- 3. Type of planers
- 4. Quick return mechanism applied to shaper, slotter and planer machine.
- 5. Work holding devices used on shaper, planer and slotter.
- 6. Types of tools used and their geometry.
- 7. Specification of shaper, planer and slotting machine.
- 8. Speeds and feeds in above processes.
- 6. Broaching** (06 hrs)
- 1. Introduction
- 2. Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.
- 3. Elements of broach tool, broach tooth details – nomenclature, types, and tool material.
- 7. Jigs and Fixtures** (08 hrs)
- 7.1 Importance and use of jigs and fixture
- 7.2 Principle of location

- 7.3 Locating devices
- 7.4 Clamping devices
- 7.5 Types of Jigs – Drilling jigs, bushes, template jigs, plate jig, channel jig, leaf jig.
- 7.6 Fixture for milling, turning, welding, grinding
- 7.7 Advantages of jigs and fixtures

**8. Cutting Fluids and Lubricants (10 hrs)**

- 1.1 Function of cutting fluid
- 1.2 Types of cutting fluids
- 1.3 Difference between cutting fluid and lubricant
- 1.4 Selection of cutting fluids for different materials and operations
- 1.5 Common methods of lubrication of machine tools.

**RECOMMENDED BOOKS**

1. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons; Delhi
2. Manufacturing Technology by M. Adithan and A.B. Gupta; New Age International (P) Ltd, Delhi.
3. Elements of Workshop Technology by SK Choudhry and Hajra; Asia Publishing House
4. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi

**SEMESTER: IV**  
**COURSE TITLE: ENVIRONMENTAL STUDIES**  
**COURSE CODE: DME411**

L	T	P	Credits
2	0	0	2

**COURSE CONTENTS**

1. Basics of ecology, ecosystem and sustainable development  
(03 hrs)
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table, rainwater harvesting, maintenance of groundwater, deforestation – its effects and control measures  
(04 hrs)
3. Pollution: Sources of pollution - natural and man made, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement. Prevention of Pollution : Introduction to Cleaner Production Technologies, Waste Minimization Techniques, Concept of Zero Discharge  
(12 hrs)
4. Solid waste management, classification of refuse material, sources, effects and control measures. Introduction to E-waste Management  
(06 hrs)
5. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA)  
(08 hrs)
6. Energy Conservation: Introduction to Energy Management, Energy Conservation, Energy efficiency & its need. Introduction to Energy Conservation Act 2001 and Energy Conservation (Amendment) Act 2010 & its importance. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) in environmental protection.  
(10 hrs)
7. Impact of Energy Usage on Environment: -  
Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling

ofMaterial,ConceptofGreenBuildings,  
(05hrs)

### **INSTRUCTIONALSTRATEGY**

Inadditiontotheoreticalinstructions,differentactivitiespertainingtoEnvironm  
entalStudieslikeexpertlectures,seminars,visitsetc.mayalsobeorganized.

### **RECOMMENDED BOOKS**

1. EnvironmentalandPollutionAwarenessby  
SharmaBR;SatyaPrakashan,NewDelhi.
2. EnvironmentalProtectionLawandPolicyinIndiabyThakurKailash;  
DeepandDeepPublications,NewDelhi.
3. EnvironmentalPollutionby  
Dr.RKKhitoliya;SChandPublishing,NewDelhi
4. EnvironmentalSciencebyDeswalandDeswal;DhanpatRaiandCo.(P)  
Ltd.Delhi.
5. EngineeringChemistrybyJain and Jain;Dhanpat Raiand Co. (P) Ltd.  
Delhi.
6. EnvironmentalStudiesbyErachBharucha;UniversityPress(India)  
PrivateLtd.,Hyderabad.
7. EnvironmentalEngineeringandManagementbySureshKDhamija;  
SKKatariaand Sons,NewDelhi.

**SEMESTER: IV**

**COURSE TITLE: HYDRAULICS AND  
PNEUMATICS LAB  
COURSE CODE: DME406**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**LIST OF PRACTICALS**

1. Measurement of pressure head by employing.
  - i) Piezometer tube
  - ii) Single and double column manometer
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 find coefficient of friction for a pipe (Darcy's friction).
6. To study hydraulic circuit of an automobile brake and hydraulic ram.
7. Study the working of a Pelton wheel and Francis turbine.
8. To study a single stage centrifugal pump for constructional details and its operation to find out its normal head and discharge.

**INSTRUCTIONAL STRATEGY**

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

**SEMESTER: IV**  
**COURSE TITLE: STRENGTH OF MATERIALS**  
**LAB**  
**COURSE CODE: DME408**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**LIST OF PRACTICALS**

1. Tensile test on bars of Mild steel and Aluminium.
2. Bending tests on a steel bar or a wooden beam.
3. Impact test on metals
  - a. Izod test
  - b. Charpy test
4. Torsion test on specimens of different metals for determining modulus of rigidity.
5. To determine the stiffness of a helical spring and to plot a graph between load and extension.
6. Hardness test on different metals.

**INSTRUCTIONAL STRATEGY**

- 5.5 Expose the students to real life problems.
- 5.6 Plan assignments so as to promote problem solving abilities and develop continued learning skills.

**SEMESTER: IV**  
**COURSE TITLE: WORKSHOP TECHNOLOGY-II**  
**LAB**

**COURSE CODE: DME409**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	4	2

## **COURSE CONTENTS**

### **PRACTICAL EXERCISES**

#### **Turning Shop**

Job 1. Grinding of single point turning tool.

Job 2. Exercise of simple turning and step turning.

Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

#### **Advance Fitting Shop**

Job 1. Exercise on drilling, reaming, counter boring, counter sinking and tapping Job 2. Dove tail fitting in mild steel

Job 3. Radius fitting in mild steel Job 4. Pipe threading with die

#### **Machine Shop**

Job 1. Prepare a V-Block up to  $\pm 0.5$  mm accuracy on shaper machine Job 2. Exercise on key way cutting and spline cutting on shaper machine.

## **INSTRUCTIONAL STRATEGY**

- 2.1 Teachers should lay emphasis in making students conversant with concepts and principles of manufacturing processes.
- 2.2 Focus should be on preparing jobs using various machines in the workshop



**SEMESTER: IV**  
**COURSE TITLE: MECHANICAL ENGINEERING**  
**DRAWING-II**  
**COURSE CODE: DME410**

L	T	P	Credits
1	0	4	3

**COURSE CONTENTS**

1. Introduction to drawing office equipment, through a visit to modern drawing office of an industry
  2. Drilling Jig (Detail and Assembly) 2 sheets
  3. Vices 3 sheets
    - 3.1 Machine vice (Detailed and Assembly drawing)
  4. I.C. Engine Parts 3 sheets
    - 4.1 Piston
    - 4.2 Connecting rod (Assembly drawing)
    - 4.3 Crankshaft and flywheel assembly
  5. Boiler Parts 2 sheets
    - 5.1 Steam Stop Valve (Assembled drawing)
    - 5.2 Blow off cock. (Assembled drawing)
  6. Mechanical Screw Jack (Assembled Drawing) 1 sheet
  7. Cams 4 sheets
    - 7.1 Types of cams and followers (Theoretical)
    - 7.2 Profile of cams for imparting following motions with knife edge and roller followers.:
      - Uniform motion
      - Simple Harmonic Motion
      - Uniformity accelerated and retarded motion:
  8. Gears 4 sheets
    - 1 Nomenclature of gears and conventional representation
    - 2 Drawing the actual profile of involute teeth of spur gear by different methods.
- Note:**
1. 1<sup>st</sup> angle projection should be followed. 20% of the drawings may be made using 3<sup>rd</sup> angle projection.
  2. SP- 46-1998 should be followed. The drawings should include dimensions with tolerance wherever necessary and material as per BIS/ISO specifications.

**RECOMMENDED BOOKS**

1. Machine Drawing by P.S. Gill; S.K. Kataria& Sons, Ludhiana
2. A Text Book of Machine Drawing by RK Dhawn; S.Chand& Co. Ltd., New Delhi.
3. Machine drawing by N.D Bhatt, Charotar Book Depot, Anand

**SEMESTER: V**

**COURSE TITLE: BASICS OF MANAGEMENT**

**COURSE CODE: DME511**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Principles of Management** (06 hrs)

1.1 Introduction, definition and importance of management.

1.2 Functions of Management

Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.

1.3 Concept and Structure of an organization  
Types of industrial organization

Line organization

Functional organization

Line and Functional organization

1.4 Hierarchical Management Structure  
Top, middle and lower level management

1.5 Departmentalization  
Introduction and its advantages.

**2. Work Culture** (06 hrs)

1.2. Introduction and importance of Healthy Work Culture in organization

1.3. Components of Culture

1.4. Importance of attitude, values and behaviour  
Behavioural Science – Individual and group behaviour

1.5. Professional ethics – Concept and need of Professional Ethics

**3. Leadership and Motivation** (06 hrs)

1.4 Leadership

Definition and Need of Leadership

Qualities of a good leader

Manager vs. leader

1.5 Motivation

Definition and characteristics of motivation

Factors affecting motivation

Maslow's Need Hierarchy Theory of Motivation

2.5. Job Satisfaction

**4. Legal Aspects of Business: Introduction and need** (06 hrs)

2.4 Labour Welfare Schemes

4.1.1. Wage payment : Definition and types

Incentives: Definition, need and types

4.5 Factory Act 1948

4.6 Minimum Wages Act 1948

**5. Management Scope in different Areas** (12 hrs)

10. Human Resource Development

Introduction and objective

Manpower Planning, recruitment and selection

Performance appraisal methods

11. Material and Store Management

a) Introduction, functions and objectives of material management b) Purchasing: definition and procedure

c) Just in time (JIT)

12. Marketing and Sales

a) Introduction, importance and its functions b) Difference between marketing and selling

c) Advertisement- print media and electronic media d) Market-Survey and Sales promotion.

13. Financial Management – Introduction

Concept of NPV, IRR, Cost-benefit analysis

Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund

- 3.5 Maintenance Management
  - Concept
  - Preventive Maintenance

**6. Miscellaneous topics (12 hrs)**

- 7.1 Customer Relationship Management (CRM)
  - Definition and Need
  - Types of CRM
  - Customer satisfaction
- 7.2 Total Quality Management (TQM)
  - Inspection and Quality Control
  - Concept of Quality Assurance
  - TQM
- 7.3 Intellectual Property Rights (IPR)
  - 3.3.1. Introduction, definition and its importance
  - 3.3.2. Infringements related to patents, copyright, trade mark

**INSTRUCTIONAL STRATEGY**

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

**RECOMMENDED BOOKS**

- 7.6 Principles of Management by Philip Kotler TEE Publication
- 7.7 Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
- 7.8 Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar, New Delhi.
- 7.9 Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited, Rajouri Garden, New Delhi.

- 7.10 Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.
- 7.11 Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.
- 7.12 Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
- 7.13 Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
- 7.14 Intellectual Property Rights and the Law by Dr. GB Reddy.
- 7.15 Service Quality Standards, Sales & Marketing Department, MarutiUdyog Ltd.
- 7.16 Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
- 7.17 Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

**SEMESTER: V****COURSE TITLE: REFRIGERATION AND AIR  
CONDITIONING****COURSE CODE: DME502**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS****REFRIGERATION****1. Fundamentals of Refrigeration** (02 hrs)

Introduction to refrigeration, and air conditioning, meaning of refrigerating effect, units of refrigeration, COP, difference between COP and efficiency, methods of refrigeration, Natural system and artificial system.

**2. Vapour Compression System** (12 hrs)

Introduction, principle, function, parts and necessity of vapour compression system, T- $\phi$  and p- H charts, dry, wet and superheated compression. Effect of sub cooling, super heating, mass flow rate, entropy, enthalpy, work done, Refrigerating effect and COP. actual vapour compression system

**3. Refrigerants** (04 hrs)

Functions, classification of refrigerants, properties of R - 717, R - 22, R-134 (a), CO<sub>2</sub>, R - 11, R - 12, R - 502, Properties of ideal refrigerant, selection of refrigerant

**4. Air Refrigeration System** (08 hrs)

Introduction, advantages and disadvantages of air-refrigeration system over vapour compression system, bell - Collemann cycle, calculation of mass flow rate, work done and COP

**5. Vapour Absorption System** (06 hrs)

Introduction, principle and working of simple absorption system and domestic electrolux refrigeration systems. Solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.,

**6. Refrigeration Equipment** (12 hrs)

6.1 Compressors- Function, various types of compressors

6.2 Condensers - Function, various types of condensers

6.3 Evaporators- Function, types of evaporators

- 6.4 Expansion Valves - Function, various types such as capillary tube, thermostatic expansion valve, low side and high side float valves, application of various expansion valves
3. Safety Devices-Thermostat, overload protector LP, HP cut out switch.

## **AIR CONDITIONING**

### **7. Psychrometry** (08 hrs)

Definition, importance, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT, sensible heat, latent heat, Total enthalpy of air.

### **8. Applied Psychrometry and Heat Load Estimation.** (12 hrs)

Psychrometric chart, various lines, psychrometric process, by pass factor, room sensible heat factor, effective room sensible heat factor, grand sensible heat factor, ADP, room DPT.

Heating and humidification, cooling and dehumidification, window air-conditioning, split type air-conditioning, car air-conditioning, central air-conditioning.

## **RECOMMENDED BOOKS**

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
3. Refrigeration & Air conditioning by G.S. Aulakh, Eagle Parkashan, Jalandhar
4. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.

**SEMESTER: V**

**COURSE TITLE: THERMODYNAMICS-II**

**COURSE CODE: DME503**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

- 1. IC Engines** (09 hrs)
  1. Introduction
  2. Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, diesel cycle and dual cycle
  3. Location and functions of various parts of IC engines and materials used for them
- 2. Fuel Supply and Ignition System in Petrol Engine** (08 hrs)
  - 2.1 Concept of carburetion
  - 2.2 Air fuel ratio
  - 2.3 Simple carburetor and its application
  - 2.4 Description of battery coil and magneto ignition system, fault finding and remedial action in ignition system
- 3. Fuel System of Diesel Engine** (06 hrs)
  - 3.1 Components of fuel system
  - 3.2 Description and working of fuel feed pump
  - 3.3 Fuel injection pump
  - 3.4 Injectors
- 4. Cooling and Lubrication** (10 hrs)
  1. Function of cooling system in IC engine
  2. Air cooling and water cooling system, use of thermostat, radiator and forced circulation in water cooling (description with line diagram)
  3. Function of lubrication
  4. Types and properties of lubricant
  5. Lubrication system of engine
  6. Fault finding in cooling and lubrication and remedial action



## **5. Testing of IC Engines**

(09

hrs)

1. Engine power - indicated and brake power
2. Efficiency - mechanical, thermal. relative and volumetric
3. Methods of finding indicated and brake power
- 5.4 Morse test for petrol engine
- 5.5 Heat balance sheet
- 5.6 Concept of pollutants in SI and CI engines, pollution control, norms for two or four wheelers - EURO - 1, EURO - 2, methods of reducing pollution in IC engines, alternative fuels like CNG, LPG, Hydrogen

## **6. Steam Turbines and Steam Condensers**

(10

hrs)

5. Function and use of steam turbine
6. Steam nozzles - types and applications
7. Steam turbines - impulse, reaction, simple and compound, construction and working principle
8. Governing of steam turbines
9. Function of a steam condenser, elements of condensing plant
10. Classification - jet condenser, surface condenser
11. Cooling pond and cooling towers

## **7. Gas Turbines and Jet Propulsion**

(12

hrs)

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

## **RECOMMENDED BOOKS**

1. Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, Anand.
2. Thermodynamics-I by G.S. Aulakh, Eagle Parkashan, Jalandhar.
3. Thermal Engineering by PL. Ballaney; Khanna Publishers, New Delhi.
4. Engineering Thermodynamics by Francis F Huang; McMillan Publishing Company, Delhi.
5. Engineering Thermodynamics by CP. Arora; Tata McGraw Hill Publishers, New Delhi.
6. Thermal Engineering by RK Purohit; Standard Publishers Distributors, New Delhi.

**SEMESTER: V**  
**COURSE TITLE: WORKSHOP TECHNOLOGY - III**  
**COURSE CODE: DME504**

L	T	P	Credits
3	0	0	3

**COURSE CONTENTS**

**1. Milling(18 hrs)**

- 1.1 Specification and working principle of milling machine
- 1.2 Classification, brief description and applications of milling machines
- 1.3 Details of column and knee type milling machine
- 1.4 Milling machine accessories and attachment – Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment
- 1.5 Milling methods - up milling and down milling
- 1.6 Identification of different milling cutters and work mandrels
- 1.7 Work holding devices
- 1.8 Milling operations – face milling, angular milling, form milling, straddle milling and gang milling.
- 1.9 Cutting speed and feed, simple numerical problems.
- 1.10 Indexing on dividing heads, plain and universal dividing heads.
- 1.11 Indexing methods: direct, Plain or simple, compound, differential and angular indexing, numerical problems on indexing.
- 1.12 Thread milling

**2 Grinding(14 hrs)**

- 2.1 Purpose of grinding
- 2.2 Various elements of grinding wheel – Abrasive, Grade, structure, Bond
- 2.3 Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.
- 2.4 Truing, dressing, balancing and mounting of wheel.
- 2.5 Grinding methods – Surface grinding, cylindrical grinding and centreless grinding.
- 2.6 Grinding machine – Cylindrical grinder, surface grinder, internal

- grinder, centreless grinder, tool and cutter grinder.
- 2.7 Selection of grinding wheel
- 2.8 Thread grinding.

**3. Gear Manufacturing and Finishing Processes(08 hrs)**

- 1.5 Gear hobbing
- 1.6 Gear shaping
- 1.7 Gear finishing processes

**4. Modern Machining Processes(08 hrs)**

- 1. Mechanical Process - Ultrasonic machining (USM): Introduction, principle, process, advantages and limitations, applications
- 2. Electro Chemical Processes - Electro chemical machining (ECM) – Fundamental principle, process, applications, Electro chemical Grinding (ECG) – Fundamental principle, process, application
- 3. Electrical Discharge Machining (EDM) - Introduction, basic EDM circuit, Principle, metal removing rate, dielectric fluid, applications
- 4. Laser beam machining (LBM) – Introduction, machining process and applications
- 5. Electro beam machining (EBM)- Introduction, principle, process and applications
- 6. Plasma arc machining (PAM) and welding – Introduction, principle process and applications

**5. Metallic Coating Processes(08 hrs)**

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

**6. Metal Finishing Processes(08 hrs)**

- 2.7 Purpose of finishing surfaces.
- 2.8 Surface roughness-Definition and units
- 2.9 Honing Process, its applications
- 2.10 Description of hones.
- 2.11 Brief idea of honing machines.

- 2.12 Lapping process, its applications.
- 2.13 Description of lapping compounds and tools.
- 2.14 Brief idea of lapping machines.
- 2.15 Super finishing process, its applications.
- 2.16 Use of super finishing attachment on center lathe.
- 2.17 Polishing
- 2.18 Buffing.

#### **RECOMMENDED BOOKS**

1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi.
2. Workshop Technology-III by K.P.S. Chouhan, Eagle Parkashan, Jalandhar.
3. Manufacturing Technology by M. Adithan and A.B. Gupta; New Age International (P) Ltd., New Delhi.
4. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
5. Practical Handbook for Mechanical Engineers by Dr. AB Gupta; Galgotia Publications, New Delhi.
6. Production Technology by HMT; Tata McGraw Publishers, New Delhi.
7. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
8. Modern Machining Processes by Pandey; Tata McGraw Publishers, New Delhi.
9. A Text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi.
10. Workshop Technology Vol-III, by R.P. Dhiman, Ishan Publications Jalandhar

**SEMESTER: V**

**COURSE TITLE: THEORY OF MACHINES**

**COURSE CODE: DME505**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

- 1. Simple Mechanisms** (06 hrs)
  8. Introduction to link, kinematic pair, lower and higher pair, Kinematic chain, mechanism, Inversions.
  9. Different types of mechanisms ( with examples )
- 2. Friction**(10 hrs)
  - 1.1 Definition and its necessity
  - 1.2 Horizontal force required to move a body on an inclined plane both upward and downward
  - 1.3 Frictional torque in screws , both for square and V threads
  - 1.4 Screw jack ( Derivation and Numericals)
  - 1.5 Different types of bearings and their application
- 3. Power Transmission** (14 hrs)
  1. Introduction to Belt and Rope drives
  2. Types of belt drives and types of pulleys
  3. Concept of velocity ratio, slip and creep; crowning of pulleys (simple numericals)
  4. Flat and V belt drive: Ratio of driving tensions, power transmitted, centrifugal tension, and condition for maximum horse power (simple numericals)
  5. Different types of chains and their terminology
  6. Gear terminology, types of gears and their applications; simple and compound gear trains; power transmitted by simple spur gear
- 4. Flywheel**(08 hrs)
  2. Principle and applications of flywheel
  3. Turning - moment diagram of flywheel for different engines
  - 5.4 Fluctuation of speed and fluctuation of energy - Concept only
  - 5.5 Coefficient of fluctuation of speed and coefficient of fluctuation of energy

**5. Governor(10 hrs)**

1. Principal of governor
2. Simple description and working of Watt, Porter and Hartnel governor (simple numerical based on watt and porter governor)
3. Hunting, isochronism, stability, sensitiveness of a governor

**6. Balancing(06 hrs)**

4. Concept of balancing
5. Introduction to balancing of rotating masses (simple numericals)

**7. Vibrations (10 hrs)**

- 6.7. Types-longitudinal, transverse and torsional vibrations (simple numericals)
- 6.8. Dampening of vibrations
- 6.9. Causes of vibrations in machines, their harmful effects and remedies

**RECOMMENDED BOOKS**

1. Theory of Machines by D.R. Malhotra; Satya Prakashan, New Delhi.
2. Theory of Machines by HarpreetSingh , Eagle Parkashan, Jalandhar.
3. Theory of Machines by V.P Singh; Dhanpat Rai and sons, New Delhi.
4. Theory of Machines Jagdish Lal; Metropolitan Publishers, New Delhi.

**SEMESTER: V**  
**COURSE TITLE: REFRIGERATION AND AIR**  
**CONDITIONING LAB**  
**COURSE CODE: DME506**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**COURSE CONTENTS**

**LIST OF PRACTICALS**

1. Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes.
2. Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers.
3. Identify various parts of a refrigerator and window air conditioner.
4. To find COP of Refrigeration system
5. To detect trouble/faults in a refrigerator/window type air conditioner
6. Charging of a refrigerator/ window type air conditioner.
7. Disassembly and assembly of single cylinder open type compressor
8. Visit to an ice plant or cold storage plant. or central air conditioning plant

**INSTRUCTIONAL STRATEGY**

1. Teaches should take the students to industry and explain the details of refrigeration and air-conditioning systems and their components.
2. While imparting instructions, focus should be on conceptual understanding.
3. Training slides of “Carrier Fundamentals of Refrigeration Air Conditioning” to be shown to students.



**SEMESTER: V**  
**COURSE TITLE: THERMODYNAMICS-II LAB**  
**COURSE CODE: DME507**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**COURSE CONTENTS**

**LIST OF PRACTICALS**

1. Dismantle a two stroke engine, note the function and material of each part, re-assemble the engine.
2. Dismantle a single cylinder diesel engine. Note the function of each part, re-assemble the engine.
3. Dismantle Solex, Amal carburetor, locate and note down the functions of various parts, and re-assemble.
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 cooling of IC engine.
6. Study of lubricating system of IC engine.
5. Determination of BHP by dynamometer.
6. Morse test on multi-cylinder petrol engine.
7. Local visit to roadways or private automobile workshops.
8. Study of steam turbines through models and visit.
9. Study of steam condensers through model and visits.

**INSTRUCTIONAL STRATEGY**

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

**SEMESTER: V**  
**COURSE TITLE: WORKSHOP TECHNOLOGY - III**  
**LAB**  
**COURSE CODE: DME508**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	4	2

## **COURSE CONTENTS**

### **PRACTICAL EXERCISES**

#### **Advance Turning Shop**

1. Exercise of boring with the help of boring bar
2. Exercises on internal turning on lathe machine
3. Exercises on internal threading on lathe machine
4. Exercises on external turning on lathe machine
5. Resharpening of single point cutting tool with given geometry

#### **Machine Shop**

1. Produce a rectangular block by facing on a slotting machine
2. Produce a rectangular slot on one face with a slotting cutter
3. Produce a rectangular block using a milling machine with a side and face cutter
4. Prepare a slot on one face using milling machine
5. Job on grinding machine using a surface grinder
6. Prepare a job on cylindrical grinding machine.
7. Exercise on milling machine with the help of a form cutter
8. Exercise on milling machine to produce a spur gear
9. Grinding a drill-bit on tool and cutter grinder
10. Exercise on dressing a grinding wheel

### **INSTRUCTIONAL STRATEGY**

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations.

**SEMESTER: V**  
**COURSE TITLE: COMPUTER AIDED DRAFTING**  
**LAB**  
**COURSE CODE: DME509**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	4	2

**COURSE CONTENTS**

1. Introduction to AutoCAD commands (6 drawing sheets)
  - a. Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar)
  - b. Drawing commands – point, line, arc, circle, ellipse,
  - c. Editing commands – scale, erase, copy, stretch, lengthen and explode.
  - d. Dimensioning and placing text in drawing area
  - e. Sectioning and hatching
  - f. Inquiry for different parameters of drawing entity
2. Detail and assembly drawing of the following using AUTOCAD (4 sheets)
  - Plummer Block
  - Wall Bracket
  - Stepped pulley, V-belt pulley
  - Flanged coupling
  - Machine tool Holder (Three views)
  - Screw jack or knuckle joint
- 5 Isometric Drawing by CAD using Auto CAD (one sheet)

Drawings of following on computer:

  - Cone
  - Cylinder
  - Isometric view of objects
4. Modelling (01 sheet)

3D modelling, Transformations, scaling, rotation, translation

5. Introduction to other CAD softwares;

(Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software)

**INSTRUCTIONAL STRATEGY**

- 3.6 Teachers should show model or realia of the component/part whose drawing is to be made.
- 3.7 Emphasis should be given on cleanliness, dimensioning, & layout of sheet.
- 3.8 Teachers should ensure use of IS codes related to drawing.

**RECOMMENDED BOOKS**

- 3.7 Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.
  - 3.8 AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.
  - 3.9 AutoCAD 2000 for you by UmeshShettigar and Abdul Khader; Janatha Publishers, Udupi.
  - 3.10 Auto CAD 2000 by Ajit Singh, TMH, New Delhi.
  - 3.11 Designing with Pro Engineer, Sham Tickoo by Dream Tech Publications, New Delhi.
- Designing with CATIA, by Sham Tickoo, Dream Tech. Publications, New Delhi.

**SEMESTER: V**  
**COURSE TITLE: INDUSTRIAL TRAINING**  
**COURSE CODE: DME510**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
NA	NA	NA	4

**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% |

**SEMESTER: VI**  
**COURSE TITLE: PRODUCTION MANAGEMENT**  
**COURSE CODE: DME610**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Production Planning and Control (PPC)** (06 hrs)

- 1.6 Introduction.
- 1.6. Objectives and factors affecting PPC
- 1.7. Functions(Elements) of PPC - Planning, Routing, Loading, scheduling, dispatching, progressing and inspection
- 1.8. Types of production system - Flow or continuous production, Intermittent Production
- 1.9. Production Control - Objectives and fields of production control,
- Production control system
- 1.6 Break even analysis and Gantt chart.

**2. Plant Location, Layout and Material Handling** (12 hrs)

- 2.1 Definition and Factors affecting the plant location, Rural versus Urban Plant sites.
- 2.3 Definition and importance of Plant layout, Factors affecting plant layout.
- 2.4 Types of Plant layout- Process, product, combination and fixed position layout..
- 2.5 Methods of plant layout - Process flow charts, layout analogues Travel chart, distance, volume matrix.,
- 2.6. Plant layout procedure and work station design.
- 2.7. Material Handling- Definition, Significance and objectives of material handling, Principles of economic material handling,. Types of material handling equipment - Characteristics and classification of material handling equipment, Hoisting and conveying equipment (different types), Safety requirements while using material handling equipment

- 3. Work Study** (12 hrs)  
and Productivity(Introduction and
- 3.1 Production System definitions),  
Difference between Production and productivity, Measures to improve productivity
- 2.5 Definition, advantages and procedure of work study
- 2.6 Method study – Definition, Objectives and Procedures, Process chart symbols, outline process chart, Flow process charts, Two handed processes charts, Multiple activity chart(Mn-Machine charts), Flow diagram, string diagram.
- 2.7 Principles of motion economy, Therblig symbols, SIMO chart.
- 3.5. Work Measurement :- Definition and objective, Work measurement technique, Time Study- Definition, objectives and procedure, Calculation of basic time, performance rating and its normal time, techniques, allowance and its types, standard time (simple numerical problems)

**4. Inventory Control** (10 hrs)

- 4.2 Definition and objectives of inventory control.
- 4.3 Inventory types
- 4.4 Procurement and carrying cost, EOQ, lead time, reorder point (simple numerical problems)
- 4.5 Inventory Classification - ABC Analysis, VED Analysis, FMS Analysis
- 4.7 Standardization and Codification - Objective and advantages of standardization, Levels and types of standards, .Objective and advantages of codes. Coding systems-. National and International Codes, ISO-9000 Concept and Evolution
14. Concept of Just-In-Time (JIT)

**5. Repair and Maintenance** (06 hrs)

- 5.2. Objectives and importance of Maintenance
- 5.3. Different types of maintenance- Corrective or Breakdown maintenance, Scheduled Maintenance, Preventive Maintenance,

Predictive Maintenance

5.4. Nature of maintenance problems

5.5. Range of maintenance problems

**6. Value Engineering** (04 hrs)

6.2. Introduction, Concept

6.3. Objectives of value engineering

3.6 Value Analysis Procedures

3.7 Benefits of value analysis

3.8 Technique of value engineering

**7. Cost Estimation and Control:** (14 hrs)

7.4 Definition and functions of cost estimation

7.5 Estimation procedure

7.6 Elements of cost, ladder of costs (simple numericals)

7.7 Overhead expenses and its distribution

7.8 Depreciation -: Concept and Definition, Methods of calculating

depreciation,. Straight line method, Diminishing Balance Method, Sinking fund method (Numerical problems).

7.18 Cost control- definition and objectives, Capital cost control (planning and scheduling), operating cost control.

1.9 Cost estimation for machining processes like turning, drilling, and milling. Cost estimation of forming processes like forging, pattern making, and casting .

**INSTRUCTIONAL STRATEGY**

1. Teacher should put emphasis on giving practical problems related to plant location

and plant layout

2 Students should be taken to industrial units to give an exposure of production environment, plant layout and material handling

3 Live problems may be given to students to carry out case studies in



teams under guidance of teacher

### **RECOMMENDED BOOKS**

9. Industrial Engineering and Management by T.R. Banga and SC Sharma; Khanna Publishers, Delhi.
10. Industrial Engineering and Management by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.
11. Production Management by C.L. Mahajan; Satya Parkashan Company Limited, New Delhi.
12. Mechanical Costing, Estimation and Project Planning by CK Singh; Standard Publishers, New Delhi.
13. A Text Book of Reliability and Maintenance Engineering by A Manna, Prentice Hall of India
14. Production Management by K. P. S. Chouhan, Eagle Parkashan, Jalandhar.

**SEMESTER: VI**

**COURSE TITLE: METROLOGY AND  
INSTRUMENTATION  
COURSE CODE: DME602**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS**

**1. Introduction(06 hrs)**

Definition of metrology

Standard of measurement

Types of Errors - Controllable and random errors

Precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement, interchangeability.

Standardization and standardizing organizations

**2. Linear and Angular Measurement**

(18

hrs)

Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block.

Construction features and use of instruments for precision measurements :vernier calipers, vernier height and depth gauges, micrometers.

Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges.

Cylinder bore gauges, feeler and wire gauges. Checking flatness, roundness and squareness

Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic .

Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angle dekker. Optical instruments for angular measurement, auto collimator.

**3. Measurement of Surface Finish**

(06

hrs)

Terminology of surface roughness.

Concept of primary texture and secondary texture.

Factors affecting surface finish.

CLA, RMS and RA value.

Principle and operation of stylus probe instruments. Tomlinson surface

meter and Taylor surface talysurf.

**4. Measurements of Screw threads and Gauges** (08 hrs)

Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.

Measurements of gears (spur) – Measurement of tooth thickness, pitch,

Profile projector, Coordinate Measuring Machine (CMM), Tool maker's microscope.

**5. Instrumentation** (08 hrs)

Various types of instruments used for mechanical quantities such as displacement, velocity, acceleration, speed and torque. Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers.

Strain gauge – use of strain gauge and load cells

**6. Quality Control** (18 hrs)

Quality control, SQC, function of quality control, quality cost, factors affecting quality of product.

Inspection need, types of inspection and stages of inspection

Statistical Quality Control – Definition

Process Capability

Introduction to Control Charts(X bar, R,p,c) and their simple applications

Concepts of ISO 9000, ISO 14000

Total Quality Management

- Seven QC tools, Kaizan, 5S,

**Note:** There should be a visit to established metrology lab to familiarize students with purpose and need of metrology.

**RECOMMENDED BOOKS**

1. Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
2. A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi.
3. Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh.
4. Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
5. Metrology & Instrumentation by Aulakh&Pathania; Eagle Prakashan, Jalandhar

**SEMESTER: VI**  
**COURSE TITLE: AUTOMOBILE ENGINEERING**  
**COURSE CODE: DME603**

L	T	P	Credits
3	0	0	3

**COURSE CONTENTS**

**1. Introduction(04 hrs)**

Automobile and its development

3.5 Various types of automobiles manufactured in India, their manufacturer and location of their manufacturing unit.

3.6 Classification of automobiles

3.7 Layout of chassis

3.8 Types of drives-front wheel, rear wheel, four wheel.

**2. Power System(08 hrs)**

Introduction, classification of I.C. engines.

Engine terminology

Fuel systems for petrol and diesel engines including multi point fuel injection (MPFI), common rail direct injection (CRDI), Fuel injectors and nozzles.

Governing of fuel-carburettor, electronic control module (ECM i.e, 8 bit, 16 bit and 32 bit computers)

Comparison of MPFI with carburettor system.

Concept of double overhead cam, single overhead cam, Twin cam 16 valve technology in 4 cylinder engine.

**3. Transmission System(10 hrs)**

Clutch - Function, Constructional details of single plate and multiplate friction clutches, Centrifugal and semi centrifugal clutch, Cone clutch, Hydraulic clutch

Gear Box - Function, Working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive,

Propeller shaft and rear axle - Function, Universal joint, Differential, Different types of rear axles and rear axle drives.

Wheels and Tyres - Types of wheels, Types and specifications of tyres used in Indian vehicles, Toe in, toe out, camber, caster, kingpin inclination, Wheel balancing and alignment

**4. Steering System(08 hrs)**

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

**5. Braking system(08 hrs)**

Constructional details and working of mechanical, hydraulic, air and vacuum brake, Details of master cylinder, wheel cylinder, Concept of brake drum, brake lining and brake adjustment, Introduction to Anti lock brake system and its working.

**6. Suspension System(08 hrs)**

Function, Types, Working of coil spring, leaf spring, Air suspension, Shock absorber – Telescopic type and pneumatic type

**7. Battery(06 hrs)**

Constructional details of lead acid cell battery, Specific gravity of electrolyte - effect of temperature on specific gravity, Specification of battery-capacity, rating , number of plates, selection of battery for particular use, Battery charging, chemical reactions during charge and discharge, Maintenance of batteries, Checking of batteries for voltage and specific gravity

**8. Dynamo and Alternator(08 hrs)**

Dynamo - Function and details, Regulators - voltage current and compensated type, Cutout - construction, working and their adjustment,

Alternator - Construction and working, Charging of battery by alternator

**9. Exhaust Emissions (04 hrs)**

Types and use of catalytic converters, emission norm standards i.e. Euro I, Euro II, Euro III and Euro IV

**RECOMMENDED BOOKS**

1. Automobile Engineering by GBS Narang; Khanna Publishers, Delhi.
2. Automobile Engineering by Dr. Kirpal Singh; Standard Publishers and Distributors, Delhi.
3. Automotive Mechanics, by W.Crouse and Anglin; Tata McGraw Hill, Delhi.
4. Automobile Engineering by G. S. Aulakh; Eagle Prakashan, Jalandhar

**SEMESTER: VI**

**COURSE TITLE: MACHINE DESIGN**

**COURSE CODE: DME604**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
4	0	0	4

**COURSE CONTENTS**

**1. Introduction(08 hrs)**

Design – Definition, Type of design, necessity of design

Comparison of designed and undesigned work

Design procedure

Characteristics of a good 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 consideration Codes and Standards (BIS standards) Engineering materials and their mechanical properties : Properties of engineering materials: elasticity, plasticity, malleability, ductility, toughness, hardness and resilience. Fatigue, creep, tenacity, strength Selection of materials, criterion of material selection

**2. Design Failure(04 hrs)**

Various design failures-maximum stress theory, maximum strain theory

Classification of loads

Design under tensile, compressive and torsional loads.

**3. Design of Shaft(10 hrs)**

Type of shaft, shaft materials, Type of loading on shaft, standard sizes of shaft available

Shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of :

-Strength criterion

-Rigidity criterion

Determination of shaft dia (hollow and solid shaft) subjected to bending

Determination of shaft dia (hollow and solid shaft) subjected to combined torsion and bending .

#### **4. Design of Key(06 hrs)**

Types of key, materials of key, functions of key

Failure of key (by Shearing and Crushing).

Design of key (Determination of key dimension)

Effect of keyway on shaft strength. (Figures and problems).

#### **5. Design of Joints(20 hrs)**

Types of joints - Temporary and permanent joints, utility of various joints

Temporary Joint:

a. Knuckle Joints – Different parts of the joint, material used for the joint, type of knuckle Joint, design of the knuckle joint. (Figures and problems).

b. Cotter Joint – Different parts of the spigot and socket joints, Design of spigot and socket joint.

Permanent Joint:

Welded Joint - Welding symbols. Type of welded joint, strength of parallel and transverse fillet welds.

Strength of combined parallel and transverse weld.

Riveted Joints. : Rivet materials, Rivet heads, leak proofing of riveted joint – caulking and fullering.

Different modes of rivet joint failure.

Design of riveted joint – Lap and butt, single and multi riveted joint.

#### **6. Design of Flange Coupling (08 hrs)**

Necessity of a coupling, advantages of a coupling, types of couplings, design of

muff coupling, design of flange coupling. (both protected type and unprotected

type).

**7. Design of Screwed Joints** (08 hrs)

7.1 Introduction, Advantages and Disadvantages of screw joints, location of

screw joints.

7.2 Important terms used in screw threads, designation of screw threads

7.3 Initial stresses due to screw up forces, stresses due to combined forces

7.4 Design of power screws (Press, screw jack, screw clamp)

**Note :** The paper setter should provide all the relevant data for the machine design numericals in the question paper.

**INSTRUCTIONAL STRATEGY**

1. Use moulds of various parts/components.
2. Presentation should be arranged for various topics.

**RECOMMENDED BOOKS**

1. Machine Design by R.S. Khurmi and JK Gupta, Eurasia Publishing House (Pvt.) Limited, New Delhi.
2. Machine Design by V.B. Bhandari, Tata McGraw Hill, New Delhi.
3. Engineering Design by George Dieter; Tata McGraw Hill Publishers, New Delhi.
4. Mechanical Engineering Design by Joseph Edward Shigley; McGraw Hill, Delhi.
5. Machine Design by Sharma and Agrawal; Katson Publishing House, Ludhiana.
6. Design Data Handbook by D.P. Mandali, SK Kataria and Sons, Delhi.
7. Machine Design by A.P. Verma; SK Kataria and Sons, Delhi
8. Machine Design by AR Gupta and BK Gupta ; Satya Parkashan, New Delhi.
9. Machine Design by G.S. Aulakh; Eagle Prakashan, Jalandhar



**SEMESTER: VI****COURSE TITLE: CNC MACHINES AND  
AUTOMATION****COURSE CODE: DME605**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
3	0	0	3

**COURSE CONTENTS****1. Introduction (10 hrs)**

Introduction to NC, CNC & DNC, their advantages, disadvantages and applications, Machine Control Unit, input devices, serial communication and Ethernet techniques, selection of components to be machined on CNC machines, Problems with conventional NC, New developments in NC, Axis identification, PLC Control and its components.

**2. Construction and Tooling (08 Hrs)**

Design features, specification Chart of CNC machines, use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices, various cutting tools for CNC machines, overview of tool holder, different pallet systems and automatic tool changer system, management of a tool room.

**3. Part Programming (08 Hrs)**

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.

**4. System Devices (12 Hrs)**

Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters, potentiometers for linear and angular position, encoder and decoder, axis drives, open loop system, close loop system.

**5. Problems in CNC Machines (04 Hrs)**

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.

**6. Automation and NC system (06 Hrs)**

Role of computer in automation, emerging trends in automation, automatic assembly, manufacture of magnetic tape, manufacture of printed circuit boards, manufacture of integrated Circuits, Overview of FMS, Group technology, CAD/CAM and CIM.

**RECOMMENDED BOOKS**

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill, New Delhi.
3. CNC Machine by Bharaj; Satya Publications, New Delhi.
4. CNC Machine & Automation by Ramandeep Singh; Eagle Prakashan, Jalandhar

**SEMESTER: VI**

**COURSE TITLE: METROLOGY AND  
INSTRUMENTATION LAB  
COURSE CODE: DME606**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**COURSE CONTENTS**

**LIST OF PRACTICALS**

1. Internal and external measurements with vernier calliper and microscope
2. Measurement of linear dimensions with height gauge and depth gauge.
3. Measurement of flatness, concentricity with dial indicator
4. Use of feeler gauge, wire gauge, radius gauge and fillet gauges for checking of standard parameters.
5. Use of plain plug and ring gauge, taper plug and ring gauge, thread plug and ring gauge and snap gauges.
6. Measurement of Angle using;
  - a. Cylindrical rollers and spherical balls and slip gauges
  - b. Bevel protector
  - c. Sine Bar/Sine Table , Slip Gauges, Height Gauge and dial indicator.
  - d. Angle decker.
7. Measurement of spur gear characteristics;
  - a. Measurement over teeth (M.O.T) by using flange/Disc micrometer.

P.C.D run-out using bench centre, mandrel, cylindrical pin and dial indicator.

Composite error using Gear Roller Tester and Master Gear.
8. Measurement of thread parameters by using tool maker's microscope.
9. Measurement of effective diameter of external threads by 2-wire and 3-wire method.
10. Measurement of cylindrical bore using cylinder bore gauge for bore diameter, ovality and taper.
11. Measurement of worn out IC engine piston clearance between cylinder and piston.
12. Measurement of surface roughness using surface roughness tester.
13. Measurement of co-ordinates of two or more than two holes using surface plate, angle plate, Height Gauge, dial indicator and slip gauges.
14. Measurement of a profile using profile projector.

15. Study and use of Auto-Collimator.

#### **INSTRUCTIONAL STRATEGY**

1. Demonstrate use of various measuring instruments while imparting theoretical instructions.
2. Stress should be laid on correct use of various instruments.

**SEMESTER: VI**  
**COURSE TITLE: AUTOMOBILE ENGINEERING**  
**LAB ENGINEERING**  
**COURSE CODE: DME607**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**COURSE CONTENTS**

**LIST OF PRACTICALS**

1. Fault and their remedies in (i) Battery Ignition system (ii) magnetic Ignition system.
2. Demonstration of (i) Head Light Model (ii) Wiper and Indicators.
3. Demonstration of (i) AC Pump (ii) SU Pump (iii) Master Cylinders.
4. Demonstration of (i) rear axle (ii) differential (iii) steering system.
5. Fault finding practices on an automobile - four wheelers (petrol/ diesel vehicles).
6. Tuning of an automobile engine.
7. Driving practice on a 4-wheeler.
8. Charging of an automobile battery and measuring cell voltage and specific gravity of electrolyte.
9. Changing of wheels and inflation of tyres, balancing of wheels.
10. Measuring spark gap, valve clearance and ring clearance; carrying out cleaning operations for adjustment.
11. Cleaning and adjusting a carburetor.

**INSTRUCTIONAL STRATEGY**

1. Use computer based learning aids for effective teaching-learning
2. Expose the students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

**SEMESTER: VI**

**COURSE TITLE: CNC MACHINES AND  
AUTOMATION LAB  
COURSE CODE: DME608**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**COURSE CONTENTS**

**LIST OF PRACTICALS**

1. Study the constructional details of CNC lathe.
2. Study the constructional details of CNC milling machine.
3. Study the constructional details and working of:
  - a. Automatic tool changer and tool setter
  - b. Multiple pallets
  - c. Swarf removal
  - d. Safety devices
4. Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center.
  - a. Plain turning and facing operations
  - b. Taper turning operations
  - c. Operation along contour using circular interpolation.
5. Develop a part programme for the following milling operations and make the job on CNC milling
  - a. Plain milling
  - b. Slot milling
  - c. Contouring
  - d. Pocket milling
6. Preparation of work instruction for machine operator
7. Preparation of preventive maintenance schedule for CNC machine.
8. Demonstration through industrial visit for awareness of actual working of FMS in production.
9. Use of software for turning operations on CNC turning center.
10. Use of software for milling operations on machine centres.

**INSTRUCTIONAL STRATEGY**

This is highly practice-based course. Efforts should be made to develop programming skills amongst the students. During practice work, it should be ensured that students get opportunity to individually perform practical tasks.

## SEMESTER: VI

**COURSE TITLE: PROJECT WORK**

**COURSE CODE: DME609**

L	T	P	Credits
0	0	8	4

### COURSE CONTENTS

The practical training cum project work is intended to place students for project oriented practical training in actual work situations for the stipulated period with a view to:

1. Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
2. Develop understanding of subject based knowledge given in the class room in the context of its application at work places.
3. Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.
4. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with minimal supervision. This experience is required to be planned and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnic may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organisation is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organisations. Each teacher is expected to supervise and guide 5-6 students.

Effort should be made to identify actual field problems as project work for the students. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria is given below :

1. Punctuality and regularity
2. Initiative in learning/working at site
3. Level/proficiency of practical skills acquired
4. Ability of solve live practical problems
5. Sense of responsibility
6. Self expression/communication skills
7. Interpersonal skills/Human Relation
8. Report Writing Skills
9. Viva Voce

The projects given to students should be such for which some one is waiting for solution. Some of the suggested project activities are given below:

Projects connected with repair and maintenance of machines .

1. Estimating and costing projects.
2. Design of jigs / fixtures.
3. Projects related to quality control.
4. Project work related to increasing productivity.
5. Projects relating to installation, calibration and testing of machines.
6. Projects related to wastage reduction.
7. Project, related to fabrication.
8. Energy efficiency related projects.
9. Projects related to improving an existing system.

Note: 1. Students are required to prepare working drawings of the projects and will prepare the estimate, material lists as required, and carry out market survey etc.

2. Students will specify various processes involved in the project

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