

Programme Structure

School of Polytechnic

**Diploma in Mechanical
Engineering**

Programme Code:SPB15

Batch: 2023-2026

Vision of the University

To be recognized as an Institution of excellence, facilitating learning, fostering creativity, knowledge creation, innovations, consultancy and leadership in multiple areas to build a conscious community that will positively impact living beings for a sustainable future.

Mission of the University

1. Offers a wide range of Undergraduate and Post graduate Courses.

To create conducive environment for an interactive and application oriented experiential learning making the Institute a preferred destination for work and study.

2. Research, Innovation, Consultancy & Entrepreneurial Culture

To Foster creativity, research and innovation orientation in students and faculty in basic and applied areas in all of its disciplines, provide cost effective solutions and nurture entrepreneurial capabilities to accelerate growth.

3. Social Relevance with local actions on global thoughts

To act as a catalyst in social change by developing academic, social, political, technological, scientific, industrial and business leadership in the spirit “Think Globally and Act Locally”; by providing ample opportunities to develop team spirit, sportsmanship and love for culture and national heritage.

Core Values

Integrity
Leadership
Diversity
Community

Vision of the School

To become a center of excellence for providing quality and value based education in the field of diploma engineering that will produce skilled technocrats to meet industry requirements.

Mission of the School

- To provide technical knowledge and skills by using latest engineering tools.
- To facilitate industry-institute interaction to explore the industrial knowledge of the students.
- To inculcate ethical and professional values among students.
- To impart quality education to the students coming from rural parts and to conduct different curricular & co-curricular activities to enhance the academic

Core Values

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Diversity
Community

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1.** Possess a solid foundation in mechanical engineering theory and practice, as well as the ability to solve problems and solve them, allowing them to develop, evaluate, and build efficient mechanical systems and procedures.
- PEO 2.** To create engineers with sound technical knowledge for facing all sorts of challenges in industry or in pursuance of higher studies.
- PEO 3.** To motivate students, to acquire attitude for lifelong learning along with leadership skills, team spirit and ethical values so that they upgrade themselves with the latest trends in the field of engineering in order to serve the society.

PROGRAMME OUTCOMES (POs)

- PO 1.** Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
- PO 2.** Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.
- PO 3.** Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
- PO 4.** Modern tool usages: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.
- PO 5.** Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
- PO 6.** Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
- PO 7.** Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO 1.** An ability to apply principles of mechanical engineering, including mechanics, thermodynamics, fluid mechanics, heat transfer, materials science, manufacturing processes, and machine design to solve complex engineering problems.
- PSO 2.** Proficient in the use of modern engineering tools and software for modelling, simulation, analysis, and design of mechanical systems. They will be able to utilize CAD/CAM, FEA, and other computational tools to enhance engineering solutions.
- PSO 3.** Capability to design and develop mechanical systems, components, and processes that meet specific requirements, considering public health and safety, cultural, societal, and environmental factors.
- PSO 4.** Able to collaborate effectively with professionals from other engineering disciplines and fields of study. They will possess the skills to work in multidisciplinary teams, bringing mechanical engineering expertise to diverse projects and innovations.



SDGI GLOBAL UNIVERSITY, GHAZIABAD

SCHOOL OF ENGINEERING AND TECHNOLOGY

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - I

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	DE-ASH-23101	*Applied Mathematics -1	3	0	0	3	3	50	50	100	45
2	DC	DE-ASH-23102	*Applied Physics-1	3	0	0	3	3	50	50	100	45
3	DC	DE-ASH-23103	*Applied Chemistry	3	0	0	3	3	50	50	100	45
4	AE	DE-ASH-23104	*Communication Skill H & E-I	2	0	0	2	2	50	50	100	45
5	DC	DE-ME-23106	*Engineering Drawing-I	0	0	4	4	2	50	50	100	45
6	DC	DE-ASH-23112	*Applied Physics-1 Lab	0	0	2	2	1	60	40	100	45
7	DC	DE-ASH-23113	*Applied Chemistry Lab	0	0	2	2	1	60	40	100	45
8	AE	DE-ASH-23114	*Communication Skills H & E I Lab	0	0	2	2	1	60	40	100	45
9	DC	DE-ME-23116	*General Workshop Practice - I	0	0	4	4	2	60	40	100	45
10	SE	DE-CSE-23117	*Basics of Information Technology Lab	0	0	4	4	2	60	40	100	45
Total				11	0	18	29	20	550	450	1000	450



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SCHOOL OF ENGINEERING AND TECHNOLOGY

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - II

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	DE-ASH-23201	*Applied Mathematics -II	3	0	0	3	3	50	50	100	40
2	DC	DE-ASH-23202	*Applied Physics-II	3	0	0	3	3	50	50	100	40
3	DC	DE-ME-23203	*Applied Mechanics	4	0	0	4	4	50	50	100	40
4	OE	DE-CE-23204	General Engineering	4	0	0	4	4	50	50	100	40
5	DC	DE-ME-23205	*Engineering Drawing-II	0	0	4	4	2	50	50	100	40
6	DC	DE-ASH-23212	*Applied Physics-II Lab	0	0	2	2	1	60	40	100	40
7	DC	DE-ME-23213	*Applied Mechanics Lab	0	0	2	2	1	60	40	100	40
8	OE	DE-CE-23214	General Engineering Lab	0	0	2	2	1	60	40	100	40
9	DC	DE-ME-23216	*General Workshop Practice - II	0	0	4	4	2	60	40	100	40
Total				14	0	14	28	21	490	410	900	360



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SCHOOL OF POLYTECHNIC

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - III

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB15230301	Applied Mathematics- III	4	0	0	4	3	50	50	100	40
2	DC	SPB15230302	Engineering Materials	4	0	0	4	3	50	50	100	40
3	DC	SPB15230303	Mechanics of Solids	4	0	0	4	3	50	50	100	40
4	DC	SPB15230304	Thermal Engineering	4	0	0	4	2	50	50	100	40
5	DC	SPB15230305	Workshop Technology	4	0	0	4	2	50	50	100	40
6	DC	SPB15230351	Engineering Materials Lab	0	0	2	2	1	60	40	100	40
7	DC	SPB15230353	Mechanics of Solids Lab	0	0	2	2	1	60	40	100	40
8	DC	SPB15230354	Thermal Engineering Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB15230355	Workshop Technology Lab	0	0	6	6	2	60	40	100	40
10	SE	SPB15230360	CAD & 3D Modelling	0	0	6	6	2	60	40	100	40
Total				20	0	18	38	20	550	450	1000	400



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SCHOOL OF POLYTECHNIC

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - IV

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB15230401	Refrigeration and Air Conditioning	4	0	0	4	3	50	50	100	40
2	DC	SPB15230402	Hydraulics and Pneumatics	4	0	0	4	2	50	50	100	40
3	DC	SPB15230403	Computer Aided Design & Manufacturing	4	0	0	4	2	50	50	100	40
4	AE	SPB15230404	*Communication Skill H & E-II	2	0	0	2	2	50	50	100	40
5	VAC	SPB15230405	Environmental Studies	2	0	0	2	2	50	50	100	40
6	VAC	SPB15230406	Energy Conservation	2	0	0	2	2	50	50	100	40
7	VAC	SPB15230407	*Universal Human Values	2	0	2	4	3	60	40	100	40
8	DC	SPB15230451	Refrigeration and Air Conditioning Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB15230452	Hydraulics and Pneumatics Lab	0	0	2	2	1	60	40	100	40
10	DC	SPB15230453	CAD& M Lab	0	0	2	2	1	60	40	100	40
11	AE	SPB15230454	*Communication Skill H & E-II Lab	0	0	2	2	1	60	40	100	40
Total				20	0	10	30	20	600	500	1100	440



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SCHOOL OF POLYTECHNIC

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - V

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB15230501	Theory of Machines	3	0	0	3	2	50	50	100	40
2	DC	SPB15230502	Machine Design	3	0	0	3	3	50	50	100	40
3	DC	SPB15230503	Production Technology	3	0	0	3	2	50	50	100	40
4	DC	SPB15230504	Production Management	2	0	0	2	2	50	50	100	40
5	DC	SPB15230505	Automobile Engineering	3	0	0	3	2	50	50	100	40
6	SE	SPB15230506	Industrial Management and Entrepreneurship Development	3	0	0	3	2	50	50	100	40
7	DC	SPB15230553	Production Technology Lab	0	0	4	4	2	60	40	100	40
8	DC	SPB15230554	Production Management Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB15230555	Automobile Engineering Lab	0	0	2	2	1	60	40	100	40
10	DC	SPB15230560	Industrial Training/Summer Internship	0	0	0	0	3	60	40	100	40
Total				17	0	8	25	20	540	460	1000	400



SDGI GLOBAL UNIVERSITY, GHAZIABAD

SCHOOL OF POLYTECHNIC

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN MECHANICAL ENGINEERING

Session- 2023-26

Semester - VI

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB15230601	Industrial Engineering	3	0	0	3	3	50	50	100	40
2	DC	SPB15230602	Metrology & Measuring Instruments	4	0	0	4	4	50	50	100	40
3	DC	SPB15230603	CNC Machines & Automation	4	0	0	4	4	50	50	100	40
4	DC	SPB15230604	Tool Engineering	3	0	0	3	3	50	50	100	40
5	DC	SPB15230651	Industrial Engineering Lab	0	0	2	2	1	60	40	100	40
6	DC	SPB15230652	Metrology & Measuring Instruments Lab	0	0	2	2	1	60	40	100	40
7	DC	SPB15230653	CNC Machines & Automation Lab	0	0	2	2	1	60	40	100	40
8	DC	SPB15230663	Project Work	0	0	4	4	3	120	80	200	80
Total				14	0	10	24	20	500	400	900	360



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SCHOOL OF POLYTECHNIC

SCHEME OF STUDIES FOR DIPLOMA IN MECHANICAL ENGINEERING

Credit Analysis Report

Session- 2023-26

S. No	Status	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester6	Total
1	DISCIPLINE CORE	15	16	18	10	15	17	91
2	DISCIPLINE ELECTIVE	0	0	0	0	0	0	0
3	OPEN ELECTIVE	0	5	0	0	0	0	5
4	SKILL ENHANCEMENT	2	0	2	0	2	0	6
5	ABILITY ENHANCEMENT	3	0	0	3	0	0	6
6	VALUE ADDED COURSE	0	0	0	7	0	0	7
7	PROJECT/TRAINING	0	0	0	0	3	3	6
Total		20	21	20	20	20	20	121

Semester 1ST



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED MATHEMATICS - I

(DE-ASH-23101)

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3 **0** **0**

JUSTIFICATION

This course offers a fundamental understanding of elementary mathematics and its applications in engineering problem-solving. Students will learn to utilize key mathematical functions, including logarithms, partial fractions, matrices, as well as basic 2D geometry and curves. By mastering these concepts, students will gain the necessary skills to address engineering challenges across all disciplines effectively.

DETAILED CONTENTS

UNIT 1: Algebra	8 Periods
1.1 Series : AP and GP; Sum, nth term, Mean	
1.2 Matrices and Determinants : Matrix, Types and basic properties, Elementary properties of determinant of order 2 and 3, Consistency of equation, Cramer's rule	
UNIT 2: Algebra -II	8 Periods
2.1 Complex number: Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations.	
2.2 Addition and subtraction of Vectors, Resolution of vectors, Dot and Cross product of Vectors	
UNIT 3: Trigonometry and Inverse Trigonometric Functions	10 Periods
3.1 Trigonometric Functions and Identities.	
3.2 Inverse Trigonometric functions : Simple case only	
UNIT 4: Differential Calculus - I	16 Periods
4.1 Functions, limits, continuity, functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.	
4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logarithmic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.	
UNIT 5: Differential Calculus - II	16 Periods
5.1 Higher order derivatives, Simple applications.	
5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration.	

RECOMMENDED BOOKS

1. **Applied Mathematics-I** by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
2. **Elementary Engineering Mathematics** by BS Grewal, Khanna Publishers, New Delhi
3. **Engineering Mathematics, Vol I & II** by SS Sastry, Prentice Hall of India Pvt. Ltd.,
4. **Applied Mathematics-I** by Chauhan and Chauhan, Krishna Publications, Meerut.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED PHYSICS

(DE-ASH-23102)

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3 0 0

JUSTIFICATION

Physics is a field that explores various subjects relevant to our surroundings. It seeks to understand the natural world through observation and predicting how objects interact. The course emphasizes a strong understanding of physical laws and their practical applications in engineering and technology across different disciplines. Through this study, students gain insights into the behaviour of objects and their relevance in real-world scenarios.

DETAILED CONTENTS

UNIT 1: Fundamentals of Units, Measurement, Errors and Vector Analysis	12 Periods
1.1 Need of Measurement, physical Quantity - fundamental and derived, systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities. conversion of numerical values of physical quantities from one system of units into another	
1.2 Error in measurement, accuracy and precision of instruments, percentage error, Combination of errors in addition, subtraction, multiplication, division and powers, rules for representing significant figures in calculation.	
1.3 Scalar and vector quantities – examples, representation of vector, types of Vectors, Unit Vector, Vector Addition and Subtraction, Triangle and Parallelogram law (Statement only), difference between vector and scalar addition using examples, Scalar and Vector Product, Resolution of Vectors using the example of stationary object, falling object, moving object.	
UNIT 2: Force and Motion	10 Periods
2.1 Force, Momentum, Statement of Conservation of linear momentum, discuss using examples such as recoil of gun, Impulsive force and its examples,	
2.2 Circular motion (Uniform and Non-uniform), definition of angular, displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (numerical practice)	
Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge, Application of various forces in lifts, cranes, large steam engines and turbines.	
UNIT 3: Work, Power and Energy	10 Periods
3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,	
Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications	
Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.	
3.2 Power and its units, calculation of power in numerical problems	
3.3 Energy and its units: Kinetic energy and potential energy with examples and	

their derivation, work energy theorem, Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

UNIT 4: Rotational Motion and Gravitational Force

10 Periods

- 4.1 Concept of translatory and rotatory motions with examples, Definition of torque with examples, Angular momentum, Conservation of angular momentum and its examples
- 4.2 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.
- 4.3 Rotational kinetic energy, Rolling of sphere on the slant plane, Comparison of linear motion and rotational motion, Application of rotational motions in transport vehicles, and machines
- 4.4 Gravitational force, Acceleration due gravity and its variation

UNIT 5: Properties of Matter & Thermodynamics

14 Periods

- 5.1 Elasticity: definition of stress and strain, different types of moduli of elasticity, Hooke's law, significance of stress strain curve
- 5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
- 5.3 Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension
- 5.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
- 5.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications
- 5.6 Difference between heat and temperature, Modes of transfer of heat (Conduction, convection and radiation with examples), Different scales of temperature and their relationship, Isothermal and Adiabatic process, Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle, Application of various systems of thermometry in refrigeration and air-conditioning etc

RECOMMENDED BOOKS

1. **Text Book of Physics for Class XI** (Part-I, Part-II); N.C.E.R.T., Delhi
2. **Concepts in Physics** by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. **Comprehensive Practical Physics**, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd.
4. **Engineering Physics** by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. **Engineering Physics** by DK Bhattacharya & Poonam Tandan; Oxford University Press.
6. **Modern Engineering Physics** by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
7. **Physics-I** by V. Rajendran, Tata McGraw-Hill raw Hill publication, New Delhi.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED CHEMISTRY

(DE-ASH-23103)

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3 0 0

JUSTIFICATION

The use of various chemicals and chemical products in diverse technical and Engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

DETAILED CONTENTS

UNIT 1: Atomic Model and Chemical Bonding	15 Periods
1.1 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).	
1.2 Atomic number, atomic mass number isotopes and isobars.	
1.3 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance, Aufbau's principle, Pauli's exclusion principle and Hund's rule	
1.4 Electronic configuration of elements with atomic number (Z) = 30 only. Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded),	
1.5 Chemical bonding and cause of bonding.	
UNIT 2: Fuels	10 Periods
2.1 Definition of fuel, Calorific value-higher calorific value, lower calorific value, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels, Determination of calorific value fuel using Bomb calorimeter.	
2.2 Coal - types of coal and proximate analysis of coal Petroleum and its refining process, Fuel rating – Octane number and Cetane number. Gaseous fuels like natural gas (CNG), LPG, producer gas, water gas and biogas, their calorific value and applications. Elementary idea on – hydrogen as future fuels	
UNIT 3: Water	15 Periods
3.1 Demonstration of water resources on Earth using pie chart. Classification of water – soft water and hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numerical. Removal of hardness -Permutit process and Ion-exchange process.	
3.2 pH and buffer solutions and their applications	
3.3 Physico-Chemical methods for Water Quality Testing	

- a) Determination of pH using pH meter, total dissolved solids (TDS)
- b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method (chemical reaction of EDTA method are excluded).
- c) Understanding of Indian Water Quality standards as per WHO.

UNIT 4: Electrochemistry & Corrosion

10 Periods

- 4.1 Redox Reaction, Electrochemical cell (Galvanic and Electrolytic), application of electrochemistry – electroplating, galvanisation
- 4.2 Definition of corrosion and factors affecting corrosion rate.
- 4.3 Theories of a) Dry (chemical) corrosion & b) Wet corrosion in acidic atmosphere, Galvanic series,
- 4.4 Corrosion control: Internal corrosion preventive measures

UNIT 5: Organic compounds, Polymers and Plastics

10 Periods

- 5.1 Classification of organic compounds and IUPAC Nomenclature
- 5.2 Functional Groups and IUPAC Nomenclature
- 5.3 Definition of polymer, monomer and degree of polymerization
- 5.4 Classification of addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite). Applications of polymers in industry and daily life.
- 5.5 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

RECOMMENDED BOOKS

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1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
 2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
 3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
 4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
 5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.



SCHOOL OF ENGINEERING & TECHNOLOGY

COMMUNICATION SKILL - H & E-I

(DE-ASH-23104)

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JUSTIFICATION

Proficiency in the Hindi & English language plays a pivotal role in advancing one's career. This subject focuses on instilling fundamental principles of effective communication while prioritizing the cultivation of essential skills such as active listening, articulate speaking, proficient reading, and proficient writing as integral components of Communication Skills development.

DETAILED CONTENTS

UNIT 1: Basics of Communication	8 Periods
1.1 Definition and process of communication	
1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal	
1.3 Communications barriers and how to overcome them	
1.4 Barriers to Communication, Tools of Communication	
UNIT 2: Application of Grammar	8 Periods
2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals	
2.2 Sentences and its types	
2.3 Tenses	
2.4 Active and Passive Voice	
2.5 Punctuation	
2.6 Direct and Indirect Speech	
UNIT 3: English Reading Practices	10 Periods
3.1 Reading unseen passage	
3.2 Analyse language elements such as one-word substitutions, prefixes, suffixes, antonyms, synonyms, and more.	
UNIT 4: English Reading & Writing Practices	10 Periods
4.1 Writing practice: Summarizing short passages.	
4.2 Introduction to formal letter writing.	
4.3 Introduction to Notice writing.	
UNIT 5: Hindi Reading & Writing Practices	16 Periods
5.1 Writing practice: Summarizing short passages.	
5.2 Introduction to formal letter writing.	
5.3 Introduction to common Hindi idioms (Muhavare) and proverbs (Lokpriya Kahavatein)	
5.4 Writing practice: Short essays on Hindi culture and literature.	
5.5 Learning about famous Hindi writers, poets, Indian present and past personalities, and their works.	

RECOMMENDED BOOKS

1. **Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.**
2. **Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.**
3. **High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.**
4. **Communication Skills – I by R Thakur, Nageen Prakashan Publication, Meerut, UP, India**
5. **Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra**
6. **The Functional aspects of Communication Skills – Dr. P. Prasad, S.K. Katria & Sons, New Delhi**



SCHOOL OF ENGINEERING & TECHNOLOGY

ENGINEERING DRAWING - I

(DE-ME-23105)

L T P
0 0 4

JUSTIFICATION

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:

- i) First angle projection is to be followed
- ii) Minimum of 18 sheets to be prepared and atleast 2 sheets on AutoCAD
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

DETAILED CONTENTS

UNIT 1	Introduction to Engineering Drawing & Dimensioning Technique	6 Periods
1.1	Introduction to drawing instruments, materials, layout and sizes of drawing	
1.2	Sheets and drawing boards.	
1.3	Different types of lines in Engineering drawing as per BIS specifications	
1.4	Practice of vertical, horizontal and inclined lines, geometrical figures such as	
1.5	Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)	
1.6	Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches	
1.7	Scales –their needs and importance (theoretical instructions), type of scales,	
1.8	Definition of R.F. and length of scale	
UNIT 2	English Reading & Writing Practices	6 Periods
2.1	Theory of orthographic projections (Elaborate theoretical instructions)	
2.2	Projection of Points in different quadrant	
2.3	Projection of Straight Line (1st and 3rd angle)	
4.3.1.	Line parallel to both the planes	
4.3.2.	Line perpendicular to any one of the reference plane	
4.3.3.	Line inclined to any one of the reference plane.	
2.4	Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only	
2.5	Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)	
2.6	Identification of surfaces	
UNIT 3	Projection of Solid	6 Periods
3.1	Definition and salient features of Solid	
3.2	Types of Solid (Polyhedron and Solid of revolution)	
3.3	To make projections, sources, Top view, Front view and Side view of various types of Solid.	
3.4	Importance and salient features Sections	

3.5	Drawing of full section, half section, partial or broken out sections, Offset	
3.6	sections, revolved sections and removed sections.	
3.7	Convention sectional representation of various materials, conventional breaks	
UNIT 4:	Isometric Views and Common Symbols used in Engineering	16 Periods
4.1	Fundamentals of isometric projections and isometric scale.	
4.2	Isometric views of combination of regular solids like cylinder, cone, cube and	
4.3	Civil Engineering sanitary fitting symbols	
4.4	Electrical fitting symbols for domestic interior installations	
UNIT 5	Basic of various commands in AutoCAD	2 Periods
5.1	Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.	
	* Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.	

RECOMMENDED 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 Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED PHYSICS-I LAB

(DE-ASH-23112)

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JUSTIFICATION

The diploma holder in Computer Science & Engineering needs to have hands-on knowledge of basic electrical measurements and electronic circuits, which they will encounter in their professional careers.

DETAILED CONTENTS

- 1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both screw gauge.
- 2 To find diameter of metallic bob and use it to calculate its volume. Also Find the maximum permissible error in these quantities by using Vernier callipers.
- 3 To verify parallelogram law of vector addition and Subtraction.
- 4 To find the Moment of Inertia of a flywheel about its axis of rotation.
- 5 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
- 6 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
- 7 To determine the viscosity of glycerine by Stoke's method
- 8 To determine force constant of spring using Hooks law
- 9 Simulation Practical-1
- 10 Simulation Practical-2



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED CHEMISTRY LAB

(DE-ASH-23113)

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JUSTIFICATION

The use of various chemicals and chemical products in diverse technical and Engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

DETAILED CONTENTS

1. Estimation of total hardness of water using standard EDTA solution
2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution
3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.



JUSTIFICATION

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS

1. CARPENTRY SHOP

1.1 General Shop Talk

- Name and use of raw materials used in carpentry shop : wood & alternative materials
- Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.
- Specification of tools used in carpentry shop.
- Different types of Timbers, their properties, uses & defects.
- Seasoning of wood.

1.2 Practice

- Practices for Basic Carpentry Work
- Sawing practice using different types of saws
- Assembling jack plane — Planning practice including sharpening of jack plane cutter
- Chiselling practice using different types of chisels including sharpening of chisel
- Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

1.3 Job Practice

- Job 1 Marking, sawing, planning and chiselling and their practice
- Job II Half Lap Joint (cross, L or T – any one)
- Job III Mortise and Tenon joint (T-Joint)
- Job IV Dove tail Joint (Lap or Bridle Joint)
- Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

2. PAINTING AND POLISHING SHOP

2.1 Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

2.2 Job Practice

Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Job II: To prepare metal surface for painting, apply primer and paint the same.

Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as follows:

i) Abrasive cutting by leather wheel

ii) Polishing with hard cotton wheel and with polishing material

iii) Buffing with cotton wheel or buff wheel.

3. ELECTRICAL SHOP

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

3.2 Study of electrical safety measures and protective devices.

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

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

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

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

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

3.5 Introduction to battery charger and its functioning.

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

4. WELDING SHOP

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

4.2 Job Practice

- Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).
- Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).
- Job III Preparation of lap joint using arc welding process.
- Job IV Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

5. PLUMBING SHOP

5.1 Use of personal protective equipment, safety precautions while working and leaning of shop.

5.2 Introduction and demonstration of tools, equipment and machines used in plumbing shop.

5.3 Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.

5.4 Job Practice

- Job 1 : Preparation of job using elbow, bend and nipple
- Job II: Preparation of job using Union, Tap, Plug and Socket.
- Job III: Threading practice on pipe with die

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY
COMMUNICATION SKILL - H & E-I LAB
(DE-ASH-23114)

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JUSTIFICATION

Proficiency in the Hindi & English language plays a pivotal role in advancing one's career. This subject focuses on instilling fundamental principles of effective communication while prioritizing the cultivation of essential skills such as active listening, articulate speaking, proficient reading, and proficient writing as integral components of Communication Skills development.

DETAILED CONTENTS

- 1 Self and peer introduction
- 2 Newspaper reading
- 3 Just a minute session-Extempore
- 4 Greeting and starting a conversation
- 5 Leave taking
- 6 Thanking
- 7 Wishing well
- 8 Talking about likes and dislikes
- 9 Group Discussion
- 10 Listening Exercises.

RECOMMENDED BOOKS

1. **Communicating Effectively in English, Book-I** by Revathi Srinivas; Abhishek Publications.
2. **Communication Techniques and Skills** by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. **High School English Grammar and Composition** by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. **Communication Skills – I** by R Thakur, Nageen Prakashan Publication, Meerut, UP, India
5. **Excellent General English**-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
6. **The Functional aspects of Communication Skills** – Dr. P. Prasad, S.K. Katria & Sons, New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

BASIC OF INFORMATION TECHNOLOGY LAB

(DE-CSE-23117)

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JUSTIFICATION

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 using MS Office/Open Office/Libre 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.

DETAILED CONTENTS

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.
9. Word Processing (MS Office/Open Office)
 - a) File Management: Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
 - b) Page set up: Setting margins, tab setting, ruler, indenting
 - c) Editing a document: Entering text, cut, copy, paste using tool- bars
 - d) Formatting a document: Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods, Aligning of text in a document, justification of document, inserting bullets and numbering
Formatting paragraph, inserting page breaks and column breaks, line spacing, Use of headers, footers: Inserting footnote, end note, use of comments, autotext, Inserting date, time, special symbols, importing graphic images, drawing tools
 - e) Tables and Borders: Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table, Print preview, zoom, page set up, printing options Using find, replace options
 - f) Using Tools like: Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables, Using shapes and drawing toolbar, Working with more than one window.

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)

- a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets
- b) Menu commands: Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working
- c) Work books: Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting
- d) Creating a chart: Working with chart types, changing data in chart, formatting a chart, use chart to analyze data, Using a list to organize data, sorting and filtering data in list
- e) Retrieve data with query: Create a pivot table, customizing a pivot table. Statistical analysis of data
- f) Exchange data with other application: Embedding objects, linking to other applications, import, export document.

11. PowerPoint Presentation (MS Office/Open Office/Libre office)

- a) Introduction to PowerPoint: How to start PowerPoint, Working environment: concept of toolbars, slide layout & templates, Opening a new/existing presentation Different views for viewing slides in a presentation: normal, slide sorter.
- 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 Editing objects, Working with Clip Art
- d) Formatting slides
Using slide master, Text formatting, Changing slide layout, Changing slide colour scheme, Changing background, Applying design template

12. Google Suits Using Google drive, Google shut, Google docs, Google slides

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
4. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi

Semester 2nd



JUSTIFICATION

Basic elements of integral calculus, differential calculus, numerical methods, differential equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

DETAILED CONTENTS

UNIT 1: Integral Calculus-I	20 Periods
Method of Indefinite Integration:	
1.3 Integration by substitution.	
1.4 Integration by rational function.	
1.5 Integration by partial fraction.	
1.6 Integration by Parts	
1.7 Integration of special function	
UNIT 2: Integral Calculus -II	20 Periods
2.1 Meaning and properties of definite integrals, Evaluation of definite integrals..	
2.2 Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.	
2.3 Simpson’s 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson’s method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)	
UNIT 3: Co-ordinate Geometry (2 Dimension)	18 Periods
3.1 Circle, Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.	
UNIT 4: Co-ordinate Geometry (3 Dimension)	18 Periods
4.1 Straight lines and planes in space, Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)	

RECOMMENDED BOOKS

5. **Applied Mathematics-II** by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
6. **Elementary Engineering Mathematics** by BS Grewal, Khanna Publishers, New Delhi
7. **Engineering Mathematics, Vol I & II** by SS Sastry, Prentice Hall of India Pvt. Ltd.,
8. **Applied Mathematics-II** by Chauhan and Chauhan, Krishna Publications, Meerut.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED PHYSICS-II

(DE-ASH-24202)

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JUSTIFICATION

Applied physics includes the study of a diversified topics related to 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 behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

DETAILED CONTENTS

UNIT 1: WAVE MOTION AND ITS APPLICATIONS

12 Periods

- 1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application
- 1.2 Wave equation $y = r \sin wt$, phase, phase difference, principle of superposition of waves
- 1.3 Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic
- 1.4 Concepts of Pitch, Loudness, Echo, Ultrasonics

UNIT 2: WAVE OPTICS

6 Periods

- 2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.
- 2.2 Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.
- 2.3 Diffraction, Single Slit diffraction, Intensity calculation etc
- 2.4 Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewster's law), Malus law, use of polaroids.

UNIT 3: ELECTROSTATICS

12 Periods

- 3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.
- 3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.
- 3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors.
- 3.4 Dielectric and its effect on capacitance.
- 3.5 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

UNIT 4: Magneto Statics and Electromagnetism

12 Periods

- 4.1 Magnet, Magnetic poles, Magnetic Lines of Force, Different magnetic lines patterns due to interaction of two magnets, Electromagnetism, Magnetic field due to a straight conductor, Magnetic field due to a loop, Magnetic field due to a solenoid, Flemings Left Hand Rule, force on a current carrying conductor
- 4.2 Faraday's law of Electromagnetic Induction, Lenz' law, Flemings Right hand rule.
- 4.3 Magnetization, Gauss' law for magnetism.
- 4.4 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties, Application of electromagnetism in ac/dc motors and generators.

UNIT 5: Semiconductor physics**12 Periods**

- 5.1 Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode working and its V-I characteristics
- 5.2 Diode as rectifier – half wave and full wave rectifier (centre taped),
- 5.3 Semiconductor transistor, pnp and npn (concepts only)
- 5.4 Application of semiconductor diodes (Zener, LED) and transistor as switch.

RECOMMENDED BOOKS

1. **Text Book of Physics for Class XI** (Part-I, Part-II); N.C.E.R.T., Delhi
2. **Concepts in Physics** by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. **Comprehensive Practical Physics**, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd.
4. **Engineering Physics** by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. **Engineering Physics** by DK Bhhatacharya & Poonam Tandan; Oxford University Press.
6. **Modern Engineering Physics** by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
7. **Physics-II** by V. Rajendran, Tata McGraw-Hill raw Hill publication, New Delhi.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED MECHANICS

(DE-ME-24203)

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JUSTIFICATION

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

UNIT 1: Introduction	12 Periods
1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.	
1.2 Concept of rigid body, scalar and vector quantities	
1.3 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples)	
1.4 Definition of ideal machine, reversible and self-locking machine	
UNIT 2: Laws of Forces	07 Periods
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, and characteristics of a force.	
2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition.	
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, Equilibrant Force and its determination, Lami's Theorem (Concept Only)	
2.5 Type of Load, supports, Beams- analysis for simply supported, cantilever beams.	
UNIT 3: Moment	07 Periods
3.1 Concept of Moment, Moment of a force and units of moment, Varignon's Theorem (Definition Only), Principle of moment and its applications, Parallel forces (like and unlike parallel force), calculating their resultant.	
3.2 Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces.	
3.3 Position of resultant force by moment [Simple problems on the above topics]	
UNIT 4: Friction	08 Periods
4.1 Definition and concept of friction, types of friction, force of friction, Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction.	
4.2 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.	

- 4.3 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:
- Acting along the inclined plane Horizontally
 - At some angle with the inclined plane

UNIT 5: Centre of Gravity

08 Periods

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

RECOMMENDED BOOKS

- A Text Book of Applied Mechanics by S Ramamurtham , Dhanpat Rai Publishing Co. Ltd.
- A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
- A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi.
- Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
- Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

GENERAL ENGINEERING

(DE-ME-24204)

L T P
4 0 0

JUSTIFICATION

Apart from the core subjects, some engineering subjects are included in this diploma course one of these subjects is General Engg. which aims to impart some necessary knowledge and skill about other Engg disciplines. Inclusion of the subject is further justified by the fact that impractical field, any job of technician is intermingled. As such the relevant basic topics of these disciplines are included in the content of the subject.

DETAILED CONTENTS

Section A : Electrical Engineering		12 Periods
UNIT 1: Overview of DC Circuits		
1.1	Definition of basic terms, such as current, EMF, Potential Difference (PD); Ohm's Law and its limitations; Factors affecting resistors; simple problems on series and parallel combinations of resistors with their wattage considerations.	
1.2	Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion.	
1.3	DC Circuit Theorems: Thevenin's theorem, Norton's theorem, application of network theorems in solving D.C. circuit problems.	
UNIT 2: Batteries		8 Periods
2.1	Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel- Cadmium and Silver-Oxide batteries.	
2.2	Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries	
2.3	General idea of solar cells, solar panels and their applications	
UNIT 3: A.C Fundamental and A.C Circuit		10 Periods
3.1	Concept of alternating quantities, Difference between ac and dc, Different AC and DC waveforms, Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor. Equation of sinusoidal wave form for an alternating quantity and its derivation,	
3.2	Effect of alternating voltage applied to a R, L, C, RL, RC, RLC circuits, Power Factor, Methods of Power Factor improvement	
3.3	3-phase Ac circuits, advantages of polyphase system over single phase system. Relations between line and phase value of voltages and currents for star and delta connections.	
Section B: Civil Engineering		
UNIT 4: Construction Materials & Foundations		6 Periods
4.1	Properties and uses of various construction materials such as stones, bricks, lime, content and timber with their properties, physical/field testing, elements of brick masonry.	
4.2	Foundations: Bearing capacity of soil and its importance, Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines.	
UNIT 5: Concrete & RCC		6 Periods

- 5.1 Concrete: Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/field testing of concrete, mixing of concrete, placing and curing of concrete.
- 5.2 RCC: Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building.

RECOMMENDED BOOKS

1. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi.
2. Basic Electrical Engineering by Asfaque Husain, Jain Book Depot, New Delhi
3. Concrete Technology by J.Jha and Sinha; Khanna Publishers, Delhi
4. Building Construction by Jha and Sinha; Khanna Publishers, Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

ENGINEERING DRAWING-II

(DE-ME-24205)

L T P
0 0 4

JUSTIFICATION

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.

DETAILED CONTENTS

UNIT 1: Detail and Assembly Drawing	5 Periods
1.1 Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint, furniture drawing - freehand and with the help of drawing instruments.	2 Sheets
1.2 Screw Threads: Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads, Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)	3 Sheets
UNIT 2: Nuts and Bolts	2 Periods
2.1 Different views of hexagonal and square nuts. Square and hexagonal headed bolt	
2.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer	2 Sheets
2.3 Assembly of square headed bolt with hexagonal and with washer	
UNIT 3: Locking Devices	2 Periods
3.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking Plate, slotted nut and spring washer.	
3.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.	2 Sheets
3.3 Drawing of various types of studs	
UNIT 4: Keys and Cotters	3 Periods
4.1 Various types of keys and cotters - their practical application, drawings of various keys and cotters showing keys and cotters in position	
4.2 Various types of joints- Spigot and socket joint, Gib and Cotter joint , Knuckle Joint	3 Sheets
UNIT 5: Riveted Joints & Couplings	6 Periods
5.1 Riveted Joints: Types of riveted joints- Lap joint-Single riveted, double riveted (chain and zig-zag type) , Single riveted, Single cover plate butt joint, Single riveted, double cover plate butt joint , Double riveted, double cover plate butt joint(chain and zig-zag type)	4 sheets
5.2 Couplings : Introduction to coupling, their use and types , Flange coupling (protected), Flexible Coupling	2 sheets

RECOMMENDED 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 (Pvt. Ltd.), Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar



SCHOOL OF ENGINEERING & TECHNOLOGY

GENERAL WORKSHOP PRACTICE –II

(DE-ME-24216)

L T P
0 0 4

JUSTIFICATION

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS

UNIT 1: FITTING SHOP

12 Periods

- 1.1 Use of personal protective equipment and safety precautions while working.
- 1.2 Basic deburring processes.
- 1.3 Introduction to fitting shop tools, marking and measuring devices/equipment.
- 1.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)
- 1.5 Identification of various steel sections (flat, angle, channel, bar etc.).
- 1.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).
- 1.7 **Job Practice:**
 - Job I** Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
 - Job II** Filing a rectangular/square piece to maintain dimensions within an accuracy of $\pm .25$ mm.
 - Job III** Making a cut-out from a square piece of MS flat using hand hacksaw and chipping
 - Job IV** Drilling and tapping practice on MS Flat.

UNIT 2: SHEET METAL SHOP

6 Periods

- 2.1 Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.
- 2.2 Introduction and demonstration of hand tools used in sheet metal shop.
- 2.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,
- 2.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.
- 2.5 Study of various types of nuts, bolts, rivets, screws etc.
- 2.6 **Job Practice:**
 - Job I:** Shearing practice on a sheet using hand shears.
 - Job II:** Practice on making Single riveted lap joint/Double riveted lap Joint.
 - Job III:** Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

UNIT 3: WELDING SHOP-I

12 Periods

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

3.2 **Job Practice:**

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

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

Job III Preparation of lap joint using arc welding process.

Job IV Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

UNIT 4: FOUNDRY SHOP

6 Periods

4.1 Study of metal and non metals

4.2 Study and Sketch of the Foundry tools

4.3 Study and sketch of Cupola and pit furnace

4.4 To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)

4.5 Casting of non ferrous (lead or aluminium)

UNIT 5: MACHINE SHOP

12 Periods

5.1 Study and sketch of lathe machine

5.2 Study and Sketch of grinders, milling machine, drilling machine and CNC machine.

5.3 Plain and step turning and knurling practice.

5.4 Study and sketch of planing/shaping machine and to plane a rectangle of cast iron.

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED PHYSICS LAB-II

(DE-ASH-24212)

L	T	P
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JUSTIFICATION

The diploma holder in Mechanical Engineering needs to have hands-on knowledge of basic electrical measurements and electronic circuits, which they will encounter in their professional careers.

DETAILED CONTENTS

- 1 To determine the velocity of sound with the help of resonance tube.
- 2 To find the focal length of convex lens by displacement method.
- 3 To find the refractive index of the material of given prism using spectrometer.
- 4 To find the wavelength of sodium light using Fresnel's biprism.
- 5 To verify laws of resistances in series and parallel combination
- 6 To verify ohm's laws by drawing a graph between voltage and current.
- 7 To measure very low resistance and very high resistances using Slide Wire bridge
- 8 Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
- 9 To draw hysteresis curve of a ferromagnetic material.
- 10 To draw characteristics of a PN junction diode and determine knee and break down voltages.
- 11 To find wave length of the laser beam.
- 12 To find numerical aperture of an optical fiber.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED MECHANICS LAB

(DE-ME-24213)

L	T	P
0	0	2

JUSTIFICATION

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 Verification of the polygon law of forces using gravesand 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.
- 5 To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
- 6 To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
- 7 To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
- 8 To find out centre of gravity of regular lamina.
- 9 To find out centre of gravity of irregular lamina.
- 10 To determine coefficient of friction between three pairs of given surface.



SCHOOL OF ENGINEERING & TECHNOLOGY

GENERAL ENGINEERING LAB

(DE-ME-24214)

L	T	P
0	0	2

JUSTIFICATION

The diploma holder in Mechanical Engineering needs to study exercises along with some field work have been suggested to give feel of jobs and equipment involved.

DETAILED CONTENTS

1. Operation and use of measuring instruments via voltmeter, ammeter, CRO, Wattmeter, multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. Measurement of resistance of an ammeter and a voltmeter
4. Verification of dc circuits:
 - a. Thevenin's theorem,
 - b. Norton's theorem,
5. Observation of change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current and Voltage Laws in a dc circuit
7. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
8. Charging and testing of a lead - acid storage battery.
9. Measurement of power and power factor in a single phase R-.L-.C. circuit and calculation of active and reactive powers in the circuit.
10. Verification of line to line and line to neutral voltages and current in star and delta connections.
11. Study of green energy
12. Testing of bricks
 - a) Shape and size
 - b) Soundness test
 - c) Water absorption
 - d) Crushing strength
13. Testing of concrete
 - a) Slump test
 - b) Compressive Strength of concrete cube
14. The students should be taken to different construction sites to show them various Construction materials, concreting process and construction of RCC structural elements, foundations and other civil works.

Semester 3rd



SCHOOL OF POLYTECHNIC
APPLIED MATHEMATICS - III
(SPB15230301)

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

JUSTIFICATION

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

DETAILED CONTENTS

UNIT 1:	Matrices	12 Periods
1.1	Algebra of Matrices: Addition, Multiplication of matrices, Null matrix and a unit matrix, Square-matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix. Definition and Computation of inverse of a matrix.	
1.2	Elementary Row/Column Transformation: Meaning and use in computing inverse and rank of a matrix.	
1.3	Linear Dependence: Linear dependence/independence of vectors, Definition and computation of rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.	
1.4	Eigen Pairs: Definition and evaluation of eigen values and eigen vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification Use in finding inverse and powers of a matrix.	
UNIT 2:	Differential Calculus	10 Periods
2.1	Function of two variables, identification of surfaces in space, coincides	
2.2	Partial Differentiation: Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians.	
2.3	Vector Calculus: Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.	
UNIT 3:	Differential Equation	10 Periods
3.1	Formation, Order, Degree, Types, Solution: Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, nonlinear equation.	
3.2	First Order Equations: Variable separable, equations reducible to separable forms, Homogeneous equations, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.	
3.3	Higher Order Linear Equation: Property of solution, Linear differential equation with constant coefficients (PI for $X = e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax} V$, XV)	
3.4	Simple Applications: LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical	

and mechanical system

UNIT 4: Integral Calculus

8 Periods

- 4.1 Beta and Gamma Functions: Definition, Use, Relation between the two, their use in evaluating integrals.
- 4.2 Fourier Series: Fourier series of $f(x)$, $-n < x < n$, Odd and even function, Half range series.
- 4.3 Laplace Transform: Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations

UNIT 5: Probability and Statistics

8 Periods

- 5.1 Probability: Introduction, Addition and Multiplication theorem and simple problem.
- 5.2 Distribution: Discrete and continuous distribution, Binomial Distribution, Poisson Distribution, Normal Distribution.

RECOMMENDED BOOKS

9. **Applied Mathematics-III (Hindi & English)** by Kumar,Ajay; J.P.N.P, Meerut
10. **Elementary Engineering Mathematics** by BS Grewal, Khanna Publishers, New Delhi
11. **Engineering Mathematics, Vol I & II** by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. **Applied Mathematics-III** by Chauhan and Chauhan, Krishna Publications, Meerut.



SCHOOL OF POLYTECHNIC
ENGINEERING MATERIALS

(SPB15230302)

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

JUSTIFICATION

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

UNIT 1: Introduction	12 Periods
1.1 Materials, Classification of Materials, Properties of materials like- Thermal, Chemical, Electrical and Mechanical properties.	
1.2 Ferrous Materials: Different iron ores, Raw materials in production of iron and steel, Basic process of iron-making and steel-making, Classification of iron and steel.	
1.3 Cast Iron: Different types of Cast Iron, manufacture and their use. Classification of Grey cast iron and S.G. iron	
UNIT 2: Metals And Alloys	08 Periods
2.1 Steels: Steels and alloy steel, Classification of plain carbon steels, Properties and usage of different types of Plain Carbon Steels, Effect of various alloys on properties of steel.	
2.2 Uses of alloy steels: High speed steel, stainless steel, spring steel, silicon steel	
2.3 Non-Ferrous Materials: Properties and uses of Aluminium, Copper and Zinc and their alloys	
UNIT 3: Heat Treatment	08 Periods
3.1 Introduction: Heat treatment, Purpose of heat treatment, Solid solutions and its types, Formation and decomposition of Austenite, Martensitic Transformation – Simplified Transformation Cooling Curves.	
3.2 Heat Treatment Processes: Hardening, tempering, annealing, normalizing, Case hardening and surface hardening.	
3.3 Hardenability of steels, Selection of case carburizing and induction hardening steels. Types of heat treatment furnaces (only basic idea)	
UNIT 4: Plastics, Rubber, and Miscellaneous Materials	08 Periods
4.1 Plastics: Definition, classification of Plastics- Thermosetting & Thermoplastic and their uses, Various trade names of plastics.	
4.2 Rubber: Definition, Classification of Rubber- Natural & Synthetic rubber.	
4.3 Miscellaneous Materials: Tool and Die materials, Materials for bearing metals, Materials for Nuclear Energy, Refractory materials.	
UNIT 5: Crystallography, Advanced Materials and Testing of Materials	12 Periods
5.1 Crystallography: 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.	

- 5.2 **Advanced Materials:** Composites, Ceramics, Adhesives, Smart materials, their properties, classification, and applications.
- 5.3 **Destructive Testing:** Definition, Classification of destructive testing-Hardness testing
- 5.4 **Non-Destructive Testing:** Definition, Classification of Non-destructive testing- Visual testing, Ultrasonic testing, liquid penetration testing

RECOMMENDED BOOKS

- 8. Text book of Material Science by R.K. Rajput; Katson Pubs, Ludhiana
- 9. Text book of Material Science by V.K. Manchanda; India Publishing House, Jalandhar.
- 10. Engineering material & Material Science (Hindi & English) by Sinha,R.S.K, Asian, New Delhi.
- 11. Engineering material & Material Science (Hindi & English) by Bhatnagar S.K
- 12. Material & material science (Hindi & English) by Gupta, J L.



SCHOOL OF POLYTECHNIC

MECHANICS OF SOLID

(SPB15230303)

L	T	P
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JUSTIFICATION

Diploma holders in this course are required to analyse 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 and columns. 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

UNIT 1: Stresses and Strains	10 Periods
1.1 Basic assumptions, Concept of load, stress and strain	
1.2 Tensile, compressive and shear stresses, Thermal Stresses and strains	
1.3 Concept of Elasticity, Elastic limit and limit of proportionality, Nominal and true stress-strain diagrams, Hook's Law, Young Modulus of elasticity, Nominal stress, Yield point, plastic stage, Ultimate strength and breaking stress, Percentage elongation, Proof stress and working stress, Factor of safety, Poisson's Ratio, Shear modulus	
1.4 Concepts of fatigue, creep and stress concentration	
UNIT 2: Resilience and Moment of Inertia	08 Periods
2.1 Resilience, proof resilience, modulus of resilience, Strain energy due to direct stresses, Stresses due to gradual, sudden, and falling load.	
2.2 Concept of moment of inertia and second moment of area, Radius of gyration, Theorem of perpendicular axis and parallel axis without derivation, Section modulus.	
2.3 Concept of Principal stresses, principal planes and maximum shear stress.	
UNIT 3: Bending Stresses & Torsion	12 Periods
3.1 Bending Stresses: Concept of Bending stresses, Theory of simple bending, Use of the equation $\sigma/y = M/I = E/R$, Concept of moment of resistance, Bending stress diagram, Calculation of maximum bending stress in beams of rectangular, circular, and T-Section, Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.	
3.2 Torsion: Concept of torsion- difference between torque and torsion, Use of torque equation for circular shaft, Comparison between solid and hollow shaft with regard to their strength and weight, Power transmitted by shaft, Concept of mean and maximum torque, Determination of shaft diameter under combined bending and torsion.	
UNIT 4: Shear Force and Bending Moment	08 Periods
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 S.F. and B.M. Diagram for cantilever and simply supported beams with and without overhang subjected to concentrated load and U.D.L.	
UNIT 5: Columns, Thin Cylinder and Spherical Shells	08 Periods

- 5.1 **Columns:** Concept of column, modes of failure, Types of columns, Buckling load, crushing load, Slenderness ratio, Factors effecting strength of a column, End restraints, Effective length, Strength of column by Euler Formula without derivation, Rankine Gourdan formula (without derivation)
- 5.2 **Thin Cylinder and Spherical Shells:** Introduction to longitudinal stresses, circumferential or hoop stresses and radial stresses, Longitudinal and circumferential stresses in thin cylinder, Longitudinal and circumferential stresses in thin Spherical shells

RECOMMENDED BOOKS

1. SOM by Birinder Singh; Katson Publishing House, New Delhi.
2. SOM by RS Khurmi; S. Chand & Co; New Delhi
3. Mechanics of Materials by Dr. Kirpal Singh; Standard Publishers Distribution, New Delhi.
4. Mechanics of Solids by Karmveer Saini, Krishna Publication House, Meerut.
5. Mechanics of Solids (Hindi & English) by Kapoor, J.K, Bharat Bharti Prakashan, Meerut.
5. Mechanics of Solids (Hindi & English) by Varshney, M.K,



SCHOOL OF POLYTECHNIC

THERMAL ENGINEERING

(SPB15230304)

L T P
4 0 0

JUSTIFICATION

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

UNIT 1: Fundamental Concepts	08 Periods
1.1 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.	
1.2 Laws of Perfect Gases: Boyle’s law, Charle’s law, Avogadro’s law, Regnault’s law	
UNIT 2: Laws of Thermodynamics	08 Periods
2.1 Laws of conservation of energy, first law of thermodynamics, Application of first law of thermodynamics to non-flow systems – Constant volume, constant pressure, Adiabatic and polytropic processes.	
2.2 Steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, nozzles.	
2.3 Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck’s statement, Clausius statement, Perpetual motion Machine of first kind, second kind, Carnot engine,	
2.4 Introduction of third law of thermodynamics, concept of irreversibility, entropy,	
UNIT 3: Properties of Steam and Steam Generators	10 Periods
3.1 Formation of steam: Thermodynamics properties of steam, steam tables, internal latent heat, internal energy of steam, Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes, Quality of steam (dryness fraction)	
3.2 Steam Generators: Uses of steam, classification of boilers, comparison of fire tube and water tube boilers, Construction features of Lancashire boiler, Nestler boiler, Babcock & Wilcox Boiler.	
UNIT 4: Introduction of IC Engines & Heat Transfer	10 Periods
4.1 Introduction of IC Engine: Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, diesel cycle and dual cycle, simple problems on efficiency.	
4.2 Introduction of Heat Transfer: Modes of heat transfer, Fourier’s law	
UNIT 5: Steam Turbines, Steam Condenser and Gas Turbines	12 Periods
5.1 Steam Turbines: Function and use of steam turbine, Steam nozzles - types and applications, Steam turbines- impulse, reaction, construction and working principle, Governing of steam turbines	

- 5.2 **Steam Condenser:** Function of a steam condenser, elements of condensing plant, Classification- jet condenser, surface condenser, Cooling-pond and cooling towers
- 5.3 **Gas Turbines:** Classification, open cycle gas turbine and closed cycle gas turbine, with general layout, PV and TS diagram and working.

RECOMMENDED BOOKS

7. Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi.
8. Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi.
9. Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi.
10. Thermal Engineering (Hindi & English) by Gupta, J.M.L, BBP, Meerut
11. Thermal Engineering (Hindi & English) by Singh, Arpit, JPN, Meerut



SCHOOL OF POLYTECHNIC
WORKSHOP TECHNOLOGY

(SPB15230305)

L T P
4 0 0

JUSTIFICATION

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

UNIT 1	Welding	12 Periods
1.1	Principle of welding, Classification of welding processes, Advantages and limitations of welding, Welding defects	
1.2	Gas Welding: Principle of operation, Types of gas welding flames and their applications,	
1.3	Arc Welding: Principle of operation, Types of Arc Welding- TIG & MIG Welding	
1.4	Resistance Welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding	
UNIT 2	Pattern Making	08 Periods
2.1	Types of patterns, Pattern material, Pattern allowances	
2.2	Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores	
UNIT 3	Moulding and Casting	12 Periods
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	
3.2	Casting Processes: Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, centrifugal casting.	
3.3	Gating and Riser System: Elements of gating system, Pouring basin, sprue, runner, gates, Types of risers	
3.4	Melting Furnaces: Construction and working of Pit furnace, Cupola furnace, Casting defects	
UNIT 4:	Metal Forming Process	08 Periods
4.1	Press Working- Types of presses, type of dies, Press Operations-Shearing, piercing trimming, punching, notching, shaving, gearing, embossing, stamping.	
4.2	Forging- Open die forging, closed die gorging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging.	
4.3	Rolling- Elementary theory of rolling, Types of rolling mills	
UNIT 5	Plastic Processing	06 Periods
5.1	Industrial use of plastics, Injection moulding-principle, working of injection moulding machine, Compression moulding-principle, and working of compression moulding machine.	
5.2	Extrusion and Drawing- Type of extrusion- Hot and Cold, Direct and indirect, pipe drawing, tube drawing, wire drawing.	

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. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd., Delhi
4. Workshop Technology (Hindi & English) by Kapoor, J.K, Bharat Bharti Prakashan, Meerut
5. Elementary Workshop Technology, Gupta, K.K, Asian, Mujaffarnagar



SCHOOL OF POLYTECHNIC
ENGINEERING MATERIALS LAB
(SPB15230351)

L T P
0 0 2

JUSTIFICATION

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

S. No	Name of Practical
1	Use of diamond polishing apparatus.
2	To perform following heat treatment process on materials of known carbon percentage and checking the change in the properties a) Annealing b) Normalising c) Case hardening
3	Preparation of specimens and study of micro structure of given metals and alloys on metallurgical microscope a) Brass b) Bronze c) Grey Cast Iron d) Low Carbon Steel e) High Carbon Steel f) High Speed Steel
4	To prepare specimen for microscope examination for polishing
5	To determine composition of alloy steel by steeloscope.



SCHOOL OF POLYTECHNIC

MECHANICS OF SOLID LAB

(SPB15230353)

L	T	P
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JUSTIFICATION

Diploma holders in this course are required to analyse 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 and columns. 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

S. No	Name of Practical
1	To find the sheer force at a given section of simply supported beam for different loading.
2	To find the value of 'E' for a steel beam by method of deflection for different loads.
3	To determine the Max-Fiber stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.
4	To determine the ultimate tensile strength, its modulus of Elasticity, stress at yield point, Elongation and contraction in X-sectional area of the specimen by U.T.M. through necking phenomenon.
5	To determine the ultimate crushing strength of materials like steel and copper and compare their strength.
6	To determine Rockwell Hardness No. and Brinell Hardness No. of a sample.
7	To estimate the Shock Resistance of different qualities of materials by Izod's test and Charpy test.
8	To determine the bending moment at a given section of a simply supported beam for different loading.
9	To determine the various parameters of helical coil spring.
10	To determine the angle of twist for a given torque by torsion apparatus and to plot a graph between torque and angle of twist.



SCHOOL OF POLYTECHNIC

THERMAL ENGINEERING LAB

(SPB15230354)

L	T	P
0	0	2

JUSTIFICATION

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS

S. No	Name of Practical
1	Demonstration of mountings and accessories on a boiler.
2	Demonstrate the working of air compressor.
3	Demonstration of heat transfer through conduction, convection and Radiation
4	Study of working of high-pressure boiler
5	Dismantle an IC engine and note down the condition of various parts, removal and fitting of piston, rings, measuring of bore size, crank shaft ovality and assemble it.
6	Service of cooling & lubrication system of IC engine and note down the functioning/testing of various components.
7	Determination of BHP by dynamometer.
8	Morse test on multi-cylinder petrol engine.



JUSTIFICATION

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

S. No Name of Practical

1 WELDING SHOP

- Job 1. Preparing gas welding joint in vertical/Horizontal position joining M.S.Flates
- 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
- Job 7 Exercise on arc welding pipe joint MS.

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. Preparations 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 aluminium
- Job 5. Preparing a mould of step pulley and also preparing core for the same.
- Job 6. A visit to cast iron foundry should be arranged to have first-hand knowledge of cast iron melting pouring and casting.
- Job 7. Testing of moisture contents and strength of moulding sand.

4 FORGING SHOP/FITTING SHOP/SHEET METAL SHOP

- Job 1. Preparation of single ended spanner by hand/machine forging.
- Job 2. Preparation of simple die
- Job 3. Demonstration of spinning process on lathe and spinning a bowl on a lathe machine.
- Job 4. Demonstration of grinding process on lathe machine and grinding a job on a lathe machine
- Job 5. Preparation of utility item out of G.I. sheet.
- Job 6. Preparation of drilling Jig.



JUSTIFICATION

Computer Aided Design plays a very important role in designing products with exact determines for manufacturing industries. Modelling helps to achieve the designed shape and size of products for the manufacturing sector. After studying this subject the students will be able to know Drafting, Designing and Modelling techniques which helps a manufacturer machines sound for better product development.

DETAILED CONTENTS

S. No	Name of Practical	
1	Introduction to AutoCAD commands	6 sheets
	1.1 Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snaps, Grid, and ortho mode (Absolute, Relative and Polar)	
	1.2 Drawing commands – point, line, arc, circle, ellipse, parabola.	
	1.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.	
	1.4 Dimensioning and placing text in drawing area	
	1.5 Sectioning and hatching	
	1.6 Inquiry for different parameters of drawing entity	
	1.7 Create layers within a drawing	
	1.8 Specifying Geometrical Dimensioning & Tolerancing (GD & T) parameters in drawing	
2	Detail and assembly drawing of the following using AUTOCAD	4 sheets
	2.1 Plummer Block	
	2.2 Wall Bracket	
	2.3 Stepped pulley, V-belt pulley	
	2.4 Flanged coupling	
	2.5 Machine tool Holder (Three views)	
	2.6 Screw jack or knuckle joint	
	2.7 Foot step bearing	
3	Isometric Drawing by CAD using Auto CAD	4 sheet
	User Co-ordinate System, Viewpoints, Viewports Elevation, World Coordinate System X/Y/Z Filter	
	Drawings of following on computer:	
	- Cone	
	- Cylinder	
	- Isometric view of objects	

Semester 4th



SCHOOL OF POLYTECHNIC
REFRIGERATION AND AIR CONDITIONING
(SPB15230401)

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

JUSTIFICATION

The diploma holders in 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

UNIT 1: Fundamentals of Refrigeration	12 periods
1.1 Introduction to refrigeration, air conditioning, necessity of refrigeration meaning of refrigerating effect, units of refrigeration, COP, difference between COP and efficiency, methods of refrigeration	
1.2 Refrigerants: Functions, classification of refrigerants, Desirable properties of refrigerant,	
1.3 Reversed carnot cycle and its representation on P-V and T-S diagram. Major application areas of refrigeration and air conditioning.	
UNIT 2: Vapour Compression System	08 Periods
2.1 Introduction, principle, function, parts and necessity of vapour compression system, T- S and p– h charts, dry, wet and superheated compression.	
2.2 Effect of sub cooling, super heating, mass flow rate, entropy, enthalpy, work done, Refrigerating effect and COP. actual vapour compression system	
UNIT 3: Air Refrigeration System	10 Periods
3.1 Introduction, advantages and disadvantages of air-refrigeration system over vapour compression system	
3.2 Bell – Collemann cycle, Boot strap system, calculation of mass flow rate, work done and COP	
3.3 Vapour Absorption System: Introduction, principle and working of simple absorption system	
UNIT 4: Refrigeration Equipment	08 Periods
4.1 Compressors- Function, various types of compressors	
4.2 Condensers - Function, various types of condensers	
4.3 Evaporators- Function, types of evaporators	
4.4 Expansion Valves - Function, various types such as capillary tube, thermostatic expansion valve, low side and high side float valves, application of various expansion valves	
UNIT 5: Air Conditioning	10 Periods
5.1 Psychrometry: Definition, importance, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT, sensible heat, latent heat, Total enthalpy of air, Psychrometric chart	
5.2 Sensible heating and cooling, Adiabatic cooling, Humidification and dehumidification, cooling and humidification, cooling and dehumidification, heating and humidification, heating and dehumidification, by pass factor	

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

RECOMMENDED BOOKS

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
3. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.
4. Refrigeration and Air Conditioning (Hindi & English) by Agrawal Anshul; Asian Publication, Meerut.
5. Refrigeration and Air Conditioning (Hindi & English)by Arpit Singh; JPNP,Meerut



SCHOOL OF POLYTECHNIC
HYDRAULICS AND PNEUMATICS

(SPB15230402)

L	T	P
4	0	0

JUSTIFICATION

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

UNIT 1: Introduction	12 Periods
1.1 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.	
1.2 Pressure and its Measurement: Concept of pressure (Atmospheric Pressure, gauge pressure, absolute pressure)	
1.3 Pressure measuring devices: piezo-meter tube manometers - simple U-tube, differential single column, inverted U-tube, micromanometer including simple problems, Bourdon pressure gauge, Diaphragm pressure gauge, dead weight pressure gauge	
UNIT 2: Flow of Fluids	12 Periods
2.1 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	
2.2 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.	
2.3 Flow through Pipes: Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; Chezy’s equation and Darcy’s equation of head loss (without proof), Reynold’s number and its effect on pipe friction; siphon, power developed. Water hammer, anchor block, syphon, surge tank (concept only).	
2.4 Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path	
UNIT 3: Water Turbines, Pumps and Hydraulics System	12 Periods
3.1 Concept of a turbine, types of turbines –impulse and reaction type (concept only), difference between them. Construction and working of pelton wheel, Francis turbine, Propeller and Kaplan turbines. Unit speed, unit power, unit discharge, specific speed of turbines, Cavitations.	
3.2 Concept of hydraulic pump, single acting reciprocating pump (construction and operation only), vane, screw and gear pumps, Construction, working and operation of centrifugal pump. Performance, efficiencies and specifications of a centrifugal pump, pitting, cavitation, priming.	
3.3 Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic press.	

UNIT 4: Introduction to Oil Power Hydraulics and Pneumatics**06 Periods**

- 4.1 Introduction to oil power hydraulic and pneumatic system, Statement of Pascal law and its applications, Industrial applications of oil power hydraulic and pneumatic system.
- 4.2 **Components of Hydraulic Systems:** Basic components of hydraulic system, function of each component in a hydraulic circuit, Oil reservoirs, couplings, motors and pumps – definition and functions of the parts, Filters- definition and purpose, classification, Seals and packing- classification of seals, sealing materials.

UNIT 5: Components of Pneumatic Systems**06 Periods**

- 5.1 **Basic components** – function of each component
- 5.2 **Air compressors** - Introduction
- 5.3 **Air cylinder** – types, function, single acting, double acting, rotating, non-rotating, piston type, diaphragm type, tandem cylinder, double ended cylinder, duplex cylinder.
- 5.4 Air filter, regulator and lubricator – their necessity in pneumatic circuit.

RECOMMENDED BOOKS

6. Fluid Mechanics by KL Kumar; S Chand and Co Ltd., Ram Nagar, New Delhi.
7. Hydraulics and Fluid Mechanics Machine by RS Khurmi; S. Chand & Co. Ltd., New Delhi.
8. Hydraulics and Pneumatics (Hindi & English) by Anshul Agrawal, Asian Publication
9. Fluid Mechanics by Dr AK Jain, Khanna Publishers, New Delhi.
10. Hydraulics and Pneumatics (Hindi & English) by J.K.Kapoor, Bharat Bharti Prakashan, Meerut



SCHOOL OF POLYTECHNIC
COMPUTER AIDED DESIGN & MANUFACTURING

(SPB15230403)

L	T	P
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JUSTIFICATION

Manufacturing of this century belongs to computerized equipment & machine tools to manufacture a variety of components with high quality, high precision & low cost at a faster rate. Computer Aided Designing, Computer Aided Manufacturing, & Flexible Manufacturing Systems-all are the part of Computer Integrated Manufacturing which help to achieve the desired goals in manufacturing. After studying the subject, the students will be able to know about these integrated techniques which help a manufacturer to achieve his goal with in stipulated time.

DETAILED CONTENTS

UNIT 1:	Introduction	12 Periods
1.1	Introduction to CAD/CAM/CIM, Advantages of CAD/CAM/CIM, Reasons for implementation of CAD/CAM, Steps in CAD	
1.2	Product Cycle, Automation-Principle, Need, Elements	
1.3	CAM: Definition, advantages, disadvantages, Steps involved in CAM operation, applications, Post processing - Converting the generated tool path in NC code depending on the system	
UNIT 2:	Viewing Objects in 3D Space & Surface / Solid Modelling Using CAD/CAM	10 Periods
2.1	Viewing the objects in different views, Concept of SW, SE, NE and Isometric Views, View Ports, Layout, changing from Model to Paper space Layout, Plotting the drawing	
2.2	Introduction to parametric and non-parametric surfaces, Concept of solid models, Solid Primitives- Box, cylinder, Cone, Sphere, Wedge and torus, Construction of solid using Region, Extrude and Revolved feature	
2.3	2D and 3D transformation: Translation, Scaling, rotation, mirror, zooming, panning.	
UNIT 3:	Flexible Manufacturing System	08 Periods
3.1	Introduction to FMS.	
3.2	Principles of flexibility, changes in manufacturing system - external changes and internal changes job flexibility, machine flexibility.	
3.3	Features of FMS – production equipment, support system, material handling system, computer control system, Advantages & limitations of FMS.	
UNIT 4:	Manufacturing Applications- Rapid Prototyping	06 Periods
4.1	3D printing, Fused deposition modelling, Laminated object manufacturing	
4.2	Selective laser sintering, Stereo lithography, Ball 3 to 2 particle manufacturing	
UNIT 5:	Robotics	06 Periods
5.1	Introduction to robot, Robot configuration, Robot motions	
5.2	Robot programming languages, Work cell, control and interlock, robot sensors, Robot applications	

RECOMMENDED BOOKS

5. CAD/CAM by Mikell Groover and Zimmers; Prentice Hall of India Pvt. Ltd., Delhi.
6. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
7. Introduction to Robotics by John J. Craig; Pearson Education Asia, Singapore.
8. Industrial Robot by Groover; Prentice Hall of India Pvt. Ltd., Delhi.
9. Robotics by Yorem Korem; McGraw Hill International. Book Co., New Delhi.
10. CAD/CAM – Theory and Practice by Zeid; Tata McGraw Hill Publishers, New Delhi.
11. Computer Aided Drawing by Jai Prakash, Sarthak Prakashan, Meerut
12. Computer Aided Drafting & Modelling (English & Hindi) by Md.Abbas/Pooja Yadav, Asian Publication, Mujaffarnagar



SCHOOL OF POLYTECHNIC
COMMUNICATION SKILLS H & E - II
(SPB15230404)

L T P
2 0 0

JUSTIFICATION

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

DETAILED CONTENTS

UNIT 1: Functional Grammar	08 Periods
1.1 Preposition	
1.2 Framing Questions	
1.3 Conjunctions	
1.4 Tenses	
UNIT 2: Reading	08 Periods
2.1 Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.	
UNIT 3: Writing Skill-1	08 Periods
3.1 Correspondence a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters. b) Official Letters- Letters to Government and other Offices	
UNIT 4: Writing Skill-2 & Report Writing	04 Periods
4.1 Memos, Circular, Office Orders	
4.2 Agenda & Minutes of Meeting, Report Writing	
UNIT 5 Hindi Speaking & Writing Practices	04 Periods
5.1 Business letter in hindi	
5.2 Report Writing in hindi	
5.3 Essays on famous Indian personalities	
5.4 Hindi Speaking	

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Professional Communication (English) by Chauhan, T.S, Nav Bharat
5. Communication Skill II (English) by Sharma, kavita



SCHOOL OF POLYTECHNIC

ENVIRONMENTAL STUDIES

(SPB15230405)

L T P
2 0 0

JUSTIFICATION

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

DETAILED CONTENTS

UNIT 1: Introduction	08 Periods
1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non-renewable.	
1.2 Air Pollution: Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.	
UNIT 2: Water & Noise Pollution	08 Periods
2.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O ₂ , BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.	
2.2 Noise Pollution: Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, and Different method of minimizes noise pollution.	
UNIT 3: Soil Pollution	06 Periods
3.1 Sources of soil pollution, Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste	
3.2 Effect of Solid waste	
3.3 Disposal of Solid Waste- Solid Waste Management	
UNIT 4: Environmental Legislation	08 Periods
4.1 Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986	
4.2 Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).	
UNIT 5: Impact of Energy Usage on Environment	06 Periods
5.1 Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Ecofriendly Material, Recycling of Material.	
5.2 Concept of Green Buildings.	

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
3. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
4. Environmental Studies by Shivdatt Upadhaya(Hindi & English),Bharat Bharti Prakashan,Meerut
5. Environmental Pollution & Control by M.K.Varshney, Asian Publication ,Mujaffarnagar



SCHOOL OF POLYTECHNIC

ENERGY CONSERVATION

(SPB15230406)

L T P
2 0 0

JUSTIFICATION

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

UNIT 1	Basics of Energy	12 Periods
1.1	Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators	
1.2	Global fuel reserve	
1.3	Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors),	
1.4	Impact of energy usage on climate	
1.5	Energy Conservation and EC Act 2001: Introduction to energy management, energy conservation, energy efficiency and its Needs,	
1.6	Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.	
1.7	Standards and Labelling. Concept of star rating and its importance, Types of product available for star rating	
UNIT 2	Electrical Supply System and Motors	10 Periods
2.1	Types of electrical supply system	
2.2	Single line diagram	
2.3	Losses in electrical power distribution system	
2.4	Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)	
2.5	Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers.	
2.6	Electric Motors: Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors	
2.7	Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting	
2.8	DG Systems: Introduction, Energy efficiency opportunities in DG systems,	

Loading estimation

UNIT-3 Energy Efficiency in Electrical Utilities

10 Periods

- 3.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps
- 3.2 Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.
- 3.3 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.
- 3.4 Energy Efficiency in Thermal Utilities Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)
- 3.5 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces
- 3.6 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers
- 3.7 Efficient Steam Utilization

UNIT 4 Energy Conservation Building Code (ECBC)

8 Periods

- 4.1 ECBC and its salient features
- 4.2 Tips for energy savings in buildings: New Buildings, Existing Buildings
- 4.3 Waste Heat Recovery and Co-Generation: Concept, classification and benefits of waste heat recovery

UNIT-5 General Energy Saving Tips Energy saving tips in:

8 Periods

- 5.1 Lighting, Room Air Conditioner ,Refrigerator , Water Heater , Computer, Fan, Heater, Blower and Washing Machine, Colour Television , Water Pump , Cooking ,Transport
- 5.2 Energy Audit: Types and methodology , Energy audit instruments , Energy auditing reporting format

RECOMMENDED BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015.
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015.
3. Energy Conservation (Hindi & English) by Vijay & Mittal, Asian Publication, Mujaffarnagar
4. Energy Conservation by Kumar & Kumar (Hindi & English), JPNP, Meerut



SCHOOL OF POLYTECHNIC
UNIVERSAL HUMAN VALUES

(SPB15230407)

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DETAILED CONTENTS

UNIT 1:	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	8 Periods
	1.1 Understanding the need, basic guidelines, content and process for Value Education	
	1.2 Self-Exploration-what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration	
	1.3 Continuous Happiness and Prosperity- A look at basic Human Aspirations	
	1.4 Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority	
	1.5 Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario	
	1.6 Method to fulfill the above human aspirations: understanding and living in harmony at various levels	
UNIT2:	Understanding Harmony in the Human Being - Harmony in Myself!	8 Periods
	2.1 Understanding human being as a co-existence of the sentient ‘I’ and the material the Body’	
	2.2 Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha	
	2.3 Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)	
	2.4 Understanding the characteristics and activities of ‘I’ and harmony in ‘I’	
UNIT3:	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	8 Periods
	3.1 Understanding Harmony in the family – the basic unit of human interaction	
	3.2 Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; a.Trust (Vishwas) and Respect (Samman) as the foundational values of relationship	
	3.3 Understanding the meaning of Vishwas; Difference between intention and competence	
	3.4 Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship	
	3.5 Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals	
	3.6 Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family! -Practice Exercises and Case Studies will be taken up in Practice Sessions.	
UNIT4:	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	8 Periods
	4.1 Understanding the harmony in the Nature	
	4.2 Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature	
	4.3 Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space	
	4.4 Holistic perception of harmony at all levels of existence-Practice Exercises and	

Case Studies will be taken up in Practice Sessions

UNIT5: Implications of the above Holistic Understanding of Harmony on 6 Periods Professional Ethics

- 5.1 Natural acceptance of human values
- 5.2 Definitiveness of Ethical Human Conduct
- 5.3 Basis for Humanistic Education, Humanistic Constitution and Humanistic universal Order
- Competence in professional ethics:
 - a) Ability to utilize the professional competence for augmenting universal human order.
 - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.
 - c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
- 5.4
- 5.5 Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - b) At the level of society: as mutually enriching institutions and organizations
- 5.6
- 5.7 To inculcate Human Values among Students: The Role of self ,Parents and Teachers
- Practice Exercises and Case Studies will be taken up in Practice Sessions.
- 5.8 Practical Session also Includes Different Yogic Exercises and Meditation Session

REFERENCE BOOKS

- 1. Value Education websites, <http://uhv.ac.in>, and <http://www.aktu.ac.in>
- 2. Story of Stuff, <http://www.storyofstuff.com>
- 3. Al Gore, an Inconvenient Truth, Paramount Classics, USA
- 4. Charlie Chaplin, Modern Times, United Artists, USA
- 5. IIT Delhi, Modern Technology—the Untold Story
- 6. Case study Hevade Bazar Movie



SCHOOL OF POLYTECHNIC
REFRIGERATION & AIR CONDITIONING LAB
(SPB15230451)

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JUSTIFICATION

The diploma holders in 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

S. No	Name of Practical
1	Demonstration of various refrigeration tools and equipment.
2	Practice in cutting, bending, flaring, swaging and brazing of tubes.
3	Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers.
4	Identify various parts of a refrigerator and window air conditioner.
5	To find COP of Refrigeration system
6	To measure air flow using anemometer.
7	To detect faults in a refrigerator/ air conditioner
8	Demonstration and working of window type air-conditioner.



SCHOOL OF POLYTECHNIC

HYDRAULIC & PNEUMATIC LAB

(SPB15230452)

L	T	P
0	0	2

JUSTIFICATION

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

S. No	Name of Practical
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- | | |
|----|--|
| 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. |



SCHOOL OF POLYTECHNIC

CAD & M LAB

(SPB15230453)

L	T	P
0	0	2

JUSTIFICATION

Manufacturing of this century belongs to computerized equipment & machine tools to manufacture a variety of components with high quality, high precision & low cost at a faster rate. Computer Aided Designing, Computer Aided Manufacturing, & Flexible Manufacturing Systems-all are the part of Computer Integrated Manufacturing which help to achieve the desired goals in manufacturing. After studying the subject, the students will be able to know about these integrated techniques which help a manufacturer to achieve his goal with in stipulated time.

DETAILED CONTENTS

S. No	Name of Practical
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|----|--|
| 1. | Performing 3D operations like Array, mirror, rotation, translation using AutoCAD. |
| 2. | CNC Programming for turning operation |
| 3. | CNC Programming for pocket milling |
| 4. | CNC Programming for profile milling |
| 5. | CNC Programming for facing and drilling |
| 6. | Designing of Simple machine components on AutoCAD Software |
| 7. | Designing of Crank shaft (Connecting Rod) on AutoCAD Software |
| 8. | Performing simple assembly operations like- nut, bolt, coupling etc. on AutoCAD Software |



SCHOOL OF POLYTECHNIC
COMMUNICATION SKILLS H & E -II LAB
(SPB15230454)

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JUSTIFICATION

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

DETAILED CONTENTS

- 1 Debate
- 2 Telephonic Conversation: general etiquette for making and receiving calls
- 3 Offering- Responding to offers.
- 4 Requesting – Responding to requests
- 5 Congratulating
- 6 Exploring sympathy and condolences
- 7 Asking Questions- Polite Responses
- 8 Apologizing, forgiving
- 9 Complaining
- 10 Warning
- 11 Asking and giving information
- 12 Getting and giving permission
- 13 Asking for and giving opinions

Semester 5th



SCHOOL OF POYTECHNIC

THEORY OF MACHINES

(SPB15230501)

L	T	P
3	0	0

JUSTIFICATION

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

UNIT 1: Simple Mechanisms	06 Periods
1.1 Introduction to link, kinematic pair, lower and higher pair, Kinematic chain, mechanism, Inversions.	
1.2 Different types of mechanisms (with examples)	
UNIT 2: Flywheel	08 Periods
2.1 Principle and applications of flywheel, Turning - moment diagram of flywheel for different engines.	
2.2 Fluctuation of speed and fluctuation of energy - Concept only, Coefficient of fluctuation of speed and coefficient of fluctuation of energy.	
UNIT 3: Dynamics of Machine & Balancing	12 Periods
3.1 Static and dynamic force analysis graphical and analytical approaches	
3.2 Gyroscopic action in machines.	
3.3 Concept of balancing, Introduction to balancing of rotating masses.	
UNIT 4: Power Transmission	12 Periods
4.1 Introduction to Belt and Rope drives, Types of belt drives and types of pulleys	
4.2 Concept of velocity ratio, slip and creep; crowning of pulleys (simple numerical), Flat and V belt drive: Ratio of driving tensions, power transmitted, centrifugal tension, and condition for maximum horse power (simple numerical).	
4.3 Different types of chains and their terminology, Gear terminology, types of gears and their applications; simple and compound gear trains; power transmitted by simple spur gear.	
UNIT 5: Cam and follower & Vibrations	10 Periods
5.1 Introduction, types of Cam and follower, construction of Cam profile for constant velocity motion, constant acceleration motion and simple harmonic motion.	
5.3 Types-longitudinal, transverse and torsional vibrations (simple numerical).	
5.4 Dampening of vibrations, Causes of vibrations in machines, their harmful effects and remedies.	

RECOMMENDED BOOKS

1. Theory of Machine by B.S Ubhi; S.K. Kataria and Sons, New Delhi.
2. Theory of machine by J.K Kapoor, Bharat Bharti Prakashan, Meerut
3. Theory of Machine by R.S.Khurmi, S Chand



SCHOOL OF POLYTECHNIC

MACHINE DESIGN

(SPB15230502)

L	T	P
3	0	0

JUSTIFICATION

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

UNIT 1:	Introduction	10 Periods
1.1	Design – Definition, Type of design, necessity of design, Comparison of designed and undersigned work, Design procedure, Characteristics of a good designer	
1.2	Design terminology: , 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), Selection of materials, criteria of material selection, Ergonomics and Aesthetic Consideration in design, Ergonomics of design-man-machine relationship. Design of equipment for control, environment and safety. Aesthetic consideration regarding shape, size, color and surface finish.	
UNIT 2:	Design Failure & Design of Joints	10 Periods
2.1	Theories of failure, Classification of loads, Design under tensile, compressive and tensional loads.	
2.2	Types of joints - Temporary and permanent joints, utility of various joints	
2.3	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.	
2.4	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.	
UNIT 3:	Design of Shaft & Design of Key	10 Periods
3.1	Type of shaft, shaft materials, Type of loading on shaft, standard sizes of shaft available, Shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of :Strength criterion, Rigidity criterion	
3.2	Determination of shaft diameter (hollow and solid shaft) subjected to bending.	
3.3	Determination of shaft diameter (hollow and solid shaft) subjected to combined torsion and bending.	
3.4	Types of key, materials of key, functions of key, Failure of key (by Shearing and Crushing).	
3.5	Design of key (Determination of key dimension)	

3.6	Effect of keyway on shaft strength. (Figures and problems).	
UNIT 4:	Design of Flange Coupling	8 Periods
4.1	Necessity of a coupling, advantages of a coupling, types of couplings,	
4.2	Design of muff coupling, design of flange coupling. (Both protected type and unprotected type).	
UNIT 5:	Design of Screwed Joints	10 Periods
5.1	Introduction, Advantages and Disadvantages of screw joints, location of screw joints.	
5.2	Important terms used in screw threads, designation of screw threads	
5.3	Initial stresses due to screw up forces, stresses due to combined forces	
5.4	Design of power screws (Press, screw jack, screw clamp)	

RECOMMENDED BOOKS

1. Machine Design by R.S. Khurmi and JK Gupta, Eurasia Publishing House (Pvt.) Limited, New Delhi.
2. Machine Design by V.B.Bhandari, Tata McGraw Hill, New Delhi.
3. Engineering Design by George Dieter; Tata McGraw Hill Publishers, New Delhi.
4. Mechanical Engineering Design by Joseph Edward Shigley; McGraw Hill, Delhi.
5. Machine Design (Hindi & English) by Anshul Agarawal, Asian Publication, Mujaffarnagar
6. Design Data Handbook by D.P. Mandali, SK Kataria and Sons, Delhi.
7. Machine Design (Hindi & English) by Anurag Kumar, JPNN, Meerut



SCHOOL OF POLYTECHNIC
PRODUCTION TECHNOLOGY

(SPB15230503)

L T P
3 0 0

JUSTIFICATION

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, tools, jigs and fixtures is required to be imparted.

DETAILED CONTENTS

UNIT 1: Lathe	10 Periods
1.1 Principle of turning, Description and function of various parts of a lathe, Classification and specification of various types of lathe, Drives and transmission.	
1.2 Work holding devices, Lathe tools: Parameters/Nomenclature and applications, Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.	
1.3 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time. Speed ratio, preferred numbers of speed selection. 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.	
1.4 Brief description of capstan and turret lathe, comparison of capstan/Turret lathe, work holding and tool guiding devices in capstan and turret lathe.	
UNIT 2: Milling, Drilling	10 Periods
2.1 Specification and working principle of milling machine.	
2.2 Classification, brief description and applications of milling machines.	
2.3 Details of column and knee type milling machine, Milling machine accessories and attachment – Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment shover chuck and rotary table.	
2.4 Milling methods - up milling and down milling.	
2.5 Identification of different milling cutters and work mandrels.	
2.6 Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck’s statement, Clausius statement, Perpetual motion Machine of first kind, second kind, Carnot engine.	
2.7 Principle of drilling, Classification of drilling machines and their description.	
2.8 Various operations performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.	
2.9 Types of drills and their features, nomenclature of a drill, Drill holding devices. Types of reamers.	
2.10 Speeds and feeds during drilling, impact of these parameters on drilling, machining time.	
UNIT 3: Boring, Shaping and Planning	12 Periods
3.1 Principle of boring, Classification of boring machines and their brief description.	
3.2 Specification of boring machines, Boring tools, boring bars and boring heads, Description of jig boring machine.	

- 3.3 Working principle of shaper and planer, Type of shapers
- 3.4 Type of planers, Quick return mechanism applied to shaper and planer machine.
- 3.5 Specification of shaper and planer, Speeds and feeds in above processes

UNIT 4: Broaching

6 Periods

- 4.1 Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.

UNIT 5: Grinding

10 Periods

- 5.1 Purpose of grinding.
- 5.2 Selection of grinding wheel.
- 5.3 Various elements of grinding wheel – Abrasive, Grade, structure, Bond
- 5.4 Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.
- 5.5 Truing, dressing, balancing and mounting of wheel, Grinding methods – Surface grinding, cylindrical grinding and centre less grinding.
- 5.6 Grinding machine – Cylindrical grinder, surface grinder, internal grinder, centre less grinder, tool and cutter grinder.

RECOMMENDED BOOKS

1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi.
2. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
3. A Text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi.
4. Production Technology by HMT; Tata McGraw Publisher, New Delhi
5. Production Technology (Hindi & English) by Dr. Vijay Mittal, Asian Publication, Mujaffarnagar
6. Production Technology (Hindi) by Shivdatt Upadhyaya, Bharat Bharti Prakashan, Meerut



SCHOOL OF POLYTECHNIC
PRODUCTION MANAGEMENT
(SPB15230504)

L T P
2 0 0

JUSTIFICATION

Diploma holder 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

UNIT 1: Production Planning and Control (PPC)	10 Periods
1.1 Introduction, Objectives and factors affecting PPC	
1.2 Functions (Elements) of PPC - Planning, Routing, Loading, scheduling, dispatching, progressing and inspection	
1.3 Types of production system - Flow or continuous production, Intermittent Production	
1.4 Production Control - Objectives and fields of production control, Production control system	
1.5 Break even analysis and Gantt chart	
UNIT 2: Inspection and Quality Control	12 Periods
2.1 Inspection – Introduction, Need and Importance, Types of Inspection, Role of operator and inspector in inspection	
2.2 Quality Control: Introduction, Need and Importance. Factors affecting product quality.	
2.3 Quality Assurance	
UNIT 3: Cost Estimation	10 Periods
3.1 Definition and functions of cost estimation, estimation procedure, elements of cost, ladder of costs (simple numerical).	
3.2 Overhead expenses and its distribution, Depreciation- Concept and Definition, Methods of calculating depreciation- Straight line method, Diminishing Balance Method, Sinking fund method (Numerical problems).	
3.3 Cost control- definition and objectives, Capital cost control (planning and scheduling), operating cost control.	
3.4 Cost estimation for machining processes like turning, drilling, and milling. Cost estimation of forming processes like forging, pattern making, and casting.	
UNIT 4: Repair and Maintenance	8 Periods
4.1 Objectives and importance of Maintenance.	
4.2 Different types of maintenance- Corrective or Breakdown maintenance, Scheduled Maintenance, Preventive Maintenance, Predictive Maintenance.	
4.3 Nature of maintenance problems.	
4.4 Range of maintenance problems.	
UNIT 5: Labour Legislation and Pollution Control Acts	6 Periods

- 5.1 Factory Act 1948.
- 5.2 Workmen's compensation Act 1923.
- 5.3 Apprentices Act 1961.
- 5.4 Water Pollution Control Act 1974 and 1981.
- 5.5 Air Pollution Control Act 1981.
- 5.6 Environmental protection Act 1986.
- 5.7 PF Act, Employee's State Insurance (ESI) Act
- 5.8 Pollution control provision in Motor Vehicle Act.

RECOMMENDED BOOKS

1. Production Management by C.L. Mahajan; Satya Parkashan Company Limited, New Delhi.
2. Mechanical Costing, Estimation and Project Planning by CK Singh; Standard Publishers, New Delhi.
3. Industrial Engineering and Management by T.R. Banga and SC Sharma; Khanna Publishers, Delhi.
4. Industrial Engineering and Management by O.P. Khanna, Dhanpat Rai
5. Industrial Engg. & Safety (Hindi & English) by Madhvendra Raj, Sarthak Publication, Meerut



SCHOOL OF POLYTECHNIC
AUTOMOBILE ENGINEERING
(SPB15230505)

L **T** **P**
3 **0** **0**

JUSTIFICATION

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

UNIT 1: Introduction	06 Periods
1.1 Automobile and its development, Various types of automobiles manufactured in India.	
1.2 Classification of automobiles	
1.3 Layout of chassis.	
1.4 Types of drives-front wheel, rear wheel, four wheel.	
1.5 Concept of double overhead cam, single overhead cam, Twin cam 16 Valve technology in 4 cylinder engine.	
UNIT2: Transmission System	12 Periods
2.1 Clutch - Function, Constructional details of single plate and multi plate friction clutches, Centrifugal and semi centrifugal clutch, Cone clutch, Hydraulic clutch	
2.2 Gear Box - Function, Working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive, Introduction to Automated Manual Transmission, Automatic transmission and Continuously Variable Transmission	
2.3 Propeller shaft and rear axle - Function, Universal joint, Differential, Different types of rear axles and rear axle drives.	
2.4 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, Factors affecting tyre life.	
UNIT3: Steering System & Braking system	12 Periods
3.1 Function and principle, Ackerman and Davis steering gears, Types of steering gears -worm and wheel, rack and pinion, Power steering-Hydraulic and Electrical.	
3.2 Constructional details and working of mechanical, hydraulic, air and vacuum brake, Relative merits and demerits. Details of master cylinder, wheel cylinder, Concept of brake drum, brake lining/pad and Brake adjustment, Introduction to Anti-lock Brake System and its working.	
UNIT4: Suspension System & Battery	10 Periods
4.1 Function and types of Coil spring, leaf spring, Air suspension, Shock absorber – Function, construction and working of Telescopic type.	
4.2 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. Batteries for electric and hybrid vehicles.

UNIT5: Exhaust Emissions

6 Periods

- 5.1 Types and use of catalytic converters, selective catalytic reduction methods for emission control, emission norm standards i.e. Bharat norms.

RECOMMENDED BOOKS

1. Automotive Mechanics, by W.Crouse and Anglin; Tata McGraw Hill, Delhi.
2. Automobile Engineering by G. S. Aulakh; Eagle Prakashan, Jalandhar
3. Automobile Engineering (Hindi & English) by P.S.Kushwaha; Bharat Bharti Publication, Meerut
4. Automobile Engineering (Hindi & English) by Er. Arpit Gupta, JPNN, Meerut
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.



SCHOOL OF POLYTECHNIC
INDUSTRIAL MANAGEMENT AND
ENTREPRENEURSHIP DEVELOPMENT
(SPB15230506)

L **T** **P**
3 **0** **0**

JUSTIFICATION

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

UNIT 1: Introduction	04 Periods
1.1 Concept /Meaning and its need	
1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship	
1.3 Sole proprietorship and partnership forms and other forms of business organizations through the concept of a set of independent vectors, Consistency of equations.	
1.4 Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organization: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks	
UNIT 2: Market Survey and Opportunity Identification/Ideation	04 Periods
2.1 Scanning of the business environment	
2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities	
2.3 Types and conduct of market survey	
2.4 Assessment of demand and supply in potential areas of growth	
2.5 Identifying business opportunity	
2.6 Considerations in product selection	
2.7 Converting an idea into a business opportunity	
UNIT 3: Project report Preparation and basic of Accounting and Finance	12 Periods
3.1 Preliminary project report	
3.2 Detailed project report including technical, economic and market feasibility	
3.3 Common errors in project report preparations	
3.4 Exercises on preparation of project report, Sample project report	
3.5 Basic of Accounting: Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company	
3.6 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization	
UNIT 4: Introduction to Management, Leadership and Motivation	12 Periods
4.1 Definitions and importance of management	
4.2 Functions of management: Importance and process of planning, organizing, staffing, directing and controlling	
4.3 Principles of management (Henri Fayol, F.W. Taylor).	
4.4 Concept and structure of an organization	

- 4.5 Types of industrial organizations and their advantages
- 4.6 Line organization, staff organization
- 4.7 Line and staff organization, Functional Organization
- 4.8 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs. leader, Types of leadership, Case studies of great leaders
- 4.9 Motivation: Definition and characteristics, Importance of self-motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

UNIT 5: Management Scope in Different Areas, Work culture

16 Periods

- 5.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods.
- 5.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ
- 5.3 Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion.
- 5.4 Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST
- 5.5 Introduction and importance of Healthy Work Culture in organization: Components of Culture, Importance of attitude, values and behavior, Behavioral Science – Individual and group behavior.
- 5.6 Professional ethics – Concept and need of Professional Ethics and human values.

RECOMMENDED BOOKS

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1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
 2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
 3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
 4. Industrial Management & entrepreneurship development (Hindi & English) by Shivdatt Upadhyay, BBP, Meerut
 5. Industrial Management by M. Maharajan, Dhanpat Rai, Co, New Delhi
 6. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.



SCHOOL OF POLYTECHNIC
PRODUCTION TECHNOLOGY LAB
(SPB15230553)

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

JUSTIFICATION

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, tools, jigs and fixtures is required to be imparted.

LIST OF PRACTICAL'S

1 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.

2 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

3 MACHINE SHOP

- Job 1 Prepare a V-Block up to 0.5 mm accuracy on shaper machine
- Job 2 Exercise on key way cutting and spline cutting on shaper machine.
- Job 3 Produce a rectangular block using a milling machine with a side and face cutter
- Job 4 Prepare a slot on one face using milling machine

4 ADVANCE TURNING SHOP

- Job 1 Exercise of boring with the help of boring bar
- Job 2 Exercises on
- Job 3 Exercises on internal threading on lathe machine

5 FORGING SHOP/FITTING SHOP/SHEET METAL SHOP

- Job 1 Preparation of single ended spanner by hand, machine forging
- Job 2 Demonstration of grinding process on lathe machine and grinding a job on a lathe machine
- Job 3 Preparation of utility item out of G.I. sheet
- Job 4 Preparation of drilling jig

1.



SCHOOL OF POLYTECHNIC
PRODUCTION MANAGEMENT LAB
(SPB15230554)

L	T	P
0	0	2

JUSTIFICATION

Diploma holder 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.

LIST OF PRACTICAL'S

- 1 Prepare a flow diagram
- 2 Prepare a Gantt chart
- 3 Draw X, R, p and c charts
- 4 Estimate the cost of turning
- 5 Estimate the cost of drilling
- 6 Prepare maintenance schedule

1.



SCHOOL OF POLYTECHNIC
AUTOMOBILE ENGINEERING LAB
(SPB15230555)

L	T	P
0	0	2

JUSTIFICATION

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.

LIST OF PRACTICAL'S

- 1 Fault and their remedies in Battery Ignition system.
- 2 Adjustment of Head Light Beam, wiper and Indicators.
Dismantling and inspection of (i) AC Pump (ii) SU Pump
- 3 Dismantle (i) rear axle (ii) differential and find out the gear ratio of crown wheel & driven sun gear and planet pinion.
- 4 Fault finding practices on an automobile - four wheelers (petrol/ diesel vehicles).
- 5 Servicing/Tuning of a 2 wheeler/4 wheeler.
- 6 Servicing of hydraulic brakes :
 - a) adjustment of brakes
 - b) bleeding of brakes
- 7 Tuning of an automobile engine.
- 8 Testing and Charging of an automobile battery and measuring cell voltage and specific gravity of electrolyte.
- 9 Changing of wheels and inflation of tyres, balancing of wheels.
- 10 Measuring spark gap, valve clearance and ring clearance; carrying out cleaning Operations for adjustment.



SCHOOL OF POLYTECHNIC INDUSTRIAL TRAINING/SUMMER INTERNSHIP

(SPB15230560)

L	T	P
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It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organized during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details. 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) Presentation and Viva 15%
- d) Industrial training report 55%

Semester 6th



SCHOOL OF POLYTECHNIC INDUSTRIAL ENGINEERING

(SPB15230601)

L **T** **P**
3 **0** **0**

JUSTIFICATION

A diploma holder in this course will have to conduct time and motion study to improve the methods/system. For this, knowledge and related skills in method study and work measurement are essential. Knowledge of industrial safety is also required.

DETAILED CONTENT

UNIT 1: Productivity	8 Periods
1.1 Introduction to productivity, factors affecting productivity, practical measurement of productivity, difference between production and productivity, causes of low productivity and methods to improve productivity, contribution of standardization in improving productivity.	
UNIT 2: Work Study, Method Study	12 Periods
2.1 Definition and scope of work study; factors for selection of work study job, uses and limitations of work study, Inter-relation between method study and work measurement; Human aspects of work study; Role of work study in improving productivity.	
2.2 Definition, Objectives and procedure for Method study analysis; Information collection and recording techniques through various diagrams.	
UNIT 3: Motion Analysis, Work Measurement	12 Periods
3.1 Principles of Motion analysis; Therbligs and SIMO charts; Normal work area (Principle of motion economy), design and arrangement of work place. Ergonomics, design of tools and equipments.	
3.2 Objectives; work measurement techniques, stop watch time study; principle, equipment used and procedure; systems of performance rating; standard elements of time, calculation of basic times; various allowances; guide for rest allowance in Indian conditions, calculation of standard time, work sampling, standard data and its usage. Work sampling.	
UNIT 4: Wages and Incentive Schemes, Stores Management	8 Periods
4.1 Introduction to wages, Wage payment for direct and indirect labour, wage payment plans and incentives, various incentive plans, incentives for indirect labour.	
4.2 Different Layout and structures of stores, Inventory control, calculation of EOQ, Bin cards and various forms required in stores for documentation. Purchase procedures.	
UNIT 5: Industrial Safety	8 Periods
5.1 Accident- causes, types, results and control.	
5.2 Mechanical and electrical hazards- types, causes and preventive steps/procedure.	
5.3 Describe salient points of Factories Act 1948 for health and safety- wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels etc.	
5.4 Fire prevention and firefighting, equipment and methods.	

RECOMMENDED BOOKS

1. Work Study and Ergonomics by S Dalela and Sourabh
2. Industrial Engineering and Management by O.P. Khanna, Dhanpat Rai and Sons, Delhi.
3. Industrial Engineering and Management by M. Mahajan; Dhanpat Rai and Sons, New Delhi.
4. Industrial Engg. & Safety (Hindi & English) by Madhvendra Raj, Sarthak Prakashan, Meerut
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.



SCHOOL OF POLYTECHNIC
METROLOGY AND MEASURING INSTRUMENTS

(SPB15230602)

L	T	P
4	0	0

JUSTIFICATION

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 CONTENT

UNIT 1: Introduction		08 Periods
1.1	Definition of metrology	
1.2	Standard of measurement	
1.3	Types of Errors - Controllable and random errors	
1.4	Precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement, interchangeability.	
1.5	Standardization and standardizing organizations	
UNIT 2: Linear and Angular Measurement		12 Periods
2.1	Construction features and use of instruments for non-precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block.	
2.2	Construction features and use of instruments for precision measurements: vernier calipers, vernier height and depth gauges, micrometers.	
2.3	Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges.	
2.4	Cylinder bore gauges, feeler and wire gauges. Checking flatness, roundness and squareness.	
2.5	Comparators – Characteristics, uses, working principles of different types of Comparators: mechanical, electrical, electronics and pneumatic.	
2.6	Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, and clinometer, angle dekker. Optical instruments for angular measurement, auto collimator.	
UNIT 3: Measurement of Surface Finish, Limits, Fits and Tolerance		12 Periods
3.1	Terminology of surface roughness. Concept of primary texture and secondary texture.	
3.2	Factors affecting surface finish, CLA, RMS and RA value.	
3.3	Principle and operation of stylus probe instruments. Tomlinson surface meter and Taylor surface talysurf.	
3.4	Limits, Fits and Tolerance.	
UNIT 4: Measurements of Screw threads and Gauges,		8 Periods
4.1	Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.	
4.2	Measurements of gears (spur) – Measurement of tooth thickness, pitch, Gear Ball tester, Lead and Profile Testers.	
4.3	Profile projector, Coordinate Measuring Machine (CMM), Tool maker's	

microscope.

UNIT 5: Instrumentation

8 Periods

- 5.1 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.
- 5.2 Strain gauge – use of strain gauge and load cells.
- 5.3 Various types of temperature measuring instruments such as thermometers, Thermistor, Bimetallic strip, Pyrometers.

RECOMMENDED BOOKS

1. Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
2. A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi.
3. Metrology and measuring Instruments (Hindi & English) by P.S.Kushwaha, BBP, Meerut
4. Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.
6. Metrology and measuring Instruments (Hindi & English) by Jain, Bhatnagar, NBP, Meerut



SCHOOL OF POLYTECHNIC CNC MACHINES AND AUTOMATION

(SPB15230603)

L	T	P
4	0	0

JUSTIFICATION

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 CONTENT

UNIT 1:	Introduction	06 Periods
1.1	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.	
UNIT 2:	Constructional details and Tooling, Part Programming	12 Periods
2.1	Design features, specification Chart of CNC machines, use of slide ways, balls, rollers and coatings, motor and lead screw, 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.	
2.2	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.	
UNIT 3:	System Devices, Problems in CNC Machines	12 Periods
3.1	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.	
3.2	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.	
UNIT 4:	Automation and NC system	08 Periods
4.1	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.	
UNIT 5:	CNC operations involved in Turning and Milling	10 Periods
5.1	Introduction to operations involved in turning machines- Facing OD and ID Rough cut, Finish cut, Taper turning, Drilling, Threading, Grooving and cut-off (parting).	
5.2	Introduction to operations involved in Milling-contouring, pocketing, Drilling, Facing, Circular tools paths.	
5.3	Different terms like clearance, Retract, Feed plane, Depth of cut, lead in, lead	

out.

5.4 Simple programmes in Milling and Turning involving different operations.

RECOMMENDED BOOKS

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
3. CNC Machine by Bharaj; Satya Publications, New Delhi.
4. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE,NITTR, Chandigarh.
5. CNC Machine & Automation (Hindi & English)by Arpit Singh,JPNP,Meerut
6. by Bharaj; Satya Publications, New Delhi



SCHOOL OF POLYTECHNIC

TOOL ENGINEERING

(SPB15230604)

L	T	P
3	0	0

JUSTIFICATION

A diploma holder should have complete knowledge of basic tools, their materials and their optimal utilization. This subject imparts skill and awareness of quality production in minimum time by using jigs and fixtures.

DETAILED CONTENT

UNIT 1: Cutting Tools	12 Periods
1.1 Mechanical property and uses of high-speed steel, stellite, cemented carbide, ceramics diamond, study of commercially available cutting tools. Tool geometry of single point cutting tools, multipoint cutting tools, reamer, drill, milling cutter, throw-away inserts, chip breaker, tool and cutter maintenance, regrinding and lapping of tools.	
UNIT 2: Location and Clamping	12 Periods
2.1 Principles of location, 3-2-1 principle, Location with previous machined hole, different locating devices, V-location, conical locations. Purpose of Clamping elements, types of clamps.	
UNIT 3: Jigs and Fixtures	12 Periods
3.1 Importance and use of jigs and fixture, fundamental principles of jigs and fixtures design. Types of Jigs - Drilling jigs, bushes, template jig, plate jig, channel jig, leaf jig. Types of drilling jigs- template jig, channel jig, latch jig, quick acting jig, indexing jig, and box jig.	
3.2 Need for fixtures, types of fixtures-simple fixture, milling fixture, welding fixture, turning fixture, assembly fixture & inspection fixture. Advantages of jigs and fixtures, Fixture for milling, turning, welding, grinding	
UNIT 4: Cutting Tools and Cutting Materials	6 Periods
4.1 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	
4.2 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.	
UNIT 5: Cutting Fluids and Lubricants	6 Periods
5.1 Function of cutting fluid, Types of cutting fluids, Difference between cutting fluid and lubricant, Selection of cutting fluids for different materials and operations,	
5.2 Common methods of lubrication of machine tools.	

RECOMMENDED BOOKS

1. Production Engineering by P.C. Sharma; S. Chand & Company Ltd., Delhi.
2. Tool Design by Donaldson and Lecain; Tata McGraw Hill Company, New Delhi
3. Machine tool & maintenance (Hindi & English) by J.K Kapoor, BBP, Meerut



SCHOOL OF POLYTECHNIC
INDUSTRIAL ENGINEERING LAB
(SPB15230651)

L	T	P
0	0	2

JUSTIFICATION

A diploma holder in this course will have to conduct time and motion study to improve the methods/system. For this, knowledge and related skills in method study and work measurement are essential.

LIST OF PRACTICAL'S

- 1 Stop watch time study on any machine like lathe, drilling machine or milling machine.
- 2 Preparation of flow process chart.
Determination of standard time for assembly of electrical switch.
- 3 Preparation of SIMO chart.
- 4 Preparation of flow diagram.
- 5 Preventive measure in case of electrocution.
- 6 Preventive measures in case of snake/poisonous creature sitting.
- 7 Use of first aid in case of minor accidents.
- 8 Use of five extenuates/five drill.



SCHOOL OF POLYTECHNIC
METROLOGY & MEASURING INSTRUMENTS LAB
(SPB15230652)

L T P
0 0 2

JUSTIFICATION

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.

LIST OF PRACTICAL'S

- 1 Internal and external measurements with vernier calliper and micrometer.
- 2 Measurement of linear dimensions with height gauge and depth gauge.
- 3 Measurement of flatness, concentricity with dial indicator.
- 4 Use of feeler gauge, wire gauge, radius gauge and fillet gauges for checking of standard parameters.
- 5 Use of plain plug and ring gauge, taper plug and ring gauge, thread plug and ring gauge and snap gauges.
Measurement of Angle using;
- 6
 - i) Cylindrical rollers and spherical balls and slip gauges
 - ii) Bevel protector
 - iii) Sine Bar/Sine Table, Slip Gauges, Height Gauge and dial indicator.
 - iv) Angle deckor.
- 7 Measurement of thread parameters by using tool maker's microscope.
- 8 Measurement of cylindrical bore using cylinder bore gauge for bore diameter, ovality and taper
- 9 Measurement of surface roughness using surface roughness tester.
- 10 . Measurement of a profile using profile projector.
- 11 Study and use of Auto-Collimator.
- 12 Determination of temperature of thermocouple, pyrometer, Infrared thermometer.



SCHOOL OF POLYTECHNIC
CNC MACHINES & AUTOMATION LAB
(SPB15230653)

L	T	P
0	0	2

JUSTIFICATION

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.

LIST OF PRACTICAL'S

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



SCHOOL OF POLYTECHNIC

PROJECT WORK

(SPB15230663)

L	T	P
0	0	4

JUSTIFICATION

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred. This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

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

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

NOTE: Each student has to take one project individually and one to be shared with a group of four-five students depending upon cost and time involved. There is no binding to take up the above projects as it is only a suggestive list of projects.