

# **Program Syllabus Booklet**

## **Diploma in Mechanical Engineering (Code-123)**



**Session: 2018-19**

GURU KASHI UNIVERSITY										
Guru Gobind Singh College of Engineering & Technology (Code:1)										
Diploma in Mechanical Engineering (Code: 123)										
Study Scheme										
Semester: 1st										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120101	Applied Chemistry – I	T	4	0	0	4	50	50	100
2	120102	Applied Mathematics - I	T	5	0	0	5	50	50	100
3	120103	Applied Physics – I	T	4	0	0	4	50	50	100
4	120104	English and Communication Skills – I	T	3	0	0	3	50	50	100
5	123101	Engineering Drawing – I	T/P	2	0	6	5	50	50	100
6	120105	Applied Chemistry – I Lab	P	0	0	2	1	50	50	100
7	120106	Applied Physics – I Lab	P	0	0	2	1	50	50	100
8	120107	English and Communication Skills – I Lab	P	0	0	2	1	50	50	100
9	120108	General Workshop Practice – I	P	0	0	6	3	50	50	100
Total No. of Credits							27			

\* Common Course with all other diploma programmes.

Semester: 2nd										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120201	*English and Communication Skills –II	T	4	0	0	4	50	50	100
2	120202	*Applied Mathematics -II	T	5	0	0	5	50	50	100
3	120203	*Applied Physics-II	T	4	0	0	4	50	50	100
4	120204	**Applied Chemistry –II	T	4	0	0	4	50	50	100
5	120205	*English and Communication Skills –II Lab	P	0	0	2	1	50	50	100
6	120206	*Applied Physics-II Lab	P	0	0	2	1	50	50	100
7	120207	**Applied Chemistry –II Lab	P	0	0	2	1	50	50	100
8	121202	# Basics of Information Technology Lab	P	0	0	4	2	50	50	100
9	123201	**Engineering Drawing-II	T/P	2	0	6	5	50	50	100
10	120208	*General Workshop Practice -II	P	0	0	6	3	50	50	100
Total No. of Credits							30			

\*Common Course with other diploma programmes

\*\* Common course with diploma program in Civil Engg. & ME

# Common course with diploma program in Civil Engg. , ME, ECE , 1st sem of CSE & IT.

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Diploma in Mechanical Engineering (Code: 123)										
Study Scheme										
Semester: 3rd										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	123301	Computer Applications in Mechanical Engineering	T	3	0	0	3	50	50	100
2	123302	*Applied Mechanics	T	4	0	0	4	50	50	100
3	123303	Elements of Electrical and Electrical Engineering	T	4	0	0	4	50	50	100
4	123304	Workshop Technology -I	T	4	0	0	4	50	50	100
5	123305	Material Science	T	4	0	0	4	50	50	100
6	123306	Computer Applications in Mechanical Engineering Lab	P	0	0	2	1	50	50	100
7	123307	* Applied Mechanics Lab	P	0	0	2	1	50	50	100
8	123308	Elements of Electrical and Electrical Engineering Lab	P	0	0	2	1	50	50	100
9	123309	Workshop Technology -I	P	0	0	6	3	50	50	100
10	123312	Material Science Lab	P	0	0	2	1	50	50	100
11	123313	Mechanical Engineering Drawing-I	T/P	2	0	6	5	50	50	100
Total No. of Credits				31						

\* Common course with diploma program in Civil Engg.

Semester: 4th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120401	* Generic Skills Entrepreneurship Development	T	4	0	0	4	50	50	100
2	123401	Hydraulics and Pneumatics	T	4	0	0	4	50	50	100
3	123402	Thermodynamics-I	T	4	0	0	4	50	50	100
4	123403	Strength of Materials	T	4	0	0	4	50	50	100
5	123404	Workshop Technology -II	T	4	0	0	4	50	50	100
6	123405	Hydraulics and Pneumatics Lab	P	0	0	2	1	50	50	100
7	123406	Thermodynamics Lab	P	0	0	2	1	50	50	100
8	123407	Strength of Materials Lab	P	0	0	2	1	50	50	100
9	123408	Workshop Technology –II	P	0	0	6	3	50	50	100
10	123409	Mechanical Engineering Drawing -II	T/P	2	0	6	5	50	50	100
Total No. of Credits				31						

\*Common Course with diploma programmes in IT, CSE, ECE, EE & 5th sem of Civil Engg.

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Study Scheme										
Semester: 5th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	123501	Production Management	T	4	0	0	4	50	50	100
2	123502	Refrigeration and Air-conditioning	T	4	0	0	4	50	50	100
3	123503	Thermodynamics-II	T	4	0	0	4	50	50	100
4	123504	Workshop Technology-III	T	4	0	0	4	50	50	100
5	123505	Theory of Machines	T	4	0	0	4	50	50	100
6	123506	Refrigeration and Air-conditioning Lab	P	0	0	2	1	50	50	100
7	123507	Thermodynamics-II Lab	P	0	0	2	1	50	50	100
8	123508	Workshop Technology-III Lab	P	0	0	6	3	50	50	100
9	123509	Computer Aided Drafting Lab	P	0	0	6	3	50	50	100
10	123510	Industrial Training /Internship (4 Weeks)	NA	NA	NA	NA	4	50	50	100
Total No. of Credits				32						

**There will be compulsory industrial / educational tour for one week during this semester or after the semester**

Semester: 6th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120601	*Basics of Management	T	4	0	0	4	50	50	100
2	123601	Metrology and Instrumentation	T	4	0	0	4	50	50	100
3	123602	Automobiles Engineering	T	4	0	0	4	50	50	100
4	123603	Machine Design	T	4	0	0	4	50	50	100
5	123604	CNC Machines and Automation	T	3	0	0	3	50	50	100
6	123605	Metrology and Instrumentation Lab	P	0	0	2	1	50	50	100
7	123606	Automobiles Engineering Lab	P	0	0	2	1	50	50	100
8	123607	CNC Machines and Automation Lab	P	0	0	4	2	50	50	100
9	123608	Major Project	P	0	0	8	4	50	50	100
Total No. of Credits				27						

**\*Common with diploma programs in IT, CSE, ECE, EE**

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**Diploma in Mechanical Engineering (Code:23)**

**APPLIED CHEMISTRY –I (120101)**

**Credits- 04**

**L T P**

**4 0 0**

**OBJECTIVE:**

Every branch of engineering is expanding greatly. The contributions of chemicals and chemical products are playing important role in the field of engineering, biotechnology, agriculture and pharmacology etc. The numbers of such chemical products are exponentially increasing each successive year. This results in enhancing the responsibility of engineers while choosing engineering materials for converting them into finished products. Now a days, choosing engineering material is not only based conventional qualitative and quantitative testing of their chemical composition and behavior under service conditions, but also based on environmental and eco-friendly factors. To achieve such objectives it is essential to apply applied aspects of chemistry. In order to educate and train Engineers and skilled work force applied chemistry syllabus for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciate physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the skilled engineers and work force by imparting essential knowledge required from this subject through demonstrations, and minor projects.

**COURSE CONTENT:**

**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.

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**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.

**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)

**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)

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**TEXT BOOKS:**

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan, Jalandhar
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.
6. Applied Chemistry-I by Dr.P.K. Vij & Shiksha Vij, Lords Publications, Jalandhar
7. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)
8. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
9. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
10. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)

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**APPLIED MATHEMATICS -I (120102)**

**Credits- 05**

**L T P**  
**5 0 0**

**OBJECTIVES:**

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, and coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

**COURSE CONTENTS:**

**Algebra:** Complex Numbers: Complex number, representation, modulus and amplitude. De-moivier'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 nth 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) Permutations and Combinations: Value of  ${}^n P_r$   ${}^n C_r$ . 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.

**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 ex. Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

**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), inter section 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,



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parabola and hyperbola) and their application in solving engineering problems.

**REFERENCE/TEXT BOOKS:**

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 RD Sharma.
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar.
5. Comprehensive Mathematics, Vol. I & II by Luxmi Publications.
6. Engineering Mathematics by Dass Gupta.
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi.
9. Engineering Mathematics by S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi.
10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi
12. Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar
13. Advanced Engineering Mathematics by Peter V.Oneil, University of Albama, 2007 edition, Cengage Learning India Pvt. Ltd. Patparganj, New Delhi

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**APPLIED PHYSICS-I (120103)**

**Credits- 04**

**L T P**  
**4 0 0**

**OBJECTIVES:**

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

**COURSE CONTENTS:**

**Units and Dimensions:** Physical quantities, Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units), Dimensions and 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, limitations of dimensional analysis, 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, equilibrium of forces, Newton's Laws of motion: concept of momentum, 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 its application such as banking of roads, bending of cyclist, motion in vertical circle etc, Application of various forces in lifts, cranes, large steam engines and turbines.

**Waves and Vibrations:** Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, 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, Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical

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applications.

**Rotational Motion:** Concept of translatory and rotating motion with examples, 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.

**Properties of Matter:** Elasticity: definition of stress and strain, different types of modulus of elasticity, 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, stream line and turbulent flow, Equation of Continuity, Bernauli'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 on the basis of K.E. of molecules, Principles of measurement of temperature and different scales of temperature and their Relationship, Resistance thermometers and Pyrometers with their field applications such as Thermocouple, Bi-metallic thermometer, Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Modes of transfer of heat (Conduction, convection and radiation with examples), Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method), Application of various systems of thermometry in refrigeration and air-conditioning etc.

**REFERENCE/TEXT BOOKS:**

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T

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3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi
6. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi .
7. The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi
8. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
9. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
10. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
11. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar City
12. Physics by Nelcon and Parker Publishers UK.
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

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**ENGLISH AND COMMUNICATION SKILLS -I (120104)**

**Credits- 04**

**L T P**

**4 0 0**

**OBJECTIVES:**

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 can not 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:**

**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)

**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.

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

**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.

**REFERENCE/TEXT BOOKS:**

1. Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw

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Hills, New Delhi.

2. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
3. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
4. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
5. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
7. Business Correspondence & Report writing (4<sup>th</sup> Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
8. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
9. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
10. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
11. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
12. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
13. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
14. Developing Communication Skills (2<sup>nd</sup> Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
15. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
16. Basic Communication Skills for Technology by Andrea J Rutherford; Published by Pearson Education, New Delhi
17. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
18. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
19. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
20. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
21. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

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**ENGINEERING DRAWING - I (123101)**

**Credits- 05**

**L T P**

**2 0 6**

**OBJECTIVES:**

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

**Note:**

1. First angle projection is to be followed
2. Minimum of 16 sheets to be prepared
3. Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

**COURSE CONTENTS:**

**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 degree in different standards, series of 3,5,8 and 12 mm heights in the ratio of 7:4

**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.

**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 plane, Line inclined to any one of the reference plane. 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.

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

**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.

**REFERENCE/TEXT BOOKS:**

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



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**APPLIED CHEMISTRY –I LAB (120105)**

**Credits- 01**

**L T P**

**0 0 2**

**List of Practical's**

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 cuprammonium  $\{Cu(NH_3)_4SO_4\}$  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.

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**APPLIED PHYSICS-I LAB (120106)**

**Credits- 01**

**L T P**

**0 0 2**

**List of Practical's**

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.

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**ENGLISH AND COMMUNICATION SKILLS –I LAB (120107)**

**Credits- 01**

**L T P**

**0 0 2**

**List of Practical's**

**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

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**GENERAL WORKSHOP PRACTICE -I (120108)**

**Credits- 03**

**L T P**

**0 0 6**

**OBJECTIVES:**

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

**COURSE CONTENTS:**

The following shops are included in the syllabus:

1. Carpentry and Painting Shop
2. Fitting Shop
3. Electric Shop

The contents of various shops prescribed under workshop Practice –I are same as that of General Workshop Practice-I which is common for most of engineering diploma programmes except for Computer Engineering and Information Technology.

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**

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.  
**Job I Marking, sawing, planning and chiseling & their practice.**
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses. **Job II Preparation of half lap joint. Job III Preparation of Mortise and Tenon Joint.**
- 1.4 Demonstration of various methods of painting wooden items.  
**Job IV Preparation of surface before painting including primer coat.**  
**Job V Painting Practice by brush/roller/spray.**

**2. Fitting Shop**

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop,

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Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.).  
Identification of various sections of steel viz. Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

- 2.2 Description and demonstration of various types of work benches. Holding devices and files. Precautions while doing filing work.

**Job I Marking of job, use of marking tools and measuring instruments.**

**Job II Filing a dimensioned rectangular or square piece of an accuracy of 0.25mm**

**Job III Filing practice (Production of flat surfaces) Checking by straight edge.**

- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

**Job IV Making a cutout from a square piece of MS Flat using Hand hacksaw.**

### **3. Electric Shop**

- 3.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.

- 3.2 Study of electrical safety measures and demonstration about use of protective devices.

**Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.**

**Job II Preparation of a house wiring circuit using fuse, switches socket, holder, ceiling rose etc. by batten wiring and PV casing and capping.**

- 3.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, desert cooler etc.

- 3.4 Introduction to the construction of a Lead-acid battery and its working.

Job III Installation of a battery and to connect two or more batteries in series and in parallel.

Job IV Charging of a battery and testing it with the help of hydrometer and Cell Tester.

### **RECOMMENDED BOOKS**

1. Workshop Technology I, II, III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay

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2. Workshop Technology by Manchanda Vol. I, II, III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

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**ENGLISH AND COMMUNICATION SKILLS - II (120201)**

**Credits- 04**

**L T P**  
**4 0 0**

**Course Objective:**

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 can not 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.

**1. LISTENING**

**Practical:**

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

**Note:** Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

**2. SPEAKING**

**Practical:**

- 2.1 Voice Modulation: Horizons (pitch, tone, volume, modulation)
- 2.2 Word stress, rhythm, weak and strong form, pauses, group-sense, falling and rising tones, fluency, pace of delivery, dealing with problem sounds, accent, influence of mother tongue etc.
- 2.3 Situational Conversation/role-playing with feedback, preferably through video recording
- 2.4 Telephonic Conversation: Types of calls, agreeing and disagreeing, making and changing appointments, reminding, making complaints and handling complaints, general etiquettes,
- 2.5 A small formal and informal speech
- 2.6 Seminar
- 2.7 Debate

**Note:** Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

**3. READING**

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**Theory:**

- 3.1 Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

**Section-I**

- a. The Portrait of a Lady - Khushwant Singh
- b. The Lost Child by Mulk Raj Anand
- c. The Refugees – Pearl S. Buck

**Section-II**

- a. Life Sketch of Dr. Abdul Kalam
- b. Abraham Lincoln's letter to his son's Headmaster

**Section-III**

- i. All The World's A Stage – W. Shakespeare
- ii. Say Not, The Struggle Nought Availeth – A.H. Clough
- iii. Pipa's Song – Robert Browning
- iv. A Viewpoint – RP Chaddah
- v. Comprehension exercises on unseen passages

**3. WRITING**

**Theory:**

- a. The Art of Précis Writing
- b. Correspondence: Business and Official
- c. Drafting
  - Report Writing: Progress report and Project report
  - Inspection Notes
  - Notices: Lost and found; Obituary; Auction Memos and Circulars
  - 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
- a. Writing Telephonic messages
- b. Filling-up different forms such as Banks and on-line forms for Placement etc.

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**Note:** Teachers are expected to give practical examples, while teaching above topics

**5. VOCABULARY AND GRAMMAR**

**Theory and Practical exercises on following:**

- a. Vocabulary of commonly used words
- b. Glossary of Administrative Terms (English and Hindi)
- c. One word substitution
- d. Idioms and Phrases



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- e. Prefixes and Suffixes
- f. Punctuation
- g. Narration
- h. Forms of verbs: Regular and irregular

## **5. EMPLOYABLE SKILLS**

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

**Practicals:**

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

## **RECOMMENDED BOOKS**

1. Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
2. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
3. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
4. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
5. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
7. Business Correspondence & Report writing (4<sup>th</sup> Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
8. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
9. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
10. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
10. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
11. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
12. Developing Communication Skills (2<sup>nd</sup> Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
13. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
14. Basic Communication Skills for Technology by Andrea J Rutherford; Published by Pearson Education, New Delhi
15. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.

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16. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
17. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
18. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
19. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

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**APPLIED MATHEMATICS - II (120202)**

**Credits- 05**

**L T P**  
**5 0 0**

**Course Objective**

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

**1. Algebra**

- 1.1 Determinants: Elementary properties of determinants up to 3<sup>rd</sup> order, consistency of equations, Cramer's rule.
- 1.2 Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.
- 1.3 Application of Matrix in computer programming

**2. Differential Calculus**

- 2.1 Definition of function; Concept of limits.

$$\begin{array}{l} \text{Lt } \frac{x^n - a^n}{x - a} \\ \text{Four standard limits } x \end{array}$$

$$\begin{array}{l} \text{Lt } \frac{\sin x}{x} \\ \text{Lt } \frac{a^x - 1}{x} \\ \text{Lt } (1+x)^{1/x} \end{array}$$

9. Differentiation of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$  (Please take one example of differentiation by definition)
10. Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
11. Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation, Successive differentiation (excluding nth order).
22. 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)

**3. Integral**

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

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

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

- 3.4 Applications of integration for :
- (a) Simple problem on evaluation of area bounded by a curve and axes.
  - (b) Calculation of volume of a solid formed by revolution of an area about axes. (Simple problems).
  - (c) To calculate average and root mean square value of a function and
  - (d) Area by Trapezoidal Rule and Simpson's Rule

**4. Statistics and Probability**

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

**5. Differential Equations**

- 5.1 Solution of first order and first degree differential equation by variable separation method (simple problems)
- 5.2. Differential equations of homogeneous equation

**RECOMMENDED BOOKS**

- 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
- 7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
- 8. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
- 1. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
- 2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
- 11. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi
- 12. Applied Mathematics-II, Archana Sharma, Lords Publications, Jalandhar
- 13. Advanced Engineering Mathematics by Peter V.O,neil, University of Albama 2007 edition, Cengage Learning India Pvt. Ltd. Patparganl, New Delhi.

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**APPLIED PHYSICS – II (120203)**

**Credits- 04**

**L T P**  
**4 0 0**

**Course Objective:**

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

**1. Optics**

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

**2. Electrostatics**

- 2.1 Coulombs law, unit charge and electric lines of force
- 2.2 Electric flux and Gauss's Law, Electric field intensity and electric potential
- 2.3 Electric field due to point charge, straight charged conductor, plane charged sheet and charged sphere (Inside and outside the sphere)
- 2.4 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
- 2.5 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)

**3. DC Circuits**

- 3.1 Concept of electricity, various applications of electricity
- 3.2 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
- 3.3 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
- 3.4 Kirchoff's laws, Wheatstone bridge principle and its applications
- 3.5 Heating effect of current and concept of electric power, energy and their units, related numerical problems and their applications

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- 3.6 Examples of DC Circuits e.g. Various electrical and electronic equipment CRO, T.V., Audio system, Computers (Only examples, no explanations)

**4. Electromagnetism**

- 4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units
- 4.2 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)
- 4.3 Moving coil galvanometer its principle, construction and working.

**5. Semiconductor physics**

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

**6. Modern Physics**

- 6.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers their engineering and medical applications
- 6.2 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

**RECOMMENDED BOOKS**

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers,

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New Delhi

12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

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**APPLIED CHEMISTRY - II (120204 )**

**Credits- 04**

**L T P**  
**4 0 0**

**Course Objective:**

Every branch of engineering is expanding greatly. The contributions of chemicals and chemical products are playing important role in the field of engineering, biotechnology, agriculture and pharmacology etc. The numbers of such chemical products are exponentially increasing each successive year. This results in enhancing the responsibility of engineers while choosing engineering materials for converting them into finished products. Now a days, choosing engineering material is not only based conventional qualitative and quantitative testing of their chemical composition and behavior under service conditions, but also based on environmental and eco-friendly factors. To achieve such objectives it is essential to apply applied aspects of chemistry. In order to educate and train Engineers and skilled work force applied chemistry syllabus for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciate physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the skilled engineers and work force by imparting essential knowledge required from this subject through demonstrations, and minor projects.

**1. Metallurgy**

- 1.1 General metallurgical terms/operations
- 1.2 Free energy change( $\Delta G$ ) criteria in metallurgical operation – Ellingham diagram – oxides, usefulness and limitations
- 1.3 Extraction of pure iron, copper and aluminium from their chief ores
- 1.4 Manufacture of wrought iron, steel by open hearth process and L.D. process
- 1.5 Alloys- types of alloys (ferrous and non ferrous) purposes of alloying, composition, properties and applications of – invar steel, nichrome, stain less steel, alnico, german silver, brass, bronze, gun metal, duralumin, magnalium and solder
- 1.6 Definition, classification, composition, advantages and industrial applications of composites materials.

**2. Corrosion**

- 2.1 Definition of corrosion, erosion and distinctions, cause of corrosion, types of corrosion – dry and wet corrosion
- 2.2 Theories of corrosion- Pilling Bedworth rule of dry corrosion, electrochemical theory of corrosion-  $H_2$  evolution,  $O_2$  absorption, definition of passivation, galvanic series
- 2.3 Other forms of corrosion – high temperature corrosion, stress corrosion, caustic embrittlement, filiform corrosion
- 2.4 Factors influencing rate of corrosion
- 2.5 Preventions and control measures:
  - 2.5.1 Internal measures- purification of metals, alloying with corrosion resistant elements, heat treatment



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- 2.5.2 External measures –
  - a) Modification of corrosion environments, Application of anodic, cathodic and organic inhibitors,
  - b) Protective coatings – (a) Metallic coatings (b) Non-metallic coating (c) Sacrificial anode
- 2.5.3 Prevention of corrosion by material selection and design
- 2.6 Application of corrosion protection and erosion protection in boilers, fluid flow, industries and commercial organizations.

### **3. Fuels**

- 3.1 Definition of fuel, combustion, classification of fuels, characteristics of good fuel, merits and demerits of gaseous fuels over solid and liquid fuels
- 3.2 Calorific value, - HCV, LCV and relation between both, determination of calorific value by Bomb calorimeter, and Dulong's formula (equation to be assumed, numerical problems)
- 3.3 Coal and proximate analysis of coal, Bergius process of converting coal into gasoline, power alcohol – advantages and disadvantages
- 3.4 Fuel rating: octane and cetane numbers, influence of chemical composition and structure on fuel quality
- 3.5 Gaseous fuels: chemical composition usefulness and limitations of Natural gas, CNG, producer gas, water gas and carbureted water gas, coal gas, oil gas LPG, and biogas (manufacturing details are excluded)
- 3.6 Future fuels –Hydrogen, CNG + propane, LNG.
- 3.7 Numerical problems on 3.2 and 3.3 sections only.
- 3.8 Advantages and limitations of flue gases in industries
- 3.9 Energy Conservation programmes.

### **4. Lubricants**

- 4.1 Definition of lubricants and lubrication
- 4.2 Functions of lubricant
- 4.3 Mechanism of lubrication- hydrodynamic and thin film lubrication
- 4.4 Classification of lubricants
  - 4.4.1 Lubricating oils,
  - 4.4.2 Greases
  - 4.4.3 Solid lubricants
- 4.5 Properties of lubricants
  - 4.5.1 Physical properties- viscosity and viscosity index, flash point and fire point, cloud and pour point, oiliness, volatility, colour, emulsification
  - 4.5.2 Chemical properties- total acidity number (TAN), soapanification value, iodine value, aniline point, precipitation number, coke number
- 4.6 Application of various lubricating oils, greases, solid lubricants in automobile, mechanical and chemical industry.

### **5. Engineering materials and Refractories**

- 5.1 Superconductors- Types, properties of and applications of superconductors Types-I -Al, In and Pb and Type –II Nb-Zr alloy

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- 5.2 Introduction and characteristics of good refractory materials Types and chemical composition of acidic, basic and neutral refractories Applications of refractories
- 5.3 Glass – chemical composition, types of glasses and their applications
- 5.4 Constituent of paints, characteristics of good paint Constituent and characteristics of varnishes Constituent of enamels Uses of paints varnishes and enamels
- 5.5 Applications
  - 5.5.1 Application of Geo synthetic and ceramic materials in industry, road and dam construction and high rise building construction.
  - 5.5.2 Application of Marine paints in ships, submarines and Navy equipments.

**6. Polymers, Plastics and Adhesives.**

- 6.1 Polymerization, degree of polymerization (DP). Addition and condensation polymers with suitable examples
- 6.2 Definition, structure and applications of thermoplastics {PE (HDP, LDP), PVC, Polystyrene} and thermosetting (Buna-S, Nylon-6, Nylon-66, Nylon- 10, Bakelite, teflon) plastics with examples of each type
- 6.3 Additive for plastics - Plasticizer, fillers, cross linking agents, blowing agents colourants, stabilizers and binders
- 6.4 Definition and examples of fibers and elastomers (natural and synthetic rubber) gutta percha,
- 6.5 Adhesives, synthetic resins (both thermosetting and thermoplastic)
- 6.6 Chemical factors influencing adhesive action (polarity, DP, branching of chain and pH)
- 6.7 Applications
  - 6.7.1 Application of Polymers, plastics and adhesives in automobile, mechanical, chemical, textile and construction industries.
  - 6.7.2 Application of plastics as packaging material in food, dairy, confectionary products. Application of synthetic resins in plywood, wood furniture, house windows & doors and building decorative

**7. Environmental Pollution and its control.**

- 7.1 Introduction
- 7.2 Causes and control of air, water, and soil pollutions
- 7.3 Noise pollution
- 7.4 Radio active pollution and its control
- 7.5 Sewage and its treatment
- 7.6 Chemical analysis and treatment of industrial effluent

**RECOMMENDED BOOKS**

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – II by Dr. G.H. Hugar, Eagle Prakashan Jalandhar.
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.

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6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)
7. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
8. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
9. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)

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**ENGLISH AND COMMUNICATION SKILLS –II LAB (120205)**

**Credits-01**

**L T P**

**0 0 2**

**List of Practical's**

**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 and rising tones, fluency, pace of delivery, dealing with problem 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.

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**APPLIED PHYSICS - II LAB (120206)**

**Credits- 01**

**L T P**

**0 0 2**

**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

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**APPLIED CHEMISTRY – II LAB (120207)**

**Credits- 01**

**L T P**  
**0 0 2**

**LIST OF PRACTICALS**

**Note:** Experiments at sr. no 1 to 11 are to be performed compulsorily and maintain laboratory manual, in addition every student will compulsorily submit a separate hand written inventory report on any four topics among the list at no. 12.1 to 12.7 at the end of session.

1. Estimation of copper in the given copper ore solution volumetrically or spectro-photometrically.
2. Estimation of moisture and ash in the given coal sample gravimetrically
3. Determination of viscosity of given liquid by Red Wood viscometer
4. Determination of flash / fire point of the given lubricant using Able's flash point apparatus
5. To study the effect of metal coupling on corrosion of iron.
6. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.
7. Volumetric estimation of total acid value (Total acid number TAN) of a lubricating oil
8. Determination of molecular mass of polystyrene (high polyester) by viscometry.
9. Study of effect of acids and bases on tensile strength of natural (use cotton, wool, and silk) and synthetic polymer fibres.
10. Application of  $\text{FeCl}_3$  in etching process for PCB
11. To construct Daniel cell and measure its e.m.f. using voltmeter.

A compulsory hand written inventory report need to be submitted by the students for any four determination of viscosity of given lubricant, total acid number (TAN) of a lubricating oil, metal ions present in the water, estimation of hardness of water collected from different water sources estimation of chloride and alkalinity of water collected from different water sources Collecting technical data on lubricating oils, edible oils etc Ores of different metals and non metals available in India along with chemical composition and locating the places on self drawn India's map Collection and presentation of statistical data on water quality of your district/ state / country .

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**BASICS OF INFORMATION TECHNOLOGY LAB (121101)**

**Credits- 02**

**L T P**  
**0 0 4**

**Course Objective:**

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

**Note:**

**Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.**

***TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION***

1. Information Technology – its concept and scope, applications of IT, impact of computer and IT in society.
2. Computers for information storage, information seeking, information processing and information transmission
3. Computer Application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, Air and Railway Ticket reservation, robotics, Military, banks, Insurance financial transactions and many more
4. Elements of computer system, computer hardware and software; data types – numeric data, alpha numeric data; contents of a program, processing
5. Computer organization, block diagram of a computer, CPU, memory
6. Input devices; keyboard, Scanner, mouse etc; output devices; VDU and Printer, Plotter
7. Electrical requirements, inter-connections between units, connectors and cables
8. Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus
9. Installation concept and precautions to be observed while installing the system and software
10. Introduction about Operating Systems such as MS DOS, Windows, Windows NT etc. as an interface to Computer System
11. Special features, various commands of MS word and MS-Excel, MS PowerPoint
12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing

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13. Various Browsers like Internet explorer, Mozilla Fire fox, WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
14. Basics of Networking – LAN, WAN, Topologies
15. Ethics and information Technology
16. Future with information Technology

***LIST OF PRACTICALS***

- 1 *Given a PC, name its various components and peripherals. List their functions*
- 2 Practice in installing a computer system by giving connection and loading the system software and application software
- 3 Exercises on entering text and data (Typing Practice)
- 4 Installation of operating System viz. Windows XP, Windows 2007 etc.  
Features of Windows as an operating system
  - a. Start
  - b. Shutdown and restore
  - c. Creating and operating on the icons
  - d. Opening closing and sizing the windows
  - e. Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
  - f. Creating and operating on a folder
  - g. Changing setting like, date, time, colour (back ground and fore ground)
  - h. Using short cuts
  - i. Using on line help
8. MS-Word
  - a. File Management:
  - b. Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
  - c. Page Set up:
  - d. Setting margins, tab setting, ruler, indenting
  - e. Editing a document:
  - f. Entering text, Cut, copy, paste using tool- bars
  - g. Formatting a document:
  - h. Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
  - i. Aligning of text in a document, justification of document, Inserting bullets and numbering
  - j. Formatting paragraph, inserting page breaks and column breaks, line spacing
  - k. Use of headers, footers: Inserting footnote, end note, use of comments



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- l. Inserting date, time, special symbols, importing graphic images, drawing tools
  - m. Tables and Borders:
  - n. Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
  - o. Print preview, zoom, page set up, printing options
  - p. Using Find, Replace options
  - q. Using Tools like:
  - r. Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
  - s. Using shapes and drawing toolbar,
  - t. Working with more than one window in MS Word,
  - u. How to change the version of the document from one window OS to another
  - v. Conversion between different text editors, software and MS word
5. MS-Excel
- a. Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
  - b. Menu commands:
    - i. Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
  - c. Work books:
    - i. Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
  - d. Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
  - e. Creating a chart:
    - i. Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
  - f. Using a list to organize data, sorting and filtering data in list
  - g. Retrieve data with query: Create a pivot table, customising a pivot table. Statistical analysis of data
  - h. Exchange data with other application: embedding objects, linking to other applications, import, export document.
7. MS PowerPoint
- a) Introduction to PowerPoint
    - How to start PowerPoint
    - Working environment: concept of toolbars, slide layout, templates etc.

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- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter etc.
- b) Addition, deletion and saving of slides
- c) Insertion of multimedia elements
  - Adding text boxes
  - Adding/importing pictures
  - Adding movies and sound
  - Adding tables and charts etc.
  - Adding organizational chart
- d) Formatting slides
  - Using slide master
  - Text formatting
  - Changing slide layout
  - Changing slide colour scheme
  - Changing background
  - Applying design template
- e) How to view the slide show?
  - Viewing the presentation using slide navigator
  - Slide transition
  - Animation effects etc.
- 8. Working with MS Access
  - a) Understanding different data types
  - b) Creation of table
  - c) Entering data in a table and modify it.
  - d) Creating simple Queries
- 9. Internet and its Applications
  - a) Log-in to internet
  - b) Navigation for information seeking on internet
  - c) Browsing and down loading of information from internet
  - d) Sending and receiving e-mail
    - Creating a message
    - Creating an address book
    - Attaching a file with e-mail message
    - Receiving a message
    - Deleting a message

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**RECOMMENDED BOOKS**

5. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
6. Information Technology for Management by Henery Lucas, 7<sup>th</sup> edition, Tata Mc Graw Hills, New Delhi
7. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
8. Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
9. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
10. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
11. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
12. Mastering Windows 95, BPB Publication, New Delhi
13. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
14. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
15. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
16. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
17. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

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**ENGINEERING DRAWING - II (123201)**

**Credits- 05**

**L T P**

**2 0 6**

**Course Objective:**

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

**Note:**

4. First angle projection is to be followed
5. Minimum 15 sheets to be prepared
6. BIS Code SP 46 -1988 should be followed
- 4) Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
2. 20 percent of drawing sheets to be prepared on the third angle projection
3. Punjab State Board of Technical Education, may recommend any of the CAD software viz. Solid Works, Pro Engineer, CATIA, NX, Inventor-AutoCAD etc.
4. The State Directorate of Technical Education may allocate funds for the purchase of computer systems and CAD software for drawing classes.
5. 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

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- 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)**
- 3.5 Various types of keys and their application. Preparation of drawings of various keys and cotters
  - 7. Various types of joints (a) Sleeve and Cotter joint (b) Kunckle joint (c) Spigot and Socket joint
  - 8. 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**

1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., New Delhi
2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House
4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar
5. AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo & D. Sarvanan, Wiley India Pvt. Ltd., Delhi
6. CATIA for Beginners by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi
7. CATIA for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi
8. Pro/Engineer Wildfire 5.0 for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi.

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9. NX 6: For Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi.
10. Solidworks 2009: The Basics by David C. Planchard, Schroff Development Corporation,  
Post Box 1334, Mission KS 66222, USA.
11. Solidworks 2010 for Engineers and Designers, Prof. Sham Tickoo, Wiley India Pvt. Ltd,  
Delhi

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**Diploma in Mechanical Engineering (Code:23)**

**GENERAL WORKSHOP PRACTICE - II (120208 )**

**Credits- 03**

**L T P**  
**0 0 6**

**Course Objective:**

As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

The following shops are included in the syllabus. Student can opt relevant shops depending upon the need of his/her branch of diploma programme :

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
7. 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,

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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**



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- 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.

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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 a 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 V De-soldering Strip

Job VI Wiring of a small circuit on a PCB/tag strip 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

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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.

**RECOMMENDED BOOKS**

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

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**COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING (123301)**  
**Credits- 03** **L T P**  
**3 0 0**

**RATIONALE**

Information Technology and computers have great influence on all aspects of our life. In order to prepare diploma holders to work in computerized environment, it is essential that they are exposed to applications of computer related to their area of work, hence this subject.

**DETAILED CONTENTS**

**1. MS Power Point** (16 hrs)

Creating a presentation: using the auto content, wizard, using a template, creating a blank presentation.

Saving the presentation.

Power point's five views: slide view, outline view, slide sorter view, notes page view, slide show view.

Creating and editing slides.

Developing your presentation.

Changing the layout of a slide.

Modifying a slide master.

Changing the design template.

Outlining your presentation - creating a presentation from a word outline.

Rearranging your slides.

Previewing your slide show.

Bringing a presentation to life.

Inserting objects in your presentation like graph/chart from excel, pictures, sound, video clip and organization chart

Drawing objects in power point: Auto shapes, other objects repositioning, resizing and aligning.

Objects, working with border fill shadows and 3-D effects, selecting and grouping objects.

Animating an object: setting preset animations, setting custom animations, playing a sound or video clip.

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- 1.4 Analyzing the presentation: assigning transitions and timings, creating build slides, creating hidden slides, setting slide timings when rehearsing
4. Setting up the slide show
2. **MS Access** (08 hrs)  
Introduction to databases and MS-access, Creating a new database, opening and moving around an existing database, adding new data and editing a database table, displaying and searching for data, printing data from an access database, creating reports in access
3. **Programming Fundamentals** (08 hrs)
  - 3.1 Algorithm, pseudo language, flow charts; advantages and disadvantages
  - 3.2 Decision Table-type, advantages and disadvantages.
  - 3.3 Structured programming, structuring the control flow, modular programming
  - 3.4 Exercise on making Algorithm and flow charts.
4. **C ++ Programming** (16 hrs)
  - 4.1 Fundamentals  
Introduction, OOP, character set , C++ tokens, keywords, identifiers, constants, basic data type, declaration of variables, defining symbolic constants, assignment statement, comments in a programme, structure of c++ programme, output using COUT, output using CIN, manipulators.
  - 4.2 Operators and Expressions  
Arithmetic operators, relational operators, logical operators, shorthand assignment operator, increment and decrement operators, conditional operators, bit wise generators, precedence in C++ operators. Casting of data, standard mathematical functions.
  - 4.3 Control Structures  
If statements, IF-ELSE statements, nested IF statement, switch statements, go to statements, repetitive structures, while statements, do statement, for loop, break statement, continue statement, nested loops.

**RECOMMENDED BOOKS**

6. MS Office 2000 for Everyone by Sanjay Saxena, Vikas Publishing House, New

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Delhi.

7. Office -97 by S. Hill, BPB Publications, New Delhi.
8. Internet for Every One by Alexis Leon; Techworld, Chennai.
9. The ABCs of Microsoft Office 97 Professional Edition by Guy Hart – Davis; BPB Publications, New Delhi.
10. Programming in C++ by B. Subharamanayam
11. Programming in C by Abdul Khader; Ajanta Publications.  
MS Office 2000 by Steve Hill; BPB Publications; New Delhi.

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**Diploma in Mechanical Engineering (Code:23)**

**APPLIED MECHANICS (123302)**

**Credits- 04**

**L T P**  
**4 0 0**

**RATIONALE**

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

**DETAILED CONTENTS**

- 1. Introduction** (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

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topics]

- 3. Moment** (9 hrs)
- 3.1 Concept of moment
  - 3.2 Moment of a force and units of moment
  - 3.3 Varignon's theorem (definition only)
  - 3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)
  - 3.5 Parallel forces (like and unlike parallel force), calculating their resultant
  - 3.6 Concept of couple, its properties and effects
  - 3.7 General conditions of equilibrium of bodies under coplanar forces
  - 3.8 Position of resultant force by moment  
[Simple problems on the above topics]
- 4. Friction** (9 hrs)
- 4.1 Definition and concept of friction, types of friction, force of friction
  - 4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
  - 4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.
  - 4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:
    - a) Acting along the inclined plane 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



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- 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**

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

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**Diploma in Mechanical Engineering (Code:23)**

**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING (123303)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical and electronics engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

**DETAILED 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,

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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

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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

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**WORKSHOP TECHNOLOGY-I (123304)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is required to be imparted. Hence the subject of workshop technology.

**DETAILED CONTENTS**

- 1. Welding** (22 hrs)
  - 5.2 Welding Process**

Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols.
  - 5.3 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
  - 5.4 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
  - 5.5 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.
  - 5.6 Modern Welding Methods**

Methods, Principle of operation, advantages, disadvantages and

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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.

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- 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; Roorkee Publishing House, Roorkee.
7. A Text Book of Manufacturing Science and Technology by A Manna, Prentice Hall of India, Delhi.

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**Diploma in Mechanical Engineering (Code:23)**

**MATERIAL SCIENCE (123305)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

Lot of development has taken place in the field of materials. New materials are being developed and it has become possible to change the properties of materials to suit the requirements. Diploma holders in this course are required to make use of different materials for various applications. For this purpose, it is necessary to teach them basics of metal structure, properties, usage and testing of various ferrous and non ferrous materials and various heat treatment processes. This subject aims at developing knowledge about the characteristics, testing and usage of various types of materials used in industries.

**DETAILED CONTENTS**

- 1. Introduction** (07 hrs)  
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.
- 2. Crystallography** (07 hrs)  
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.
- 3. Metals And Alloys** (14 hrs)  
Introduction: History and development of iron and steel, Different iron ores, Raw Materials in Production of Iron and Steel, Basic Process of iron-making and steel-making, Classification of iron and steel,



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Cast Iron: Different types of Cast Iron, manufacture and their usage.

Steels: Steels and alloy steel, Classification of plain carbon steels, Availability, 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 Light Metals and their alloys, Properties and uses of White Metals and their alloys.

**4. Theory Of 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, Types of heat treatment furnaces required for above operations (only basic idea)

**5. Engineering Plastics** (03 hrs)

Important sources of plastics, Classification-thermoplastic and thermo set and their uses, Various Trade names of engg. Plastics, Plastic Coatings.

**6. Advanced Materials** (03 hrs)

Composites-Classification, properties, applications  
Ceramics-Classification, properties, applications

**7. Miscellaneous Materials** (06 hrs)

Overview of -Tool and Die materials, Materials for bearing metals, Spring Materials, 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

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**Diploma in Mechanical Engineering (Code:23)**

**COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING LAB (123306)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

1. Exercise on MS-Power Point
2. Exercise on MS-Access.
3. Write a program to check if a number is even or odd
4. Write a program to find the smallest of 3 members
5. Write a program to find longest of 4 members
6. Write a program to find the roots of quadratic equation.
7. Write a program to find the sum of the first N natural numbers using a for-do doops.
8. Preparing a project using PowerPoint/Access
9. Write a program that needs N numbers and finds the smallest number among them.
10. Write a program to find the sum of squares of the digits of number.

**INSTRUCTIONAL STRATEGY**

This is a practice-oriented course. Teachers are expected to demonstrate the use of software on computers. Emphasis should be laid on repeated practice in using software on computers by students individually.

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**APPLIED MECHANICS LAB (123307)**

**Credits- 01**

**L T P**  
**0 0 2**

**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.
- 3.2 To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
- 3.3 To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
- 3.4 To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
- 3.5 To find out center of gravity of regular lamina.
- 3.6 To find out center of gravity of irregular lamina.
- 3.7 To determine coefficient of friction between three pairs of given surface.

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**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB**  
**(123308)**

**Credits- 01**

**L T P**

**0 0 2**

**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.

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**Diploma in Mechanical Engineering (Code:23)**

**WORKSHOP TECHNOLOGY-I LAB (123309)**

**Credits- 03**

**L T P**

**0 0 6**

**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

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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.

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**Diploma in Mechanical Engineering (Code:23)**

**MATERIAL SCIENCE LAB (123310)**

**Credits- 01**

**L T P**

**0 0 2**

**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.

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**Diploma in Mechanical Engineering (Code:23)**

**MECHANICAL ENGINEERING DRAWING-I (123311)**

**Credits- 05**

**L T P**

**2 0 6**

**RATIONALE**

Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of drawing skills in the students.

**DETAILED 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



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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.

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**Diploma in Mechanical Engineering (Code: 23)**

**GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT (120401)**

**Credits- 04**

**L T P**  
**4 0 0**

**OBJECTIVES:**

Generic Skills and Entrepreneurship Development is one of the courses from “Human Science” subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one’s own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager. Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma pass outs for enhancing their employability and self confidence.

**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)-

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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.

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**Diploma in Mechanical Engineering (Code: 23)**

**HYDRAULICS AND PNEUMATICS (123401)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

Diploma holders in this course are required to deal with problems of fluid and use of hydraulics and pneumatics in power generation. For this purpose, knowledge and skills about fluid mechanics and machinery, hydraulics and pneumatics systems are required to be imparted for enabling them to perform above functions.

**DETAILED 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)
  - 1.5 Concept of pressure (Atmospheric Pressure, gauge pressure, absolute pressure)
  - 1.6 Pressure measuring devices: peizometer tube manometers - simple U-tube, differential single column, inverted U-tube, micromanometer including simple problems
  - 1.7 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).
  - 4.2 Loss of head in pipes due to sudden enlargement, sudden contraction, 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 accumulator, hydraulic door closer, hydraulic press, selection of specification of above systems for different

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applications

- 6. Water Turbines and Pumps** (14 hrs)
- 2.8 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.
  - 2.9 Concept of hydraulic pump, single acting reciprocating pump (construction and operation only), vane, screw and gear pumps.
  - 2.10 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)
- 3.2 Basic components of hydraulic system, function of each component in a hydraulic circuit.
  - 3.3 Oil reservoirs, couplings, motors and pumps – definition and functions of the parts,
  - 3.4 Filters- definition and purpose, classification
  - 3.5 Seals and packing- classification of seals, sealing materials.
- 9. Components of Pneumatic Systems** (08 hrs)
- 1.5 Basic components – function of each component
  - 1.6 Air compressors – type, working
  - 1.7 Air cylinder – types, function, single acting, double acting, rotating, non-rotating, piston type, diaphragm type, tandem cylinder, double ended cylinder, duplex cylinder.
  - 1.8 Air filter, regulator and lubricator – their necessity in pneumatic circuit.
  - 1.9 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 Shammuga Sundaram, 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.

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**THERMODYNAMICS - I (123402)**

**Credits- 04**

**L T P**  
**4 0 0**

**RATIOANLE**

A diploma holder in this course is supposed to maintain steam generators, turbines, compressors and other power plant equipment. Therefore, it is essential to impart him basic concepts of thermodynamics, steam generators, steam turbines, compressors and about IC engines.

**DETAILED 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, Classius statement, equivalence of statements, Perpetual

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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

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**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.



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**STRENGTH OF MATERIALS (123403)**

**Credits- 04**

**L T P**  
**4 0 0**

**RATIONALE**

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

**DETAILED 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
    - 3.9 Ultimate strength and breaking stress
    - 4.5 Percentage elongation
    - 4.6 Proof stress and working stress
    - 4.7 Factor of safety
    - 1.3.9 Shear modulus
  - 1.4. Longitudinal and circumferential stresses in seamless thin walled cylindrical shells (derivation of these formulae not required)
- 2. Resilience** (04 hrs)
  - 2.1 Resilience, proof resilience and modulus of resilience
  - 2.2 Strain energy due to direct stresses
  - 2.3 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 Theorm of perpendicualr 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

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- 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
  - 4.4 B.M. and S.F. Diagram for cantilever and simply supported beams with 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
  - 10. End restraints
  - 11. Effective length
  - 12. Strength of column by Euler Formula without derivation
  - 14. 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 Birinder Singh,; 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.

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**GURU GOBIND SINGH COLLEGE OF ENGINEERING & TECHNOLOGY**  
**Diploma in Mechanical Engineering (Code: 23)**

**WORKSHOP TECHNOLOGY-II (123404)**

**Credits- 04**

**L T P**  
**4 0 0**

**RATIONALE**

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

***DETAILED 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
- 3.2 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**

- 3.7 Principle of turning
- 3.8 Description and function of various parts of a lathe
- 3.9 Classification and specification of various types of lathe
- 3.10 Drives and transmission
- 3.11 Work holding devices
- 3.12 Lathe tools: Parameters/Nomenclature and applications
- 3.13 Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.
- 3.14 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.
- 3.15 Speed ratio, preferred numbers of speed selection.
- 3.16 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.
- 4.4 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**

- 5.3 Principle of drilling.
- 5.4 Classification of drilling machines and their description.
- 5.5 Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.
- 5.6 Speeds and feeds during drilling, impact of these parameters on drilling, machining time.
- 5.7 Types of drills and their features, nomenclature of a drill

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- 5.8 Drill holding devices.
- 5.9 Types of reamers.
- 4. Boring (06 hrs)**
  - 6.3 Principle of boring
  - 6.4 Classification of boring machines and their brief description.
  - 6.5 Specification of boring machines.
  - 6.6 Boring tools, boring bars and boring heads.
  - 6.7 Description of jig boring machine.
- 5. Shaping, Planing and Slotting (10 hrs)**
  - 11. Working principle of shaper, planer and slotter.
  - 12. Type of shapers
  - 13. Type of planers
  - 14. Quick return mechanism applied to shaper, slotter and planer machine.
  - 15. Work holding devices used on shaper, planer and slotter.
  - 16. Types of tools used and their geometry.
  - 17. Specification of shaper, planer and slotting machine.
  - 18. Speeds and feeds in above processes.
- 6. Broaching (06 hrs)**
  - 13. Introduction
  - 14. Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.
  - 15. 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)**
  - 1.7 Function of cutting fluid
  - 1.8 Types of cutting fluids
  - 1.9 Difference between cutting fluid and lubricant
  - 1.10 Selection of cutting fluids for different materials and operations
  - 1.11 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

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**GURU GOBIND SINGH COLLEGE OF ENGINEERING & TECHNOLOGY**  
**Diploma in Mechanical Engineering (Code: 23)**

**HYDRAULICS AND PNEUMATICS LAB (123405)**

**Credits- 01**

**L T P**  
**0 0 2**

**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

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**Diploma in Mechanical Engineering (Code: 23)**

**THERMODYNAMICS-I LAB (123406)**

**Credits- 01**

**L T P**  
**0 0 2**

**LIST OF PRACTICALS**

1. Determination of temperature by
  - 1.1 Thermocouple
  - 1.2 Pyrometer
  - 1.3 Infrared thermometer
2. Demonstration of mountings and accessories on a boiler.
3. Study of boilers ( through industrial visit)
4. Study of air compressors.
5. Demonstration of heat transfer through conduction, convection and Radiation

**INSTRUCTIONAL STRATEGY**

1. Expose the students to real life problems.
2. Plan assignment so as to promote problem solving abilities.

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**Diploma in Mechanical Engineering (Code: 23)**

**STRENGTH OF MATERIALS LAB (123407)**

**Credits- 01**

**L T P**  
**0 0 2**

**LIST OF PRACTICALS**

3. Tensile test on bars of Mild steel and Aluminium.
4. Bending tests on a steel bar or a wooden beam.
5. Impact test on metals
  - Izod test
  - Charpy test
6. Torsion test on specimens of different metals for determining modulus of rigidity.
7. To determine the stiffness of a helical spring and to plot a graph between load and extension.
8. 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.

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**Diploma in Mechanical Engineering (Code:23)**

**WORKSHOP TECHNOLOGY-II LAB (123408)**

**Credits- 03**

**L T P**  
**0 0 6**

**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**

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



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**Diploma in Mechanical Engineering (Code:23)**

**MECHANICAL ENGINEERING DRAWING-II (123409)**

**Credits- 05**

**L T P**

**2 0 6**

**RATIONALE**

Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of skills and understanding of mechanical engineering drawings.

**DETAILED 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
  - 2 Nomenclature of gears and conventional representation
  - 3 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.

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**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

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**Diploma in Mechanical Engineering (Code:23)**

**PRODUCTION MANAGEMENT (123501)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

Diploma holder in this course is responsible for controlling production and quality of the product on the shop floor as well as for production planning and control. He is also required to supervise erection, installation and maintenance of equipment including material handling and undertake work-study for better utilization of resources. For this purpose, knowledge and skills about these topics need to be imparted to them. This subject aims at development of competencies to prepare material, equipment schedule and production control schedules and maintain required quality levels. In addition, it will also help in developing skills in erection, installation and testing of equipment.

**DETAILED CONTENTS.**

- 1. Production Planning and Control (PPC)** (06 hrs)
  - 1.1 Introduction.
  - 1.2. Objectives and factors affecting PPC
  - 1.3. Functions (Elements) of PPC - Planning, Routing, Loading, scheduling, dispatching, progressing and inspection
  - 1.4. Types of production system - Flow or continuous production, Intermittent Production
  - 1.5. Production Control - Objectives and fields of production control, Production control system
  - 1.8 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.
  - 2.2 Definition and importance of Plant layout, Factors affecting plant layout.
  - 2.3 Types of Plant layout- Process, product, combination and fixed position layout..
  - 2.4 Methods of plant layout - Process flow charts, layout analogues Travel chart, distance, volume matrix.,
  - 2.5. Plant layout procedure and work station design.
  - 2.6. 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

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

- 3.1 Production System and Productivity(Introduction and definitions), Difference between Production and productivity, Measures to improve productivity
- 2.11 Definition, advantages and procedure of work study
- 2.12 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.
- 2.13 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 techniques, normal time, allowance and its types, standard time (simple numerical problems)

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

- 4.1 Definition and objectives of inventory control.
  - 4.2 Inventory types
  - 4.3 Procurement and carrying cost, EOQ, lead time, reorder point (simple numerical problems)
  - 4.4 Inventory Classification - ABC Analysis, VED Analysis, FMS Analysis
  - 4.5 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
10. Concept of Just-In-Time (JIT)

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

- 5.1. Objectives and importance of Maintenance
- 5.2. Different types of maintenance- Corrective or Breakdown maintenance, Scheduled Maintenance, Preventive Maintenance, Predictive Maintenance
- 5.3. Nature of maintenance problems
- 5.4. Range of maintenance problems

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

- 6.1. Introduction, Concept
- 6.2. Objectives of value engineering
- 3.6 Value Analysis Procedures

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- 3.7 Benefits of value analysis
- 3.8 Technique of value engineering

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

- 7.1 Definition and functions of cost estimation
- 7.2 Estimation procedure
- 7.3 Elements of cost, ladder of costs (simple numericals)
- 7.4 Overhead expenses and its distribution
- 7.5 Depreciation -: Concept and Definition, Methods of calculating depreciation,. Straight line method, Diminishing Balance Method, Sinking fund method (Numerical problems).
- 7.6 Cost control- definition and objectives, Capital cost control (planning and scheduling), operating cost control.
- 1.10 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.

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**GURU GOBIND SINGH COLLEGE OF ENGINEERING & TECHNOLOGY**  
**Diploma in Mechanical Engineering (Code:23)**

**REFRIGERATION AND AIR CONDITIONING (123502)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

The diploma holder of Mechanical Engineering are responsible for supervising and maintenance of RAC system. For this purpose, the knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students. Moreover, RAC industry is expanding and employment opportunities in this field are good.

**DETAILED 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.,

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**Diploma in Mechanical Engineering (Code:23)**

- 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
5. 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**

- 9. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
- 10. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
- 11. Refrigeration & Air conditioning by G.S. Aulakh, Eagle Parkashan, Jalandhar
- 12. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.

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**Diploma in Mechanical Engineering (Code:23)**

**THERMODYNAMICS-II (123503)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIOANLE**

A diploma holder in this course is supposed to know about testing of IC Engines, fuel supply, ignition system, cooling and lubrication of engines and gas turbines. Hence this subject

**DETAILED CONTENTS**

- 1. IC Engines** (09 hrs)
  - 4.4 Introduction
  - 4.5 Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, diesel cycle and dual cycle
  - 4.6 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)
  6. Function of cooling system in IC engine
  7. Air cooling and water cooling system, use of thermostat, radiator and forced circulation in water cooling (description with line diagram)
  8. Function of lubrication
  9. Types and properties of lubricant
  10. Lubrication system of engine
  11. Fault finding in cooling and lubrication and remedial action
  
- 5. Testing of IC Engines** (09 hrs)
  6. Engine power - indicated and brake power
  7. Efficiency - mechanical, thermal. relative and volumetric



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- 8. 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)

- 11. Function and use of steam turbine
- 12. Steam nozzles - types and applications
- 13. Steam turbines - impulse, reaction, simple and compound, construction and working principle
- 14. Governing of steam turbines
- 15. Function of a steam condenser, elements of condensing plant
- 16. Classification - jet condenser, surface condenser
- 17. 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**

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

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**Diploma in Mechanical Engineering (Code:23)**

**WORKSHOP TECHNOLOGY - III (123504)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

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

**DETAILED 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.

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**Diploma in Mechanical Engineering (Code:23)**

- 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)**
- 11. Mechanical Process - Ultrasonic machining (USM): Introduction, principle, process, advantages and limitations, applications
  - 12. Electro Chemical Processes - Electro chemical machining (ECM) – Fundamental principle, process, applications, Electro chemical Grinding (ECG) – Fundamental principle, process, application
  - 13. Electrical Discharge Machining (EDM) - Introduction, basic EDM circuit, Principle, metal removing rate, dielectric fluid, applications
  - 14. Laser beam machining (LBM) – Introduction, machining process and applications
  - 15. Electro beam machining (EBM)- Introduction, principle, process and applications
  - 16. 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

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- (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

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**Diploma in Mechanical Engineering (Code:23)**

**THEORY OF MACHINES (123505)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

A diploma holder in this course is required to assist in the design and development of prototype and other components. For this, it is essential that he is made conversant with the principles related to design of components and machine and application of these principles for designing. The aim of the subject is to develop knowledge and skills about various aspects related to design of machine components.

**DETAILED CONTENTS**  
**THEORY**

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

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5.5 Coefficient of fluctuation of speed and coefficient of fluctuation of energy

**5. Governor** (10 hrs)

2.2 Principal of governor

2.3 Simple description and working of Watt, Porter and Hartnel governor (simple numerical based on watt and porter governor)

2.4 Hunting, isochronism, stability, sensitiveness of a governor

**6. Balancing** (06 hrs)

2.4 Concept of balancing

2.5 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

**INSTRUCTIONAL STRATEGY**

12. Use teaching aids for classroom teaching
13. Give assignments for solving numerical problems
14. Arrange industry visits to augment explaining use of various machine components like belt, rope, chain, gear drives, action due to unbalanced masses, brake clutch, governors, fly wheels, cams and gear drives
15. Video films may be used to explain the working of mechanisms and machine components like clutch, governors, brake etc.

**RECOMMENDED BOOKS**

- 3.2. Theory of Machines by D.R. Malhotra; Satya Prakashan, New Delhi.
- 3.3. Theory of Machines by Harpreet Singh , Eagle Parkashan, Jalandhar.
- 3.4. Theory of Machines by V.P Singh; Dhanpat Rai and sons, New Delhi.
- 3.5. Theory of Machines Jagdish Lal; Metropolitan Publishers, New Delhi.

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**Diploma in Mechanical Engineering (Code:23)**

**REFRIGERATION AND AIR CONDITIONING LAB (123506)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

4. Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes.
5. Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers.
6. Identify various parts of a refrigerator and window air conditioner.
7. To find COP of Refrigeration system
8. To detect trouble/faults in a refrigerator/window type air conditioner
9. 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**

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

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**Diploma in Mechanical Engineering (Code:23)**

**THERMODYNAMICS-II LAB (123507)**

**Credits- 01**

**L T P**

**LIST OF PRACTICALS**

**0 0 2**

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.
12. Determination of BHP by dynamometer.
13. Morse test on multi-cylinder petrol engine.
14. Local visit to roadways or private automobile workshops.
15. Study of steam turbines through models and visit.
16. 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



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**Diploma in Mechanical Engineering (Code:23)**

**WORKSHOP TECHNOLOGY - III LAB (123508)**

**PRACTICAL EXERCISES**

**Credits- 03**

**L T P**

**0 0 6**

**Advance Turning Shop**

20. Exercise of boring with the help of boring bar
21. Exercises on internal turning on lathe machine
22. Exercises on internal threading on lathe machine
23. Exercises on external turning on lathe machine
24. Resharpener 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**

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

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**Diploma in Mechanical Engineering (Code:23)**

**COMPUTER AIDED DRAFTING LAB (123509)**

**Credits- 03**

**L T P**

**0 0 6**

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**

- 3.8 Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.

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**Diploma in Mechanical Engineering (Code:23)**

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

**GURU KASHI UNIVERSITY**  
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**Diploma in Mechanical Engineering (Code:23)**  
**INDUSTRIAL TRAINING**

Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry.

Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following.

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

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**Diploma in Mechanical Engineering (Code:23)**  
**BASICS OF MANAGEMENT (120601)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

**DETAILED CONTENTS**

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

- 1.2 Introduction, definition and importance of management.
- 1.3 Functions of Management  
Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.
- 1.4 Concept and Structure of an organization  
Types of industrial organization  
Line organization  
Functional organization  
Line and Functional organization
- 1.5 Hierarchical Management Structure Top, middle and lower level management
- 1.6 Departmentalization  
Introduction and its advantages.

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

- 1.6. Introduction and importance of Healthy Work Culture in organization
- 1.7. Components of Culture
- 1.8. Importance of attitude, values and behaviour  
Behavioural Science – Individual and group behaviour
- 1.9. Professional ethics – Concept and need of Professional Ethics

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

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**Diploma in Mechanical Engineering (Code:23)**

- 1.9 Leadership
  - Definition and Need of Leadership
  - Qualities of a good leader
  - Manager vs. leader
- 1.10 Motivation
  - Definition and characteristics of motivation
  - Factors affecting motivation
  - Maslow's Need Hierarchy Theory of Motivation
- 2.7. Job Satisfaction
- 4. Legal Aspects of Business: Introduction and need** (06 hrs)
- 2.14 Labour Welfare Schemes
  - 4.1.1. Wage payment : Definition and types
  - Incentives: Definition, need and types
- 4.6 Factory Act 1948
- 4.7 Minimum Wages Act 1948
- 5. Management Scope in different Areas** (12 hrs)
- 11. Human Resource Development
  - Introduction and objective
  - Manpower Planning, recruitment and selection
  - Performance appraisal methods
- 12. Material and Store Management
  - a) Introduction, functions and objectives of material management
  - b) Purchasing: definition and procedure
  - c) Just in time (JIT)
- 13. 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.
- 14. Financial Management – Introduction
  - Concept of NPV, IRR, Cost-benefit analysis
  - Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund
- 3.9 Maintenance Management
  - Concept
  - Preventive Maintenance
- 6. Miscellaneous topics** (12 hrs)
- 7.6 Customer Relationship Management (CRM)
  - Definition and Need
  - Types of CRM
  - Customer satisfaction

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- 7.7 Total Quality Management (TQM)
  - Inspection and Quality Control
  - Concept of Quality Assurance
  - TQM
- 7.8 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**

- 7.7 Principles of Management by Philip Kotler TEE Publication
- 7.8 Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
- 7.9 Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar , New Delhi.
- 7.10 Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.
- 7.11 Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.
- 7.12 Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.
- 7.13 Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
- 7.14 Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
- 7.15 Intellectual Property Rights and the Law by Dr. GB Reddy.
- 7.16 Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
- 7.17 Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
- 7.18 Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

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**GURU GOBIND SINGH COLLEGE OF ENGINEERING & TECHNOLOGY**  
**Diploma in Mechanical Engineering (Code:23)**  
**METROLOGY AND INSTRUMENTATION (123601)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

Metrology is the science of measurement, Diploma holders in this course are responsible for ensuring process and quality control by making measurements and carrying out inspection of various parameters. For this purpose, knowledge and skills about various measuring instruments are required. The aim of this subject is to develop knowledge and skills regarding various measuring instruments amongst the students.

**DETAILED CONTENTS**

- 1. Introduction** (06 hrs)
  2. Definition of metrology
  3. Standard of measurement
  4. Types of Errors - Controllable and random errors
  5. Precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement, interchangeability.
  6. Standardization and standardizing organizations
  
- 2. Linear and Angular Measurement** (18 hrs)
  - 4 Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block.
  - 5 Construction features and use of instruments for precision measurements : vernier calipers, vernier height and depth gauges, micrometers.
  - 6 Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges.
  - 7 Cylinder bore gauges, feeler and wire gauges. Checking flatness, roundness and squareness
  - 8 Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic .
  15. 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)
  - 3.1 Terminology of surface roughness.
  - 3.2 Concept of primary texture and secondary texture.
  - 3.3 Factors affecting surface finish.
  - 3.4 CLA, RMS and RA value.
  - 3.5 Principle and operation of stylus probe instruments. Tomlinson surface meter and Taylor surface talysurf.



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- 4. Measurements of Screw threads and Gauges** (08 hrs)
- 6.5 Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.
  - 6.6 Measurements of gears (spur) – Measurement of tooth thickness, pitch,
  - 6.7 Profile projector, Coordinate Measuring Machine (CMM), Tool maker's microscope.
- 5. Instrumentation** (08 hrs)
- 6. 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.
  - 7. Strain gauge – use of strain gauge and load cells
- 6. Quality Control** (18 hrs)
- 10. Quality control, SQC, function of quality control, quality cost, factors affecting quality of product.
  - 11. Inspection need, types of inspection and stages of inspection
  - 12. Statistical Quality Control – Definition
  - 13. Process Capability
  - 14. Introduction to Control Charts(X bar, R,p,c) and their simple applications
  - 15. Concepts of ISO 9000, ISO 14000
  - 16. 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**

- 4.7 Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
- 4.8 A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi.
- 4.9 Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh.
- 4.10 Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
- 4.11 Metrology & Instrumentation by Aulakh & Pathania; Eagle Prakashan, Jalandhar

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**Diploma in Mechanical Engineering (Code:23)**

**AUTOMOBILE ENGINEERING (123602)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

These days, automobile has become a necessity instead of luxury. The diploma holders in this course are required to supervise production and repair and maintenance of vehicles. For this purpose, knowledge and skills are required to be imparted to them regarding automobile industry as a whole. This subject aims at developing required knowledge and skills in this area.

**DETAILED CONTENTS**

- 1. Introduction** (04 hrs)
  - 3.5 Automobile and its development
  - 3.6 Various types of automobiles manufactured in India, their manufacturer and location of their manufacturing unit.
  - 3.7 Classification of automobiles
  - 3.8 Layout of chassis
  - 3.9 Types of drives-front wheel, rear wheel, four wheel.
  
- 2. Power System** (08 hrs)
  12. Introduction, classification of I.C. engines.
  13. Engine terminology
  14. Fuel systems for petrol and diesel engines including multi point fuel injection (MPFI), common rail direct injection (CRDI), Fuel injectors and nozzles.
  15. Governing of fuel-carburettor, electronic control module (ECM i.e, 8 bit, 16 bit and 32 bit computers)
  16. Comparison of MPFI with carburettor system.
  17. Concept of double overhead cam, single overhead cam, Twin cam 16 valve technology in 4 cylinder engine.
  
- 3. Transmission System** (10 hrs)
  9. Clutch - Function, Constructional details of single plate and multiplate friction clutches, Centrifugal and semi centrifugal clutch, Cone clutch, Hydraulic clutch
  10. Gear Box - Function, Working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive,
  - 5.7 Propeller shaft and rear axle - Function, Universal joint, Differential, Different types of rear axles and rear axle drives.
  18. 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

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**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)

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

7.8 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

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**Diploma in Mechanical Engineering (Code:23)**

**MACHINE DESIGN (123603)**

**Credits- 04**

**L T P**

**4 0 0**

**RATIONALE**

A diploma holder in this course is required to assist in the Design and Development of Prototype and other components. For this, it is essential that he is made conversant with the principles related to design of components and machine and application of these principles for designing. The aim of the subject is to develop knowledge and skills about various aspects related to design of machine components.

**DETAILED CONTENTS**

- 1. Introduction** (08 hrs)
- 1.13 Design – Definition, Type of design, necessity of design
- Comparison of designed and undesigned work
  - Design procedure
  - Characteristics of a good designer
- 1.14 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)
17. 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)
- 1.7. Various design failures-maximum stress theory, maximum strain theory
- 1.8. Classification of loads
- 1.9. Design under tensile, compressive and torsional loads.
- 3. Design of Shaft** (10 hrs)
- 2.19 Type of shaft, shaft materials, Type of loading on shaft, standard sizes of shaft available
- 2.20 Shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of :
- Strength criterion

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**Diploma in Mechanical Engineering (Code:23)**

-Rigidity criterion

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

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

11. Types of key, materials of key, functions of key
12. Failure of key (by Shearing and Crushing).
13. Design of key (Determination of key dimension)
14. 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

3.13 Temporary Joint:

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

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

3.14 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

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numericals in the question paper.

**INSTRUCTIONAL STRATEGY**

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

**RECOMMENDED BOOKS**

- 4.10 Machine Design by R.S. Khurmi and JK Gupta, Eurasia Publishing House (Pvt.) Limited, New Delhi.
- 4.11 Machine Design by V.B.Bhandari, Tata McGraw Hill, New Delhi.
- 4.12 Engineering Design by George Dieter; Tata McGraw Hill Publishers, New Delhi.
- 4.13 Mechanical Engineering Design by Joseph Edward Shigley; McGraw Hill, Delhi.
- 4.14 Machine Design by Sharma and Agrawal; Katson Publishing House, Ludhiana.
- 4.15 Design Data Handbook by D.P. Mandali, SK Kataria and Sons, Delhi.
- 4.16 Machine Design by A.P.Verma; SK Kataria and Sons, Delhi
- 4.17 Machine Design by AR Gupta and BK Gupta ; Satya Parkashan, New Delhi.
- 4.18 Machine Design by G.S. Aulakh; Eagle Prakashan, Jalandhar

**GURU KASHI UNIVERSITY**  
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**Diploma in Mechanical Engineering (Code:23)**  
**CNC MACHINES AND AUTOMATION (123604)**

**Credits- 03**

**L T P**

**3 0 0**

**RATIONALE**

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

**DETAILED CONTENTS**

- 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.

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**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**

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



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**Diploma in Mechanical Engineering (Code:23)**

**METROLOGY AND INSTRUMENTATION LAB (123605)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

9. Internal and external measurements with vernier calliper and microscope
10. Measurement of linear dimensions with height gauge and depth gauge.
11. Measurement of flatness, concentricity with dial indicator
12. Use of feeler gauge, wire gauge, radius gauge and fillet gauges for checking of standard parameters.
13. Use of plain plug and ring gauge, taper plug and ring gauge, thread plug and ring gauge and snap gauges.
14. Measurement of Angle using;  
Cylindrical rollers and spherical balls and slip gauges  
Bevel protector  
Sine Bar/Sine Table , Slip Gauges, Height Gauge and dial indicator.  
Angle deckor.
15. Measurement of spur gear characteristics;  
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.
13. Measurement of thread parameters by using tool maker's microscope.
14. Measurement of effective diameter of external threads by 2-wire and 3-wire method.
15. Measurement of cylindrical bore using cylinder bore gauge for bore diameter, ovality and taper.
16. Measurement of worn out IC engine piston clearance between cylinder and piston.
17. Measurement of surface roughness using surface roughness tester.
18. Measurement of co-ordinates of two or more than two holes using surface plate, angle plate, Height Gauge, dial indicator and slip gauges.
19. Measurement of a profile using profile projector.
20. 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.

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**Diploma in Mechanical Engineering (Code:23)**  
**AUTOMOBILE ENGINEERING LAB (123606)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

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

**INSTRUCTIONAL STRATEGY**

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

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**CNC MACHINES AND AUTOMATION LAB (123607)**

**Credits- 03**

**L T P**

**0 0 6**

**LIST OF PRACTICALS**

- 1 Study the constructional details of CNC lathe.
- 3.7 Study the constructional details of CNC milling machine.
- 3.8 Study the constructional details and working of:
  - Automatic tool changer and tool setter
  - Multiple pallets
  - Swarf removal
  - Safety devices
- 3.9 Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center.
  - Plain turning and facing operations
  - Taper turning operations
  - Operation along contour using circular interpolation.
- 3.10 Develop a part programme for the following milling operations and make the job on CNC milling
  - Plain milling
  - Slot milling
  - Contouring
  - Pocket milling
- 3.11 Preparation of work instruction for machine operator
- 3.12 Preparation of preventive maintenance schedule for CNC machine.
- 3.13 Demonstration through industrial visit for awareness of actual working of FMS in production.
- 3.14 Use of software for turning operations on CNC turning center.
- 3.15 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.

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**Diploma in Mechanical Engineering (Code:23)**  
**PROJECT WORK (123608)**

**Credits- 03**

**L T P**

**0 0 6**

**RATIONALE**

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:

- 2.5 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.
- 2.6 Develop understanding of subject based knowledge given in the class room in the context of its application at work places.
- 2.7 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.
- 2.8 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 :

- 2.6 Punctuality and regularity
- 2.7 Initiative in learning/working at site
- 2.8 Level/proficiency of practical skills acquired
- 2.9 Ability of solve live practical problems
- 2.10 Sense of responsibility
- 2.11 Self expression/communication skills
- 2.12 Interpersonal skills/Human Relation
- 2.13 Report Writing Skills
- 2.14 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:

- 6.10. Projects connected with repair and maintenance of machines .
16. Estimating and costing projects.

# **GURU KASHI UNIVERSITY**

## **Syllabus**

### **Diploma (Mechanical Engineering)**

17. Design of jigs / fixtures.
18. Projects related to quality control.
19. Project work related to increasing productivity.
20. Projects relating to installation, calibration and testing of machines.
21. Projects related to wastage reduction.
22. Project, related to fabrication.
23. Energy efficiency related projects.
24. 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.

3.6. Students will specify various processes involved in the project