TECHNICAL EDUCATION DEPARTMENT (DIPLOMA SECTOR) UTTAR PRADESH

Three Year (Six Semesters) Diploma Course In

TOOL AND DIE UNDER MECHANICAL ENGINEEERING

Semester System

Effective From Session: 2025-26

Prepared by:

MSME TECHNOLOGY CENTRE KANPUR

CORRECTED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 04.11.2025

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PREFACE

An important issue generally debated amongst the planners and educator's world over is how technical education can contribute to sustainable development of the societies struggling hardtop come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of 42 diploma Programmes as per the needs of the industry and making them NEP-2020/AICTE compliant, are laudable. In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma Programmes. The curricula for diploma Programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma Programme. The real success of the diploma Programme depends upon its effective implementation. However, best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula. It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Director
Institute of Research Development & Training

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1. Sh. Narendra Kumar Bhushan, IAS Additional Chief Secretary, Technical Education Govt. of U.P. for his exemplary vision & approach .

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3. Sh. F.R. Khan, Director, I.R.D.T., Kanpur for entrusting this project of Curriculum revision.

4. All the participants from industry/field organizations, engineering colleges, polytechnics, and other technical institutions for their professional inputs during curriculum workshops.

5. Faculty /Subject Experts from U.P. Government polytechnics.

CDC Officer
IRDT Kanpur

1. Silent Features of Diploma Programmes in Tool and Die Under Mechanical Engineering

1)	Duration of the Programmes	:	Three Years (Six Semesters)
2)	Entry Qualification	:	Matriculation or equivalent qualification.
3)	Intake	:	60 seats (As per prescribed by the BTE)
4)	Pattern of the Programmes	:	Semester Pattern

5) Student Centered Activities:

A provision of Student-Centered Activities for overall personality development of students. Such activities will comprise of co- curricular activities such as expert lectures, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits and other cultural activities etc.

6) Project work:

A project work has been included in the curriculum to enable the student get familiarize with the practice and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

7) Industrial Training:

Six weeks of industrial training is included during VI semester during summer vacation Internal Assessment out of 50 marks and external assessment out of another 50 marks will be added in 6th semester result. Total marks allotted to industrial training will be 100.

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2- STUDY AND EVALUATION SCHEME FOR TOOL AND DIE UNDER MECHANICAL ENGINEERING

FIRST SEMESTER

S. No	SUBJECTS	STUDY SCHEME Periods/Week		Credit (C) (L + P) = C	Marks in Evaluation Scheme								
					Internal Assessment			External Assessment					Total Marks of Int. & Ext.
		L	P		Th	Pr	Total	Th	Hrs.	Pr	Hrs.	Total	
1.1	English and Communication Skills	2	2	3	40	60	**100**	60	3	40	3	**100**	**200**
1.2	Applied Mathematics-I	3	-	3	40	-	**40**	60	3	-	-	**60**	**100**
1.3	Physics-I	2	2	3	40	60	**100**	60	3	40	3	**100**	**200**
1.4	Engineering Drawing-I	-	4	2	-	40	**40**	60	3	-	-	**60**	**100**
1.5	Workshop Technology – I (Fitting & Measuring Instruments)	2	-	2	40	-	**40**	60	3	-	-	**60**	**100**
1.6	Basic Chemistry	2	2	3	40	60	**100**	60	3	40	3	**100**	**200**
1.7	General Workshop Practice-I (Fitting)	-	8	4	-	120	**120**	-	-	80	3	**80**	**200**
# Student Centered Activities (SCA)		-	7	-	-	50	**50**	-	-	-	-	-	**50**
Total		**11**	**25**	**20**	**200**	**390**	**590**	**360**	**-**	**200**	**-**	**560**	**1150**

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

Note -

1) Each period will be 60 minutes' duration.
2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.

STUDY AND EVALUATION SCHEME FOR TOOL AND DIE UNDER MECHANICAL ENGINEERING BRANCH

SECOND SEMESTER

S. No	SUBJECTS	STUDY SCHEME Periods/Week		Credit (C) (L + P) = C	Marks in Evaluation Scheme								
					Internal Assessment			External Assessment					Total Marks of Int. & Ext.
		L	P		Th	Pr	Total	Th	Hrs.	Pr	Hrs.	Total	
2.1	Applied Mathematics-II	3	-	3	40	-	**40**	60	3	-	-	**60**	**100**
2.2	Physics-II	2	2	3	40	60	**100**	60	3	40	3	**100**	**200**
2.3	Engineering Drawing - II	-	4	2	-	40	**40**	60	3	-	-	**60**	**100**
2.4	Material Science	2	-	2	40	-	**40**	60	3	-	-	**60**	**100**
2.5	Basics of Information Technology	1	2	2	40	60	**100**	60	3	40	3	**100**	**200**
2.6	Metrology & Quality Control	2	2	3	40	60	**100**	60	3	40	3	**100**	**200**
2.7	General Workshop Practice-II (Turning)	2	8	5	40	60	**100**	60	3	40	3	100	**200**
# Student Centered Activities (SCA)		-	6	-	-	50	**50**	-	-	-	-	-	**50**
Total		**12**	**24**	**20**	**240**	**330**	**570**	**420**		**160**		**580**	**1150**

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

Note -

1) Each period will be 60 minutes' duration.
2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.

1.1 ENGLISH AND COMMUNICATION SKILLS

L	P
2	2

RATIONALE

Communication Skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

1. Develop listening skills for enhancing communications.
2. Develop speaking skills with a focus on correct pronunciation and fluency.
3. Introduce the need for personality development - Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc., for that purpose group discussion extempore and other activities should be conducted during lab classes.

DETAILED CONTENTS

Unit -1 Communication: Theory and Practice

1.1 Basics of Communication, Definition Process of Communication
1.2 Types of communication (formal and informal, verbal and non-verbal), 7 C's of Communication
1.3 Barriers to communication and ways to overcome them
1.4 Tools or devices of Communication

Unit - 2 Soft Skills for Professional Excellence

2.1 Introduction to Soft skills and hard skills
2.2 Importance of soft skills
2.3 Applying soft skills across cultures

Unit: 3 Professional Writing

CV Writing, Covering Letter, Resume, Notices, Precis -Writing, Official Letters (Memo, Circular, Office Orders, Agenda, Minutes of Meeting, Report Wring, E-mail Drafting)

Unit: 4 Vocabulary and Grammar

- Sentence and its Types
- Parts of Speech
- Tenses
- Active and Passive Voice
- Punctuation
- One Word Substitution, Idioms and Phrases

LIST OF PRACTICALS

Unit-1. Listening skills

1.1 Introduction to listening process and practice
1.2 Listening to recorded lectures/speeches/poems/interviews and Dialogues

Unit 2. Introduction to phonetics

2.1 Sounds: consonants, vowels (Monophthongs and Diphthongs)
2.2 Transcription of words (IPA) syllable diversion and word stress

Unit 3. Speaking skills

3.1 Self and Peer introduction
3.2 Extempore-Just a minute session
3.3 Greeting and starting conversation
3.4 Leave taking
3.5 Wishing well
3.6 Talking about likes and dislikes
3.7 Asking questions-polite responses
3.8 Apologizing/forgiving
3.9 Complaining/Warning
4.0 Asking and giving information
4.1 Getting and giving Permission
4.2 Asking for and giving Opinion
4.3 Delivering formal speeches
4.4 Mock Interviews
4.5 Presentation
4.6 Conversation practices in various situations such as -asking address, enquiries at places like retail shop, service center, bank, customer care etc.

Unit 4. Building Vocabulary

4.1 Word Formation
4.2 Phrasal Verbs, Foreign Phrases, Jargons
4.3 Word Games such as crosswords, scrabble, quiz spell it etc. (To enhance self-expression and vocabulary of participants.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

Means of Assessment

Assignments and quiz/class tests, mid-semester and end-semester written tests
Actual practical work, exercises and viva-voce
Presentation and viva-voce

LIST OF 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. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra

5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria& Sons, New Delhi

6. Q. Skills for success – Level & Margaret Books, Oxford University Press.

7. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

8. English for Communication (text Book Published by IRDT, Kanpur 1998).

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	7	25
2	Unit 2	7	25
3	Unit 3	7	25
4	Unit 4	7	25
Total:		**28**	**100**

1.2 APPLIED MATHEMATICS – I

L	P
3	0

RATIONALE

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D curves in solving various engineering problems in all fields.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

Understand and apply angle measurements, T-Ratios, and graph functions.
Grasp the concepts of limits, differentiation and apply differentiation rules.
Resolve proper and improper fractions into partial fractions with various factors.
Solve problems using permutations and combinations and apply the binomial theorem.
Understand complex numbers in different forms, perform arithmetic operations and applications of De Moivre's theorem.

DETAILED CONTENTS

UNIT - I: Trigonometry

Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of | x |, sin x, cos x, tan x and ex.

UNIT-II: Differential Calculus

Definition of function, concept of limits. Four standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$

Differentiation of x^n, $\sin x$, $\cos x$, $\tan x$, e^x, $\log_e x$ by definition. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, logarithmic differentiation, exponential functions.

UNIT- III: Permutations, Combinations and Binomial theorem

Value of nPr, nCr and formula based problems. Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof); applications of Binomial theorem.

INSTRUCTIONAL STATREGY

The basic instructional strategy to teach basic mathematics, binomial theorem, trigonometry, differential calculus etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

LIST OF RECOMMENDED BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.

2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)

4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.

5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1.	Unit 1	14	30
2.	Unit 2	14	30
3.	Unit 3	14	40
Total:		**42**	**100**

1.3 PHYSICS – I

L	P
2	2

RATIONALE

Applied physics includes the study of 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.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
Analyze and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
Derive work, power and energy relationship and solve problems about work and power.
Define work, energy and power and their units.
Describe conservation of energy and its applications.
Understand the concept of rotational motion of a rigid body and its applications.

DETAILED CONTENTS

1. Units and Dimensions

1.1 Need of Measurement in engineering and science, unit of a physical quantity - fundamental and derived units, systems of units (FPS, CGS and SI units)
1.2 Dimensions and dimensional formulae of physical quantities.
1.3 Principle of homogeneity of dimensions
1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities.
1.5 Limitations of dimensional analysis
1.6 Error in measurement, accuracy and precision of instruments measuring instruments least count, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures and rounding off in calculation.

2. Force and Motion

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors
2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.
2.3 Resolution of Vectors and its application to lawn roller and inclined plane.
2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.
2.5 Impulse and its Applications
2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist.
2.9 Gravitational force, Kepler' s law of planetary motion.
2.10 Acceleration due to gravity and its variation with depth and height from earth surface.

3. Work, Power and Energy

3.1 Work: and its units, examples of zero work, positive work and negative work.
3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction, reducing friction and its Engineering Applications.
3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications
3.4 Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation.
3.5 Mechanical Energy, Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
3.6 Power and its units, calculation of power in numerical problems

4. Rotational Motion

4.1 Concept of translator and rotatory motions with examples
4.2 Definition of torque with examples
4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples
4.4 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).
4.5 Rotational kinetic energy, Rolling of sphere on the slant plane
4.6 Comparison of linear motion and rotational motion.

LIST OF PRACTICALS

1. To measure length, radius of a given cylindrical body like test tube, beaker using a one-year calipers and find volume of each object.
2. To determine diameter of a wire, a solid ball using a screw gauge.
3. To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4. To verify parallelogram law of forces.
5. To find the coefficient of friction between wood and glass using a horizontal board.
6. To determine the atmospheric pressure at a place using Fortin's Barometer

7. To determine the viscosity of glycerin by Stoke's method
8. To verify law of conservation of mechanical energy (PE to KE).

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENTS

Assignment & Quiz,
Mid-Term and End-Term written test,
Model Making,
Actual Lab & Practical Work,
Viva Voice

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., New Delhi

4. B.Sc. Practical Physics by C L Arora, S. Chand Publication.

5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

6. Engineering Physics by DK Bhhatacharya & amp; Poonam Tandan; Oxford University Press, New Delhi

7. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1.	Unit 1	7	25
2.	Unit 2	7	25
3.	Unit 3	7	25
4.	Unit 4	7	25
Total:		**28**	**100**

1.4 ENGINEERING DRAWING - I

L	P
0	4

RATIONALE

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 16 sheets to be prepared and at least 2 sheets on AutoCAD
iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

Identify and use of different grades of pencils and other drafting instruments which are used in engineering field.
Draw free hand sketches of various kinds of objects.
Utilize various types of lines used in engineering drawing.
Read and apply different dimensioning methods on drawing of objects.
Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
Draw 2 - dimensional view of different objects viewed from different angles (orthographic views).
Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view.
Generate isometric (3D) drawing from different 2D (orthographic) views/sketches Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances.
Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing

1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
1.2 Different types of lines in Engineering drawing as per BIS specifications
1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degrees, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4.

2. Dimensioning Technique

2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
2.2 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.

3. Scales

3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale.
3.2 Drawing of plain and diagonal scales.

4. Orthographic Projections

4.1 Theory of orthographic projections (Elaborate theoretical instructions).
4.2 Projection of Points in different quadrant.
4.3 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.
4.4 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.
4.5 Three views of orthographic projection of different objects. (At least one sheet in 3rd angle).
4.6 Identification of surfaces.

5. Sections

5.1 Importance and salient features.
5.2 Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections.
5.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections.
5.4 Orthographic sectional views of different objects.

6. Isometric Views

6.1 Fundamentals of isometric projections and isometric scale.
6.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

7. Common Symbols and Conventions used in Engineering

7.1 Civil Engineering sanitary fitting symbols.
7.2 Electrical fitting symbols for domestic interior installations.

8. Introduction to AutoCAD

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.

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

LIST OF 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.
5. Engineering Drawing I by DK Goel, GBD Publication

1.5 Workshop Technology (Fitting & Measuring Instruments)

L	P
2	0

RATIONALE

This subject describes the facts, concepts, principles and procedures of using Hand Tools, Machine Tools and related techniques efficiently effectively to plan the manufacturing of Tool & Die Parts to the specification considering safety and environment. It also useful in understanding technology and apply them in the areas such as Workshop Practice, Tool Design, Production Plan, Estimation and Supervisory Management. It also describes the concept, principle and procedures to identify and report the maintenance requirement for corrective action. It also describes the procedures to derive the specification i.e. Hand Tools, Machine Tools for Tool and Die Making.

DETAILED CONTENTS

Unit 1: Introduction to workshop technology

1. Introduction: Classification of industrial materials and processing methods.
2. Definition: This defines the major of industrial materials and description of major processing methods.
3. Principles: Materials and processing techniques used in an industrial, especially a tool room situation and its impact of efficiency, effectiveness and safety.
4. Procedure: Identification, classification of major industrial material processing.
5.Safety precautions
1. Introduction: Use and application of safety precautions. (safety rules, prevention of accidents)
2. Definition: Concept of accidents, Classification of accidents, rules and safety precautions.
3. Principles: Source of accident, Rules for prevention of accidents, safety precautions.
4. Procedure: Study causes of accidents, Select safety rules and precautions.

Unit 2: Basic metal working technique

1. Introduction: Selection and use of Hand Tools.
2. Definition: Classification: This defines the description, design features, classification, description and design and construction of various hand tools.
3. Principles: Design features, Working features
4. Procedure: Identification, description of hand tools.
5. Metal working techniques-joining
1. Introduction: Introduction to metal joining techniques.
2. Definition: Classification of welding, Soldering, Brazing
3. Principles: Basic working principles of welding, soldering and brazing equipment tools.
4. Procedure: Identification of purpose, Selection of technique, equipment and tools, Maintenance storage of equipment and tools

Unit 3: Measuring instruments

1. Introduction: Use and application of basic measuring instruments. (Bench work related measuring instruments)
2. Definition: Concept of basic measuring instruments. Classification of basic measuring instruments.
3. Principles: Working principle of basic measuring instruments.
4. Procedure: Study basic measuring instruments, define measuring instruments, Select proper measuring instruments, proper handling and maintenance of basic measuring instruments.

Unit 4: Drilling Operations and Drilling Machines (Level I)

1. Introduction: Classification, selection and use of Drilling operations and Drilling Machines: Pillar Drill, Portable Drill
2. Definition: Description of main parts and functions.
2.1 Machines (Bench drill, pillar, portable)
2.2 Work holding devices: Vice, Angle plate, V block, C-Clamp
2.3 Cutting Tools: Center Drill, drills up to Dia 20 mm straight and taper shank, Counter sinks, Counter bores piloted or non-piloted reamers
2.4 Cutting tool holders for drilling machines: Drill Chucks, Reduction sleeves, Drifts, Tapping Attachments
2.5 Cutting Parameters: Calculation of Speed, Feed, Depth of cut., Cutting fluids
2.6 Operations: Drilling, Tapping, Reaming, Counter sinking, Counter boring
3. Principles: Cutting and material removal Calculation of machine parameter and tool geometry selection, Safety and maintenance of m/c., work piece and cutting tools & accessories.
4. Procedure: Identify the drilling machines, work holding device and cutting tool for operation by applying the standard practice and norms with respect to safety and maintenance.

5. Drilling Operations and Drilling Machines (Level II)

1. Introduction: Classification, selection and use of drilling operation of machines and functions.
2. Definition: Description of main parts of machine.
2.1 Machines: Column drilling machines, Radial drilling m/c
2.2 Work holding devices: Step blocks, T bolts and clamps, Co-ordinate tables, Sine vice and sine table
2.3 Cutting Tools: Large size drills, Boring tools, Special reamers
2.4 Cutting tool attachments: Boring attachments,
2.5 Cutting Parameters: Machine calculation, setting up, speed, feed, depth of cut.
2.6 Operations: Drilling, Counter boring, Reaming, Step drilling, Spot facing
3. Principles: Cutting and material removal, calculation of machine parameter and tool geometry selection, safety and maintenance of m/c., work piece and cutting tools and accessories.
4. Procedure: Identify the drilling machines, work holding device and cutting tool for operation by applying the standard practice and norms with respect to safety and maintenance.

6. Drilling Operations and Drilling Machines (Level III)

1. Introduction: Classification, Selection and use of Drilling operations and Drilling Machines
2. Definition: 2.1 Description of main parts and function of machines: Gang drilling machines, Multi spindle machines, Drilling machines for batch and mass production.
2.2 Work holding devices: Jigs and fixtures
2.3 Cutting tool holders: Quick Change Chucks.
2.4 Operations: setting up the machine tools for batch and mass production.
3. Principles: Operational principles of Machine and accessories. Cutting and material removal Calculation of machine parameter and tool geometry selection.
4. Safety and maintenance of machine, work piece and cutting tools and accessories.
5. Procedure: Identify the setting up of machine for production of components.
6. Principles: Operational principles of machines and parts, work holders and cutting tool holders, Safety and maintenance
7. Procedure: Identify the machine, work holding device, tool and tool holders for operation by applying standard practice and norms with respect to safety and maintenance.

LIST OF REFERENCES BOOKS

1. Chapman A. J. PUBLISHER Workshop Technology (Vol I, II & III)

2. Hazra S.K. & Choudhary S.K. New Delhi: Amol Publication Elements of Workshop Technology

Metropolitan Publishers, Bombay Raghuwanshi B.S. & Others

3. Workshop Technology New Heights, New Delhi Gupta K.N. & Kaushish J.P.

4. Workshop Technology Vol.I to II Atherton W.H. New Heights, New Delhi

5. Workshop Practice Vol I to V Gerling New Era Publishers, London All About Machine Tools B. Kishore WILEY EASTERN, Delhi Tool & Die Maker

6.Hermann Jutz Edward Scharkus Saurabh & Co., Delhi Westermann Tables WILEY EASTERN, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1.	Unit 1	4	10
2.	Unit 2	4	10
3.	Unit 3	5	20
4.	Unit 4	5	20
5.	Unit 5	5	20
6.	Unit 6	5	20
Total:		**28**	**100**

1.6 Basic Chemistry

L	P
2	2

RATIONALE

There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyses and properties of natural raw materials require for producing economical and eco-friendly finished products.

LEARNING OUTCOMES

After undergoing this course, the students must be able to:

Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
Use relevant water treatment method to solve domestic and industrial problems.
Solve the engineering problems using knowledge of engineering materials and properties.
Use relevant fuel and lubricants for domestic and industrial applications.
Solve the engineering problems using concept of Electrochemistry and corrosion.

DETAILED CONTENTS

Unit 1: Atomic Structure, Chemical Bonding and Solutions

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s, p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau's rule, electronic configuration.
Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H2, F2, HF hybridization in BeCl2, BF3, CH4, NH3, H2O), coordination bond in NH +4, and anomalous properties of NH3, H2O due to hydrogen bonding, and metallic bonding.
Solution – idea of solute, solvent and solution, methods to express the concentration of solution molarity (M = mole per liter), Molality, Normality, ppm, mass percentage, volume percentage and mole fraction.

Unit 2: Engineering Materials

Natural occurrence of metals – minerals, ores of iron, aluminum and copper, gangue (ma-trix), flux, slag, metallurgy – brief account of general principles of metallurgy.
Extraction of - iron from hematite ore using blast furnace, aluminum from bauxite along with reactions.
Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.
General chemical composition, composition based applications (elementary idea only details omitted):
Port land cement and hardening, Glasses Refractory and Composite materials.
Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

Unit 3: Chemistry of Fuels and Lubricants

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Delong's formula.

Proximate analysis of coal solid fuel Petrol and diesel - fuel rating (octane and Cetane numbers),
Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.
Lubrication – function and characteristic properties of good lubricant, classification with examples,
lubrication mechanism – hydrodynamic and boundary lubrication, physical proper- ties (viscosity and
viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke
number, total acid number saponification value) of lubricants.

Application of redox reactions in electrochemical cells –

Primary cells – dry cell,
Secondary cell - commercially used lead storage battery, fuel and Solar cells. Introduction to Corrosion
of metals –
Definition, types of corrosion (chemical and electrochemical), H2 liberation and O2 absorption
mechanism of electrochemical corrosion, factors affecting rate of corrosion.
Internal corrosion preventive measures –
Purification, alloying and heat treatment and External corrosion preventive measures: a) metal
(anodic, cathodic) coatings, b) organic Inhibitors.

INSTRUCTIONAL STRATEGY

Unit 1: Atomic Structure, Chemical Bonding and Solutions

Assignments: Writing electronic configuration of elements up to atomic number 30 (Z= 30).
Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.
Seminar:
1. Quantum numbers,
2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals. Projects: Model of molecules
BeCl2, BF3, CH4, NH3, H2O.

Unit 2: Engineering Materials

Assignments: Preparation of table showing different ores of iron, copper and aluminum metals along
with their chemical compositions and classify in to oxide sulphide halide ores.
Seminar: Discuss the chemical reactions taking place in blast furnace in extraction of Fe, Cu and Al metals.
Projects: Make table showing place of availability of different ores in India and show places on India
map.

Unit 3: Chemistry of Fuels and Lubricants

Assignments: Calculation of HCV and LCV of fuel using fuel composition in Delong's formula.
Seminar: Chemical structure of fuel components influence on fuel rating.
Projects: Mapping of energy recourses in India. Collection of data of various lubricants available in
the market.

LIST OF PRACTICALS:

Perform any Ten Laboratory Practical's. Volumetric and Gravimetric analysis:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of KMnO4 solution using standard oxalic acid and determine the percentage of iron present in given Hematite ore by KMnO4 solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of:
a) Total hardness of given water sample using standard EDTA solution.

b) Alkalinity of given water sample using 0.01M sulphuric acid.
7. Proximate analysis of coal:
a) Gravimetric estimation of moisture in given coal sample.
b) Gravimetric estimation of ash in given coal sample.

Instrumental analysis:

8. Determine the conductivity of given water sample.
9. Determination of the iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. Determination of flash and fire point of lubricating oil using Abel's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of electrochemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

(a) Open source software and website address:

1 www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2 www.visionlearning.com (Atomic structure and chemical bonding)
3 www.chem1.com (Atomic structure and chemical bonding)
4 https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5 www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6 www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf
(Fueland Combustion)
7 www.chemcollective.org (Metals, Alloys)
8 www.wqa.org(Water Treatment)

LIST OF RECOMMENDED BOOKS

1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.

2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.

3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.

4. Dara, S. S. & Dr.S.S. Umare, Engineering Chemistry, S. Chand. Publication, New Delhi, New Del-hi, 2015.

5. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

6. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.

7. Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.

8. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.ltd., 2014.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (Periods)	Marks Allotted (%)
1.	9	30
2.	9	30
3.	10	40
Total	**28**	**100**

1.7 GENERAL WORKSHOP PRACTICE – I
(FITTING)

L	P
0	8

RATIONALE

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 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 labor, safety at workplace, team working and development of right attitude are the other objectives.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

Identify tools and equipment used and their respective functions.
Identify different types of materials and their basic properties.
Use and take measurements with the help of basic measuring tools/equipment.
Select proper tools for a particular operation.
Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
Prepare independently simple jobs and inspect the same.
Follow safety procedures and measures.
Use safety equipment.

DETAILED CONTENTS

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. FITTING

1. Fitting Shop – I

2.1 Use of personal protective equipment and safety precautions while working.
Basic deburring processes.
2.2 Introduction to devices/equipment. fitting shop tools, marking and measuring
2.3 Identification of materials. (Iron, Copper, Stainless Steel, Aluminum etc.)
2.4 Identification of various steel sections (flat, angle, channel, bar etc.).
2.5 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of .25 mm.
Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping.

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., New Delhi

4. B.Sc. Practical Physics by C L Arora, S. Chand Publication. Workshop Technology I, II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.

5. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.

6. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.

7. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi

8. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

9. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi

10. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

2.1 Applied Mathematics-II

L	P
3	0

RATIONALE

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, integral calculus, coordinate geometry, basic elements of vector algebra and first order differential equations.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

Solve linear equations using determinants and matrix algebra.
Perform integration techniques, solve area and volume problems.
Solve first order differential equations and apply numerical methods.
Form and interpret equations of lines, circles and conics.
Perform vector operations and solve related engineering problems of relevant branch.

DETAILED CONTENTS

UNIT - I: Integral Calculus

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Introduction to definite integration. Use of formulae $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $\int_0^{\frac{\pi}{2}} \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ for solving problems ,where m and n are positive integers.
Applications of integration for (i). Simple problems on evaluation of area bounded by a curve and axes. (ii). calculation of volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT-II: Differential Equations & amp; Numerical Methods

Definition of differential Equations, order and degree of a differential equation, formation of differential equations, solution of first order and first degree differential equations by variable separable method (simple problems). Trapezoidal rule, Simpson's 1/3 and Simpson's 3/8 rule and their applications in simple cases. MATLAB – Simple Introduction.

UNIT - III: Two dimensional Co-Ordinate Geometry

Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.
General equation of a circle and its characteristics. To find the equation of a circle, given:

i. Centre and radius,
ii. Three points lying on it and
iii. Co-ordinates of end points of a diameter;
Definition of conics (Parabola, Ellipse, Hyperbola), their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

UNIT - IV: Vector Algebra

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector product of two vectors. Simple problems related to work, moment and angular velocity.

INSTRUCTIONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples. Differential equations and applications of differential equations can be taught with engineering applications of relevant branch.

MEANS OF ASSESSMENT

Assignments and Quiz/Class Tests
Mid-term and End-term Written Tests
Model/Prototype Making

LIST OF RECOMMENDED BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	10	25
2	Unit 2	10	25
3	Unit 3	10	25
4	Unit 4	12	25
Total:		**42**	**100**

2.2 Physics-II

L	P
2	2

RATIONALE

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 is given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOME

After undergoing this subject, the student will be able to;
Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
Define the terms: frequency, amplitude, wavelength, velocity of a wave.
Explain various Engineering, Medical and Industrial applications of Ultrasonic.
Apply acoustics principles to various types of buildings to get best sound effect
Explain diffraction, interference, polarization.
Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V

DETAILED CONTENTS

1. Wave motion and its applications

1.1 Wave motion, transverse and longitudinal wave motion with examples. Sound and light waves and their properties. Definition of wave velocity, frequency and wave length and their relationship.
1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves and amplitude
1.3 Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., study of vibration of cantilever and determination of its time period, concept of simple harmonic progressive wave.
1.4 Free, Damped and forced oscillations, Resonance with examples.
1.5 Echo and reverberation, Sabine formula for reverberation time (without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Acoustics of building.
1.6 Ultrasonic – Introduction properties and applications in engineering and medical applications.

2. Current Electricity

4.1 Electric Current and its unit, direct and alternating current Resistance and its units, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance of a wire, Color coding of carbon Resistances, Ohm's law.
4.2 Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge)
4.3 Concept of terminal potential difference and Electromotive force (EMF).
4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.

3. Electromagnetism

5.1 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties.
5.2 Magnetic field and it units, magnetic intensity, magnetic lines of force, magnetic flux and its units, magnetization.
5.3 Concept of electromagnetic induction, Faraday' s Laws, Lorentz force (Force on moving charge in magnetic field). Force on current carrying conductor.
5.4 Moving coil galvanometer – Principle of construction and working.
5.5 Conversion of galvanometer into ammeter and voltmeter.

4. Modern Physics

7.1 Lasers: Energy levels, ionization and excitation potential, spontaneous and stimulated emission, population inversion, pumping methods.
7.2 Types of lasers: Ruby, He- Ne lasers, Laser characteristic, Engineering and medical applications of lasers.
7.3 Fiber optics- introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, application in telecommunication, medical and sensors.
7.4 Nano Science and Nano technology: Introduction, nano particles and nano materials, properties at Nano scale, Nano technology, nano technology based devices and applications.

LIST OF PRACTICALS

1. To determine the velocity of sound with the help of resonance tube.
2. To verify laws of resistances in series and parallel combination.
3. To verify ohm’s laws by drawing a graph between voltage and current.
4. To measure very low resistance and very high resistances using Slide Wire bridge
5. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
6. To verify the Kirchhoff’s Law using electric circuit.

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

Assignment & Quiz
Mid-Term and End-Term written test
Model Making
Actual Lab & Practical Work
Viva-Voice

LIST OF RECOMMENDED BOOKS

1. Text Book of Physics (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. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi

4. Practical Physics, by C. L. Arora, S Chand publications

5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.

7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication

8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	7	25
2	Unit 2	7	25
3	Unit 3	7	25
4	Unit 4	7	25
Total:		**28**	**100**

2.3 ENGINEERING DRAWING – II

L	P
0	4

RATIONALE

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

Note:

1) First angle projection is to be followed.
2) Minimum 16 sheets to be prepared. At least 2 sheets in AutoCAD.
3) Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students.
4) Continuous evaluation be done by the teachers for exercises/work done on CAD software. For this proper record may be maintained for its inclusion in the internal assessment.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Draw and learn different types of wooden joints used in furniture.
- Draw the assembly from part details of objects
- Identify and draw different types of screw threads used in various machines and assemblies as per domestic and international standards
- Draw different types of nuts, bolts and washers
- Draw various locking devices and foundation bolts
- Draw different section of various types of keys and cotter joints
- Draw various riveted joints
- Draw various types of couplings used in power transmission
- Prepare drawing of given joints/couplings using AutoCAD

DETAILED CONTENTS

1. Detail and Assembly Drawing

Principle and utility of detail and assembly drawings

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. Screw Threads

2.1 Thread Terms and Nomenclature
2.1.1 Types of Threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.
2.1.2 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. Nuts and Bolt

3.1 Different views of hexagonal and square nuts. Square and hexagonal headed bolt
3.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.
3.3 Assembly of square headed bolt with hexagonal and with washer.

4. Locking Devices

4.1 Different types of locking Devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.
4.2 Foundations Bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.
4.3 Drawing of various types of studs

5. Keys and Cotters

5.1 Various types of keys and cotters - their practical application, drawings of various keys and cotters showing keys and cotters in position
5.2 Various types of joints
- Spigot and socket joint
- Gib and cotter joint
- Knuckle joint

6. Rivets and Riveted Joints

6.1 Types of general purpose-rivets heads
6.2 Caulking and filleting of riveted joints
6.3 Types of riveted joints
(i) Lap Joint-Single riveted, double riveted (chain and zig-zag type)
(ii) Single riveted, Single cover plate butt joint
(iii) Single riveted, double cover plate butt joint
(iv) Double riveted, double cover plate butt joint (chain and zig-zag type)

7. Couplings

7.1 Introduction to coupling, their use and types
7.2 Flange coupling (protected)
7.3 Flexible Coupling

8. Use of CAD software (02 sheets)

Draw any two joints/coupling using CAD software from the following:
i) Sleeve and cotter joint
ii) Knuckle joint
iii) Spigot and socket joint
iv) Gib and cotter joint
v) Flange coupling
vi) Muff coupling
* Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

MEANS OF ASSESSMENT
- Sketches
- Drawing
- Use of software

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
5. AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo & D. Sarvanan; Wiley India Pvt. Ltd., Delhi.

2.4 MATERIAL SCIENCE

L	P
2	0

RATIONALE

This subject is intended to teach basic materials classification, structure, physical and mechanical properties. The students are required to understand different materials for various application. It is necessary for students to know basics of metal structure, properties, usage and testing of metals. This knowledge will be used in Heat Treatment and Core technology subjects.

DETAILED CONTENTS

Unit 1: Crystal system & imperfections

1.1 Definition of crystal (grain)
1.2 Solidification process. Phase rule.
1.3 Elements and their classification.
1.4 Description of metals and non-metals.
1.5 Structures of crystal, space lattice, unit cell (BCC, FCC, HCP)
1.6 Elements, compounds, alloys, solid solution and its type.
1.7 Classification of imperfections/ impurities in solids.

Unit 2: Manufacturing and application of steel and cast Iron

2.1 Iron and iron ores. Dressing and smelting of iron ores.
2.2 Making of iron by different processes.
2.3 Description of plain carbon steel. Various grades and composition of Iron steel (Low, Medium, High Carbon)
2.4 Effect of carbon on structure and application.
2.5 Specification and designation of steel with commercial aspect (BIS Standard)
2.6 Various commercial forms of iron.
2.7 Description of cast iron and making of cast iron.
2.8 Carbon content and types of cast iron.
2.9 Commercial use of cast iron in metal working industry.
2.10 Special purpose cast iron such as malleable, nodular & spheroidal cast iron and application.

Unit 3: Mechanical properties

3.1 Concept of stress & strain and their units.
3.2 Study of stress-strain curve for steel and cast iron.
3.3 Description of mechanical properties such as strength, elasticity, plasticity, ductility and malleability, toughness, hardness, fatigue and creep.

Unit 4: Deformation

4.1 Principle of deformation of metals.
4.2 Deformation processes by slip, twining etc.
4.3 Description of work hardening or strain hardening.
4.4 Principle of stress relieving and process annealing.
4.5 Concept of Hot working and Cold working. Relative merits and demerits.
4.6 Effect of temperature on grain growth.

Unit 5: Alloy steel and alloying elements

5.1 Concept of alloy steel. Classification as low alloy and high alloy steel.
5.2 Common alloying elements.
5.3 Purpose of alloying elements and their effect on properties of steel.

Unit 6: Destructive and non-destructive testing

6.1 Concept and procedure of mechanical testing of metals such as tensile, compression, impact (Izod and Charpy), Hardness (Rockwell, Brinell, Vickers Pyramid), Fatigue and creep test
6.2 Concept and procedure of non-destructive testing of metals such as Dye Penetration, Magnetic Particles, Ultrasonic rays, Laser beam.

Unit 7: Non-ferrous metals and alloys

7.1 Concept of ferrous and non-ferrous metals.
7.2 Brief description of manufacturing and application of aluminum, magnesium, zinc, lead, copper, tin and nickel.
7.3 Description of common non-ferrous alloys as brass, bronze, duralumin, germin silver.
7.4 Concept of bearing metals and alloys.
7.5 Common alloys used as bearing materials.

Unit 8: Polymers and composite materials

9.1 Introduction to polymers.
9.2 Process of polymerization.
9.3 Concept of plastics, fibers and elastomers as derivatives of polymers.
9.4 Principle and application of common thermos plastic.
9.5 Principle and application of common thermosetting plastics.

Unit 9: Powder metallurgy

10.1 Concept of powder metallurgy.
10.2 Process of making powder.
10.3 Common metals and non-metals used in powder metallurgy.
10.4 Procedure for making parts and components in powder metallurgy.
10.5 Specific application of making carbide and ceramic cutting tools or bits.

Unit 10: Oxidation and corrosion

11.1 Principle and concept of oxidation and reduction.
11.2 Principle of corrosion.
11.3 Specific types of corrosion based on environment.
11.4 Common methods and procedures to control and prevent corrosion.

LIST OF RECOMMENDED BOOKS

1. AUTHOR TITLE G. B. S. Narang Material Science PUBLISHER Khanna Publications, Delhi

2. Hazra Choudhary & Hazra Choudhary Material Science & Processes Indian Book Distribution Co. George"s Brady Material Hand Book Roy

3. A. Lindberg McGraw Hill Book Co. Materials & Manufacture O.P. Khanna Prentice Hall of India Material Science & Metrology Dhanpat Rai & Sons., New Delhi

4. Y. Lakhtin R.K. Rajput Engineering Physical Metrology Material Science & Engineering Mir Publishers-Moskow D.S. Nat Kataria & Sons., Delhi

5. Materials & Metallurgy Albert G. Guy Katson Publishing House, Delhi Physical Metallurgy for Engineers

6. Dr. D. Swarup & Ajay Rastogi Addison Wesley Publishing Co. Elements of Metallurgy Rastogi Publications, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	2	10
2	Unit 2	3	10
3	Unit 3	2	10
4	Unit 4	3	10
5	Unit 5	3	10
6	Unit 6	3	10
7	Unit 7	3	10
8	Unit 8	3	10
9	Unit 9	3	10
10	Unit 10	3	10
Total:		**28**	**100**

2.5 BASICS OF INFORMATION TECHNOLOGY

L	P
1	2

RATIONALE

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/Liber Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

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

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

Identify Computer Hardware Components, Network Components and Peripherals.
Explain the role of an Operating System.
Install System and Application Software.
Explain the function of the system components including Processor, Motherboard and Input-output devices.
Use Word Processing Software to prepare document.
Use Spreadsheet Software to create workbooks and automate calculation.
Use Presentation Software to create interactive presentation.
Perform fundamental tasks common to most application software including print, save, edit, cut, copy, paste, format, spell and grammar check.
Find and evaluate information on the Web.
Install Antivirus.
Safeguard against Online Frauds, threats and crimes

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Basic Concepts of IT and Its Application

1.1 Information Technology concept and scope.
1.2 Applications of IT in office, Air and Railway Ticket reservation, Banks financial transactions, E-Commerce and E-Governance applications etc., Ethics of IT, concept of online frauds, threats of IT crimes.

2. Computer Hardware:

2.1 Block diagram of a computer.
2.2 Components of computer system.
2.3 CPU
2.4 Memory
2.5 Input devices; keyboard, Scanner, mouse etc.
2.6 Output devices; VDU, LCD, Printers etc. Primary and Secondary Memory.
2.7 RAM, ROM, magnetic disks – tracks and sectors.
2.8 Optical disk (CD, DVD &Blue Ray Disk.), USB/Flash Drive.

3. Software Concepts:

3.1 System software.
3.2 Application software.
3.3 Virtualization software and Utility software.
3.4 Introduction of Operating System.
3.5 Installation of Window / Linux.
3.6 Features of OPEN OFFICE/MS_OFFICE (MS word, Excel, PowerPoint).

4. Internet Concepts:

4.1 Basics of Networking – LAN, WAN,
4.2 Wi-Fi technologies and sharing of printers and other resources.
4.3 Concept of IP addresses.
4.4 DNS.
4.5 Introduction of internet, applications of internet like: e-mail and browsing.
4.6 Concept of search engine and safe searching.
4.7 Various browsers like Internet explorer/Microsoft Edge, Mozilla Firefox.
4.8 WWW (World Wide Web).
4.9 Hyperlinks.
4.10 Introduction to Anti-virus.

LIST OF PRACTICAL EXERCISES

1. Given a PC, name its various components and peripherals. List their functions.
2. Installing various components of computer system and installing system software and application software
3. Installation of I/O devices, printers and installation of operating system viz. Windows/BOSS/ LINUX
4. Features of Windows as an operating system
Start
Shut down and restore
Creating and operating on the icons
Opening, closing and sizing the windows and working with windows interfacing elements (option buttons, checkbox, scroll etc.)
Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file and folders
Changing settings like, date, time, color (back ground and fore ground etc.)
Using short cuts
Using on line help

5. 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 color, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline method
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, auto text
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 labels.
Using shapes and drawing toolbar.
Working with more than one window.

6. Spread Excel Sheet Processing (MS Office/Open 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, organize, 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.

7. PowerPoint Presentation (MS Office/Open 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

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 color scheme
Changing background
Applying design template

e) How to view the slide show?
Viewing the presentation using slide navigator
Slide transition
Animation effects, timing, order etc.
F) Use of Pack and Go Options.

8. Internet and its Applications

a) Establishing an internet connection.
b) Browsing and downloading of information from internet.
c) Sending and receiving e-mail
Creating a message
Creating an address book
Attaching a file with e-mail message
Receiving a message
Deleting a message
d) Assigning IP Addresses to computers and use of domain names.

9. Functioning of Antivirus

a) Installation and updating of an antivirus.
b) How to scan and remove the virus.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently.

LISTS OF 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. Computers Fundamentals Architecture and Organization by B Ram, revised Edition, New Age International Publishers, New Delhi.
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (Periods)	Marks Allotted (%)
1.	4	25
2.	2	25
3.	4	25
4.	4	25
Total	**14**	**100**

2.6 METROLOGY & QUALITY CONTROL

L	P
2	2

LEARNING OUTCOMES

After successful completion of the course, student will be able to –

1 make use of various instruments for linear and angular measurements
2 interpret the importance of tolerances and gauging practice
3 measure the profiles and surface finish of a given component
4 identify suitable quality control tool for given application.

DETAILED CONTENTS

Unit I: Linear and Angular Measurements:

Standards of measurement, Line standards, end standards, sources of error in measurement. Various Linear measuring instruments like Calipers, surface plates, Vernier height gauge, Vernier depth gauges, micrometers, slip gauges. Comparators: classification and characteristics of comparators, uses, working principal, advantages and disadvantages of various types of comparators. Angular measurements: Bevel protector, Sine bars, angle gauges, clinometers, optical instrument for angle measurements, measurement of pressure, temperature, motion, force and torque, Introduction to coordinate measuring machines.

Unit II: Measurement of Surface Finish:

Meaning of surface texture, surface roughness, terminology as per Indian Standards, methods of measuring surface finish, direct instrument measurement, measurement of surface coating thickness, measurement by Light wave interference: Principle and its applications. Measurement of screw threads and gears: Metrology of screw thread: screw thread terminology, effect of pitch errors, measurements of various elements of thread. Gear measurement: Sources of error in manufacturing gears, rolling tests, measurements of various elements.

Unit III:

Limits, fits and gauges Tolerances, limits, fits and allowances, basis of system, hole basis and shaft basis system, types of fits and their interpretation types of gauges and gauge design.

UNIT – IV:

Fundamental of Quality Definition, need and evolution of quality, dimensions of product and service quality, basic statistical measure / terms, source of variation, chance and assignable causes of variations, process capability, quality assurance, cost of quality, quality control tools

Self – Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

Suggested Readings/References:

1. Galyer J.F.W. and Shot bolt, Metrology for Engineers, Thomson Learning

2. Mahajan M., A Text Book of Engineering Metrology, Dhanpat Rai & Sons

3. Juran J.M. and Gryna Frank M, Quality planning and analysis, Tata McGraw Hill Education.

4. Mitra Amitava., Fundamentals of Quality Control and Improvement, John Wiley & Sons.

5. Grant E.L., Statistical Quality Control, McGraw-Hill Education.

6. Kaoru Ishikawa, Introduction to Quality Control, Modern Productivity and Quality Publishing Pvt. Ltd.

Suggested list of experiments:

1. Dimension measurement using different linear measuring instruments
2. Dimension measurement using indirect instruments and gauges
3. Calibration of micrometer using slip gauges
4. Calibration of dial gauge using dial gauge tester
5. Angle measurement using sine bar and Vernier bevel protractor
6. Feature measurement using tool maker's microscope
7. Measurement of gear tooth thickness
8. Calibration of tachometer using stroboscope
9. Calibration of Bourdon-tube pressure gauge
10. Measurement of surface roughness of given specimen
11. Observation of fringe pattern using interferometer
12. Measurement of flatness and roundness of given component
13. Alignment test of lathe Machine

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	7	25
2	Unit 2	7	25
3	Unit 3	7	25
4	Unit 4	7	25
Total:		**28**	**100**

2.7. WORKSHOP TECHNOLOGY AND WORKSHOP PRACTICE (TURNING)

L	P
2	8

RATIONALE

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 labor, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS

UNIT 1. Turning Operations and Lathe (Level I)

1. Introduction: Classification, selection and use of turning operation and lathe.
2. Definition: Description of main parts and functions of
2.1 Machines: Center Lathe
2.2 Work Holding Devices: 3 Jaw Chuck, 4 - Jaw Chuck, Dead Center, revolving center, Face plate, Dog carrier 2.3 Cutting Tools: Nomenclature and types of, Center Drills, H S S Tools (single point) for roughing and finishing, Knurling tools, Grooving, left hand, right hand tools.
2.4 Cutting tool holders: Drill chuck, Tool post, Multiple or indexing tool post, Quick change tool holder
2.5 Cutting Parameters: Speed, Feed, Depth of cut, Tool geometry, Time calculations, Cutting fluids
2.6 Operations: Plain Turning, Shoulder turning, Grooving, Facing, Knurling, Eccentric Turning, Drilling, Chamfering
3. Principles: The operational principles of machines, parts and accessories. Cutting and material removal, Calculation of machine parameters and tool geometry selection, Safety and maintenance of machines and cutting tools.
4. Procedure: Identify the lathe machine, work holding device, cutting tool and holder for Operations by applying the standard practice and norms with respect to safety and maintenance.

UNIT 2. Turning Operation and Lathe (Level II)

1. Introduction: Classification, selection and use of turning operations and lathe
2. Definition: Description of main parts and functions of
2.1 Machines: Tool room lathe, Capstan lathe, Turret lathe
2.2 Work holding Devices: Collets, steady rest, follow rest, Taper Turning attachments, Thread Chaser
2.3 Cutting Tools: Boring, Threading form tools, Counter Boring tools, Parting tools, ISO nomenclature for brazed carbide tips, Taps and Dies
2.4 Cutting Tool holders: Boring tool holders, Die holders, Special tool holders for capstan and turret lathe
2.5 Cutting parameters: Tool geometry with respect to operations, Time calculation for carbide tools.
2.6 Operations: Boring, Threading- internal, external, Counter boring, Taper turning, Form Generation e.g.: External grooves for "o" rings, circlips fillets, Reaming, Tapping, Use of die sets for external threads.
3. Principle: The operational principles of machines and parts, Cutting and material removal, Calculation of machine parameters and cutting tool selection, Operational principle of work holders and cutting tool holders, Use coolants, Safety and maintenance of machine and cutting tools etc.
4. Procedure: Identify the machine, work holding devices, tools and tool holders for operations by applying the standard practice and norms with respect to safety and maintenance.

UNIT 3. Turning Operation and Lathe (Level III)

1. Introduction: Classification, selection and use of turning operation and lathe
2. Definition: Description of main parts and functions of
2.1 Machines: Special Purpose Machines E.g. Automats Large size lathes
2.2 Work holding devices and attachments: Soft jaws, Special fixtures, Radius turning attachments, Copy turning attachments, Milling attachments, Grinding attachments.
2.3 Cutting tools: Modular tooling system, Holders and Inserts.
2.4 Cutting the holders: Special purpose holders
2.5 Cutting parameters: Tool geometry of inserts, Special tool geometries, Coolants and cutting fluids
2.6 Operations: Form turning, Milling, Grinding, Polishing
3. Principles: Operational principles of machines and parts, work holders and cutting tool holders, Safety and maintenance
4. Procedure: Identify the machine, work holding device, tool and tool holders for operation by applying standard practice and norms with respect to safety and maintenance.

1. Turning Shop

To make the exercise jobs and the parts of press tools such as bushes, pillars and utility items like central punch, studs, nuts to cover the skills like plane turning, facing, step turning, parting, recessing, undercutting, thread cutting, taper turning and eccentric turning.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topics	Time Allotted (Periods)	Marks Allotted (%)
1	Unit 1	9	30
2	Unit 2	9	30
3	Unit 3	10	40
Total:		**28**	**100**

4 - GUIDELINES FOR ASSESSMENT OF STUDENT-CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 15 Marks for general behavior and discipline

(By HODs in consultation with all the teachers of the department)

ii. 10 Marks for attendance as per following:

(By HODs in consultation with all the teachers of the department)

a)	75%	Nil
b)	75 – 80%	6 Marks
c)	80 – 85%	8 Marks
d)	Above 85%	10 Marks

iii. 25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:

(By In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	National Level participation
b)	10	-	Participation in two of above activities
c)	5	-	Inter-Polytechnic level participation

5. Evaluation Scheme Guidelines: As Per AICTE

A. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

B. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.