



CURRICULUM
FOR
DIPLOMA PROGRAMME IN
ALL ENGINEERING BRANCH



FOR UTTARAKHAND
(First Year Only)



Prepared by:

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STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN ALL ENGINEERING BRANCHES

FIRST SEMESTER

Sr. No	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks
						Internal Assessment		External Assessment (Examination)				
						Hrs/Week		Theory		Practical		
						Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
1.1	English and Communication Skills –I *	3	2/2	2	6	20	30	50	2.5	50	3	150
1.2	Applied Mathematics-I*	3	4/2	-	5	50	-	100	2.5	-	-	150
1.3	Applied Physics – I *	3	2/2	2	6	20	30	50	2.5	50	3	150
1.4	Applied Chemistry – I *	3	2/2	2	6	20	30	50	2.5	50	3	150
1.5	Basics of Information Technology *	2	-	3	5	10	10	50	2.5	30	3	100
1.6	Engineering Drawing-I *	-	-	8	8	-	50	100	3.0	-	-	150
1.7	General Workshop Practice – I *	-	-	8	8	-	50	-	-	50	4	100
Disc/Game/SCA/NCC/NSS#		-	-	4	4	-	-	-	-	25	-	25
Industrial Exposure (Assessment at Inst. Level)+		-	-	-	0	-	-	-	-	25	-	25
Total		14	5	29	48	120	200	400	-	280	-	1000

* Common with other Engineering diploma programmes.

Student Centered Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS and cultural activities etc.

+ Industrial visit compulsory at minimum 2 Industries or Department.

Note: 1- Each period will be 50 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 12.5 weeks.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN ALL ENGINEERING BRANCHES

SECOND SEMESTER

Sr. No	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks
						Internal Assessment		External Assessment (Examination)				
						Hrs/Week		Theory		Practical		
						Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
2.1	English and Communication Skills –II*	3	2/2	2	6	20	30	50	2.5	50	3	150
2.2	Applied Mathematics-II*	3	4/2	-	5	50	-	100	2.5	-	-	150
2.3	Applied Physics – II *	3	2/2	2	6	20	30	50	2.5	50	3	150
2.4	Applied Chemistry – II *	3	2/2	2	6	20	30	50	2.5	50	3	150
2.5	Environmental Science *	3	-	-	-	20	-	80	2.5	-	-	100
2.6	Engineering Drawing-II *	-	-	8	8	-	50	100	3.0	-	-	150
2.7	General Workshop Practice – II *	-	-	8	8	-	50	-	-	50	4	100
Disc/Game/SCA/NCC/NSS#		-	-	6	6	-	-	-	-	25	-	25
Industrial Exposure (Assessment at Inst. Level)+		-	-	-	0	-	-	-	-	25	-	25
Total		15	5	28	48	130	190	430	-	250	-	1000

* Common with other Engineering diploma programmes.

Student Centered Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS and cultural activities etc.

+ Industrial visit compulsory at minimum 2 Industries or Department.

Note: 1- Each period will be 50 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 12.5 weeks.

**2. DETAILED CONTENTS
OF
VARIOUS SUBJECTS**

FIRST SEMESTER

1.1 ENGLISH AND COMMUNICATION SKILLS – I

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieve results and create successful organizations. The goal of the Communicating Skills course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

1. COMMUNICATION SKILLS (12 Periods)
 - 1.1 Introduction and Process of Communication
 - 1.2 Objectives of Communication
 - 1.3 Verbal and Non-verbal Communication
 - 1.4 Process of Communication
 - 1.5 Barriers to Communication; Overcoming Strategies
 - 1.6 Listening and Speaking Skills and Sub-Skills
(All topics should be in detail)

2. GRAMMAR AND USAGE (08 Periods)
 - 2.1 Syntax (Parts of speech)

3. WRITING SKILLS (10 Periods)
 - 3.1 Writing Paragraphs
 - 3.2 Picture Composition
 - 3.3 Developing writing skills based on some audio-visual stimulus

4. READING COMPREHENSION SKILLS (10 Periods)

Unseen comprehension passages (at least 3 passages of literary, scientific, data interpretation).

5. FACETS OF LITERATURE (24 Periods)

5.1 Fiction

5.1.1 Homecoming – R.N. Tagore

5.1.2 The Selfish Giant - Oscar Wilde

5.1.3 The Missing Mail – R K Laxman

5.2 Prose

5.2.1 Of Studies – Francis Bacon

5.2.2 Art of Conversation – Richard Steel

5.2.3 Democracy – Dr. Radhakrishnan

5.3 Poems

5.3.1 Ozymandias – P.B. Shelley

5.3.2 Daffodils – William Wordsworth

5.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

DEVELOPING ORAL COMMUNICATION SKILLS

- Greeting, Starting a Conversation
- Introducing Oneself
- Introducing Others
- Leave Taking
- Thanking, Wishing Well
- Talking about Oneself
- Talking about Likes and Dislikes
- Mock Interview

LIST OF REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren and Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	12	20
2	08	12
3	10	16
4	10	16
5	24	36
Total	64	100

1.2 APPLIED MATHEMATICS - I

	L	T	P
Periods/Week	3	4/2	-

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like algebra, complex numbers, trigonometry and coordinate geometry. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Algebra (30 Periods)

- 1.1 Series: A.P. and G.P., n th term of AP and GP, , sum to n th term, Value of ${}^n P_r$ and ${}^n C_r$.
- 1.2 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)
- 1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors only)
- 1.4 Determinants and Matrices – expansion of determinants (upto third order), properties of determinants, solution of equations (up to 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction, multiplication of matrices (up to third order), minors and co-factors, inverse of a matrix by adjoint method (up to second order)
- 1.5 Scalar and vector product of two /three vectors

2. Trigonometry (20 Periods)

Review of ratios of some standard angles (0,30,45,60,90 degrees), 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).

3. Complex numbers (10 Periods)

Definition of complex numbers, real and imaginary parts of a complex number, polar and Cartesian form and their inter-conversion, conjugate of a complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number. De-Moiver's Theorem (simple problems)

4. Co-ordinate Geometry (20 Periods)

4.1 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines, perpendicular distance formula (without proof)

4.2 General equation of a circle and its characteristics. To find the equation of a circle, given:

- * Centre and radius
- * Three points lying on it
- * Coordinates of end points of a diameter

4.3 Equations of conics (ellipse, parabola and hyperbola), simple problems related to engineering (standards forms only)

RECOMMENDED BOOKS

1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
5. Applied Mathematics, Vol. I & II by SS Sabharwal and Sunita Jain, Eagle Parkashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	30	40
2	20	25
3	10	10
4	20	25
Total	80	100

1.3 APPLIED PHYSICS – I

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

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

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Units and Dimensions (8 Periods)

- 1.1 Physical quantities
- 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
- 1.3 Dimensions and dimensional formulae of physical quantities
- 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
- 1.5 Error in measurement, random and systematic errors, types of errors, propagation of errors, significant figures

2. Force and Motion (12 Periods)

- 2.1 Concept of Scalar and Vector quantities – examples, types of vectors.
- 2.2 Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of vectors), addition of vectors (Parallelogram law)
- 2.3 Force: Newton's laws of motion, linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.
- 2.4 Friction: Types of friction and its application.

- 2.5 Circular motion: Angular displacement, angular velocity and angular acceleration
 - 2.6 Relation between linear and angular variables (velocity and acceleration)
 - 2.7 Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists
 - 2.8 Application of various forces in lifts
- 3 Rotational Motion (6 Periods)
- 3.1 Concept of translatory and rotating motion with examples
 - 3.2 Definitions of torque, angular momentum and their relationship
 - 3.3 Conservation of angular momentum (qualitative) and its examples
 - 3.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
 - 3.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.
- 4 Work, Power and Energy (8 Periods)
- 4.1 Work: definition and its SI units
 - 4.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application
 - 4.3 Power: definition and its SI units, calculation of power with numerical problems
 - 4.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation
 - 4.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application
- 5 Properties of Matter (10 Periods)
- 5.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke’s law with its applications
 - 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, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
 - 5.4 Viscosity and coefficient of viscosity: Stoke’s Law and derivation of terminal velocity, effect of temperature on viscosity.

- 6 Thermometry (10 Periods)
- 6.1 Difference between heat and temperature
 - 6.2 Principles of measurement of temperature and different scales of temperature and their relationship
 - 6.3 Types of thermometers (Concept only)
 - 6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
 - 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
 - 6.6 Co-efficient of thermal conductivity
 - 6.7 Engineering Application of conduction, convection and radiations
7. Waves and Vibrations (10 Periods)
- 7.1 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Equation of simple harmonic progressive wave
 - 7.2 Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship $v = n\lambda$) and their applications
 - 7.3 Free, forced and resonant vibrations with examples
 - 7.4 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
 - 7.5 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

LIST OF PRACTICALS (to perform minimum ten experiments)

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
3. To determine the thickness of glass strip and radius of curvature using a spherometer
4. To verify parallelogram law of forces
5. To find the time period of a simple pendulum and determine the length of second's pendulum.
6. To find the velocity of sound by using resonance apparatus at room temperature.
7. To determine the viscosity of glycerin by Stoke's method
8. To determine the coefficient of friction on horizontal plane.

9. To determine the Young's Modulus by Searles apparatus
10. To determine force Constant of spring using Hooke's Law

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like 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 of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi
6. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
7. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
8. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
9. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
10. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	08	15
2	12	20
3	06	10
4	08	10
5	10	15
6	10	15
7	10	15
Total	64	100

1.4 APPLIED CHEMISTRY - I

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

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

DETAILED CONTENTS

1. Basics Concepts (08 Periods)
 - 1.1 Definition of chemistry and its importance
 - 1.2 Definition of matter, element, compound and mixtures, atom, molecule, ion, symbol, formula, valency and chemical equation.
 - 1.3 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound and form the empirical and molecular formula of the compound
 - 1.4 Essentials of a chemical equation, balancing of a chemical equation by hit and trial method
2. Atomic Structure and Chemical Bonding (08 Periods)
 - 2.1 Fundamental particles i.e. electron, proton and neutron, their characteristics (discovery is not included)
 - 2.2 Electronic concept of valency
 - 2.3 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency giving suitable examples to each
 - 2.4 Hydrogen bonding and its effect on physical properties of the compounds
 - 2.5 Electronic configuration of elements (up to $Z = 30$) with special reference to Aufbau principle

3. Water (16 Periods)
- 3.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation with special reference to sludge and scale formation; foaming and priming in boilers
- 3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange resin process. Simple numerical problems related to soda lime process.
- 3.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Estimation of hardness of water sample by O'Hehner's Method and E.D.T.A. Method
- 3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply
- 3.5 Disinfection of water by chlorination process
4. Solutions (12 Periods)
- 4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples
- 4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution with simple numerical problems related to these terms
- 4.3 Definition of pH, and different industrial applications of pH, determination of pH of a solution with the help of pH meter including simple numerical problems.
- 5 Electrolysis (12 Periods)
- 5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples
- 5.2 Faraday's Laws of Electrolysis with simple numerical problems
- 5.3 Different industrial applications of 'Electrolysis' with special reference to electroplating and electrorefining of metals
- 5.4 Basic concept of Buffer solutions, indicators and solubility product.

6 Environmental Chemistry

(08 Periods)

- 6.1 General concept of pollution and pollutants
- 6.2 Types and control of pollution like air, water, noise and soil pollution
- 6.3 General idea of ozone depletion, global warming

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. To analyse the inorganic mixture for two acidic and two basic radicals from the following radicals
 - a) Acidic Radicals CO_3^{2-} , SO_4^{2-} , NO_3^- , CH_3COO^- , Cl^- , Br^- , I^-
 - b) Basic Radicals NH_4^+ , Pb^+ , Cu^{++} , Cd^{++} , As^{+++} , Sb^{+++} , Sn^{++} , Al^{+++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Ni^{++} , Co^{++} , Zn^{++} , Ba^{++} , Sn^{++} , Ca^{++} and Mg^{++} ,
4. Determine the degree of temporary hardness of water by O'Heher's method
5. Estimation of total alkalinity of water volumetrically
6. Determine pH of a given sample by using pH meter
7. Determination of solubility of a solid at room temperature
8. Demonstration – Application of FeCl_3 in etching process for designing circuits on PCB (Printed Circuit Board)

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	8	15
2	8	20
3	16	20
4	12	15
5	12	15
6	8	15
Total	64	100

1.5 BASICS OF INFORMATION TECHNOLOGY

Periods/Weeks L T P
 2 - 3

RATIONALE

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

DETAILED CONTENTS

1. Information Technology – its concept and scope (2 Periods)
2. Elements of a computer system, its usefulness and applications, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data; contents of a program, processing of data (4 Periods)
3. Computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. (4 Periods)
4. Input devices; keyboard, scanner, mouse etc ; output devices ; VDU and Printer, Plotter (4 Periods)
5. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory) (4 Periods)
6. Introduction to Operating Systems such as MS-DOS and Windows (4 Periods)
7. Introduction to internet, browsing using search engine (like google etc.) (5 Periods)
8. Basics of Networking – LAN, WAN, Topologies (5 Periods)

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection

4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time color (back ground and fore ground)
 - Using short cuts
 - Using on line help
7. MS-Word
 - 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
 - Page Set up:
Setting margins, tab setting, ruler, indenting
 - Editing a document:
Entering text, Cut, copy, paste using tool- bars
 - 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
 - Inserting date, time, special symbols, importing graphic images, drawing tools
 - 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
 - Using Tools like:
Spell checker, help, use of macros, mail merge, thesaurus word content and

- statistics, printing envelopes and labels
 - Using shapes and drawing toolbar,
 - Working with more than one window in MS Word,
 - How to change the version of the document from one window OS to another
 - Conversion between different text editors, software and MS word
8. MS-Excel
- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
 - Menu commands:
Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
 - 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, working with arrays
 - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
 - 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
9. MS PowerPoint
- a) Introduction to PowerPoint
 - How to start PowerPoint
 - Working environment: concept of toolbars, slide layout, templates etc.
 - Opening a new/existing presentation
 - Different views for viewing slides in a presentation: normal, slide sorter etc.
 - b) Addition, deletion and saving of slides
 - c) How to view the slide show?
 - Viewing the presentation using slide navigator
 - Slide transition
 - Animation effects etc.
10. Internet and its Applications
- a) Log-in to internet
 - b) Navigation for information seeking on internet
 - c) Browsing and down loading of information from internet

d) Sending and receiving e-mail

- Creating a message
- Creating an address book
- Attaching a file with e-mail message
- Receiving a message
- Deleting a message

INSTRUCTIONAL STRATEGY

Since this is an introductory computer related subject, the teacher should demonstrate and explain computer and its peripherals in the laboratory. The theory may be dovetailed with practical exercises for better understanding. The students may be encouraged to work independently on computer to gain confidence.

RECOMMENDED BOOKS

1. Fundamentals of Computer by V . Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Computers Today by SK Basandara, Galgotia Publication Pvt ltd. Daryaganj, New Delhi.
3. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. Mastering Windows 95, BPB Publication, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
11. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

S. No	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	10
2	04	15
3	04	10
4	04	15
5.	04	10
6	04	10
7	05	15
8	05	15
Total	32	100

1.6 ENGINEERING DRAWING – I

L T P
Periods/Weeks - - 8

RATIONALE

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

- Note:
1. First angle projection is to be followed
 2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
 3. S.P. 46.1988 should be followed
 4. Minimum of 15 sheets to be prepared by each student

DETAILED CONTENTS

1. Drawing Office Practice, Lines & Lettering (2 Sheets)
 - 1.1 Drawing instruments
 - 1.2 Sizes and layout of standard drawing sheets and drawing boards
 - 1.3 Different types of lines in engineering drawing as per BIS specifications
 - 1.4 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4
2. Dimensioning (2 Sheets)
 - 2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning, size and location dimensioning) Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning.
 - 2.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches.
3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)
 - 3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
 - 3.2 Ellipses (concentric circle method and Intersecting Arcs method)
 - 3.3 Parabola (rectangle and tangent method), cycloid

4. Scale (2 sheets)
 - 4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale
 - 4.2 Construction of plain and diagonal scales

5. Principle of Projections (7 sheets)
 - 5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection
 - 5.2 Projection of points situated in different quadrants (1 Sheet)
 - 5.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (1st & 3rd quadrants); Line inclined to both reference planes (HP and VP) (1 Sheet)
 - 5.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and inclined to the other or vice versa (1st & 3rd quadrants) (1 Sheet)
 - 5.5 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both
 - 5.6 Drawing 3 orthographic views of given objects (3 sheets, at least one sheet in 3rd Angle Projection)
 - 5.7 Identification of surfaces on drawn orthographic views from isometric object drawn (1 Sheet)

6. Sectional Views (1 sheet)
 - 6.1 Need for sectional views – Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections

7. Isometric Views (2 sheets)
 - 7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
 - 7.2 Isometric views of combination of regular solids like cylinder, cone, cube, prism and pyramid

8. Symbols and Conventions (2 sheets)
 - 8.1 Civil engineering sanitary fitting symbols
 - 8.2 Electrical fitting symbols for domestic interior installations and electronics symbols
 - 8.3 Building plan drawing with electrical and civil engineering symbols

RECOMMENDED BOOKS

- 1 Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
2. Elementary Engineering Drawing (in First Angle Projection) by ND Bhatt, Charotar Publishing House
3. A Text Book of Engineering Drawing by Surjit Singh ; Dhanpat Rai and Co., Delhi
4. Engineering Drawing by PS Gill ; SK Kataria and sons, Delhi
5. Engineering Drawing by RB Gupta ; Satya Prakashan, New Delhi

1.7 GENERAL WORKSHOP PRACTICE – I

L T P
Periods/Week - - 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 hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

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

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering and Automobile Engineering, will do **Smithy Shop** instead of Electronic Shop- I
2. The branches e.g. Electronics and Communication Engineering, Computer Engineering and Information Technology will do **Electronic Shop-I** instead of Smithy Shop.

1. Carpentry and Painting Shop -I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
Job I Marking, sawing, planning and chiseling & their practice (size should be mentioned)
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.
Job II Preparation of half lap joint
Job III Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.
Job IV Preparation of wooden surface before painting including primer coating
Job V Painting Practice by brush/spray
Job VI Preparation of surface, before Painting such as cleaning, sanding, putty. Procedure and application of primer code and painting steel items.
- 1.5 Safety precautions in carpentry shop

2. Fitting Shop

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. Such as Steel, Brass, Copper, Aluminium etc. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches, holding devices and files. Precautions while filing.
- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.
Job II Filing a dimensioned rectangular or square piece of an accuracy of $\pm 0.5\text{mm}$
Job III Filing practice (production of flat surfaces). Checking by straight edge.

Job IV Making a cutout from a square piece of MS Flat using hand hacksaw.
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count (all gauges including dial gauge).

3. Welding Shop – I

- 3.1 (a) Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, electrode holder, electrodes and their specifications, welding screens and other welding related equipment, accessories and gloves.
- (b) Safety precautions during welding
- (c) Hazards of welding and its remedies
- 3.2 Electric arc welding, (a.c. and d.c.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc. Earthing of welding machine.
 - Job I Practice of striking arc bending and tacking while using electric arc welding set.
 - Job II Welding practice on electric arc welding for making uniform and straight weld beads
- 3.3 Various types of joints and end preparation.
 - Job III Preparation of butt joint by electric arc welding.
 - Job IV Preparation of lap joint by electric arc welding.
 - Job V Preparation of corner joint by using electric arc welding.
 - Job VI Preparation of Tee joint by electric arc welding.

4. Electric Shop – I

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, PVC Conduits, PVC Channels and allied items, tools along with electrical instruments such as voltmeter, ammeter and multimeter.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices such as fuses, MCBs, ELCBs and relays including earthing.
 - Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.
 - Job II Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, gas geyser, desert cooler, refrigerator, water purifier
- 4.4 Introduction to lead-acid battery, identification of parts and its working.
 - Job III Installation of inverter with battery and to connect two or more batteries in series and in parallel (knowledge of a.c. and d.c.)
 - Job IV Charging of a battery and testing it with the help of hydrometer and cell tester

5. Smithy Shop

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.
- 5.3 Demonstration and description of tongs, fullers, swages etc.
 - Job I To forge a L-hook.
 - Job II To prepare a job involving upsetting process
 - Job III To forge a chisel
 - Job IV To prepare a cube from a M.S. round by forging method.

OR

5. Electronic Shop – I

- 5.1 Identification and familiarization with the following tools used in electronic shop: Such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux . Their demonstration and uses.
- 5.2 Identification and familiarization with Multimeter (analog and digital)
 - Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done
- 5.3 Various types of protective devices such as : wire fuse, cartridge fuse etc. ,
- 5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video)
- 5.5 Safety precautions to be observed in the electronic shop
- 5.6 Identification and familiarization with soldering and desoldering practice
- 5.7 Introduction to thimbles and crimping tools

NOTE: Demonstration boards for the electronics components such as resistor, capacitor, diodes, transistors, FETs, IFT Coils, ICs should be made.

- Job II Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires)
- Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/audio video/telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD players, VCD/DVD players, cassette recorder and players, Hi-Fi equipment, hand- set, microphone

6. Sheet Metal Shop

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 and specifications.

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. shearing machine, bar folder, burring machine, power press, sheet bending machine.
- 6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.
- 6.4 Study of various types of rivets, steel screw etc.

Job I Shearing practice on a sheet using hand shears.

- a) Practice on making single riveted lap joint/double riveted lap Joint.
- b) Practice on making single cover plate chain type, seam joint and riveted butt joint

RECOMMENDED BOOKS

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

SECOND SEMESTER

2.1 ENGLISH AND COMMUNICATION SKILLS – II

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieve results and create successful organizations. The goal of the Communicating Skills course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

Section A

FACETS OF LITERATURE

(22 Periods)

- 1.1 Fiction
 - 1.1.1 The Portrait of a Lady - Khushwant Singh
 - 1.1.2 The Doll's House – Katherine Mansfield
 - 1.1.3 The Refugees – Pearl S. Buck
- 1.2 Prose
 - 1.2.1 Of Truth – Francis Bacon
 - 1.2.2 Praises of Solitude – Samuel Johnson
 - 1.2.3 A Gentleman – John Henry Newman
- 1.3 Poems
 - 1.3.1 All The World's A Stage – W. Shakespeare
 - 1.3.2 A Solitary Reaper – William Wordsworth

Section B

2. READING SKILLS

(08 Periods)

Unseen comprehension passages (at least 3 passages).

3. WRITING SKILLS (16 Periods)
- 3.1 Writing Notice
 - 3.2 Writing Circular
 - 3.3 Writing a Memo
 - 3.4 Agenda for a Meeting
 - 3.5 Minutes of the Meeting
 - 3.6 Press release
 - 3.7 Telephonic Messages
 - 3.8 Paragraph writing:
Simple and Current Topics should be covered.
4. Correspondence (06 Periods)
- 4.1 Business Letters
 - 4.2 Personal Letters
5. Communication (12 Periods)
- 5.1 Media and Modes of Communication
 - 5.2 Channels of Communication
 - 5.3 Barriers to Communication
 - 5.4 Listening Skills
 - 5.5 Body language
 - 5.6 Humour in Communication

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

1. LISTENING COMPREHENSION
- 1.1 Locating Main Ideas in a Listening Excerpt
 - 1.2 Note-taking
2. DEVELOPING ORAL COMMUNICATION SKILLS
- 2.1 Offering-Responding to Offers
 - 2.2 Requesting-Responding to Requests
 - 2.3 Congratulating
 - 2.4 Expressing Sympathy and Condolences
 - 2.5 Expressing Disappointments
 - 2.6 Asking Questions-Polite Responses
 - 2.7 Apologizing, Forgiving

- 2.8 Complaining
- 2.9 Persuading
- 2.10 Warning
- 2.11 Asking for and Giving Information
- 2.12 Giving Instructions
- 2.13 Getting and Giving Permission
- 2.14 Asking For and Giving Opinions
- 2.15 Group Discussion

LIST OF REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	22	34
2	08	12
3	16	24
4	06	10
5	12	20
Total	64	100

2.2. APPLIED MATHEMATICS - II

	L	T	P
Periods/Week	3	4/2	-

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like differential calculus, integral calculus, differential equations and statistics. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Differential Calculus (30 Periods)

1.1 Definition of function; Concept of limits.

$$\begin{aligned} & \text{Lt } x^n - a^n, \\ & \text{Four standard limits } x \rightarrow a \text{ -----} \\ & \qquad \qquad \qquad x - a \\ & \text{Lt } \frac{\sin x}{x}, \quad \text{Lt } \frac{a^x - 1}{x}, \quad \text{Lt } \frac{(1+x)^{1/x} - 1}{x} \\ & x \rightarrow 0 \end{aligned}$$

- 1.2 Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , $\log_a x$ only
- 1.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
- 1.4 Differentiation of inverse trigonometrical functions, Logarithmic differentiation, Exponential differentiation, Successive differentiation (upto third order only).
- 1.5 Applications:
 - (a) Maxima and minima
 - (b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only

2. Integral Calculus (25 Periods)

- 2.1 Integration as inverse operation of differentiation
- 2.2 Simple standard integrals and related problems
- 2.3 Simple integration by substitution, by parts and by partial fractions (for

linear factors only)

2.4 Properties of definite integrals

2.5 Evaluation of definite integrals (simple problems)-

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

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

2.6 Numerical integration by Simpson's Rule and Trapezoidal Rule (simple problems only)

3 Ordinary Differential Equations (10 Periods)

3.1. Definition, order, degree, linear and non-linear differential equations

3.2 Formation of differential equations (up to second order)

3.3. Solution of first order differential equations (a) Variable Separable (b) Homogeneous (c) Linear and (d) Exact.

4. Statistics (15Periods)

4.1 Measures of Central Tendency: Mean, Median, Mode

4.2 Measures of Dispersion: Mean deviation, Standard deviation

4.3 Co-efficient of rank correlation

RECOMMENDED BOOKS

1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
5. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	30	40
2	25	30
3	10	10
4	15	20
Total	80	100

2.3 APPLIED PHYSICS – II

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

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

DETAILED CONTENTS

1. Optics (10 Periods)
 - 1.1 Review of basic optics laws: reflection and refraction
 - 1.2 Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications
 - 1.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications
2. Electrostatics (12 Periods)
 - 2.1 Coulombs law, unit of charge, electric potential and electric potential difference
 - 2.2 Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law
 - 2.3 Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets
 - 2.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down
 - 2.5 Application of electrostatics in electrostatic precipitator

3. DC Circuits (12 Periods)
- 3.1 Concept of electricity, current and its units, direct and alternating current, voltage, resistance and resistivity, potential difference and e.m.f., Concept and applications of potentiometer.
 - 3.2 Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.
 - 3.3 Kirchhoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)
 - 3.4 Heating effect of current and concept of electric power, energy and their units, related numerical problems
 - 3.5 Application of electricity in various equipments, advantages of electrical energy over other forms of energy
4. Electromagnetism (13 Periods)
- 4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid
 - 4.2 Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.
 - 4.3 Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.
 - 4.4 Electromagnetic induction, Faradays Laws, Lenz's Law.
 - 4.5 Applications of Electromagnetism
5. Semiconductor physics (07 Periods)
- 5.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
 - 5.2 Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)

6. Modern Physics (10 Periods)
- 6.1 Electro magnetic spectrum, photo electric effect and work function, X rays - properties, production and their applications in medicine and industries.
 - 6.2 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications
 - 6.3 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

LIST OF PRACTICALS (To perform minimum eight experiments)

1. Conversion of Galvanometer into an Ammeter of given range.
2. Conversion of Galvanometer into Voltmeter of given range.
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To draw characteristics of a pn junction diode and determine knee and break down voltages
6. Verification of Kirchhoff's Laws
7. Determination of resistivity by Wheatstone bridge
8. To determine the resistance of electronic components by multimeter
9. Determination of internal resistance of primary cell by using ammeter and voltmeter
10. To determine emf of primary cell using potentiometer and standard voltage source.

INSTRUCTIONAL STATREGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, dc circuits, electromagnetism, and semiconductor physics etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1.	10	15
2.	12	20
3.	12	20
4.	13	20
5.	07	10
6.	10	15
Total	64	100

2.4 APPLIED CHEMISTRY-II

	L	T	P
Periods/Week	3	2/2	2

RATIONALE

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

DETAILED CONTENTS

1. Metallurgy (12 Periods)
 - 1.1 A brief introduction of the terms: Metallurgy, mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations
 - 1.2 Metallurgy of (i) Aluminium (ii) Iron
 - 1.3 Definition of an alloy, purposes of alloying, composition and uses of alloys like magnalium, duralumin, alnico, invar and stainless steel
2. Fuels (16 Periods)
 - 2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
 - 2.2 Definition of Calorific value of a fuel and its determination for a solid fuel with the help of Bomb calorimeter with simple numerical problems.
 - 2.3 Merits of gaseous fuels over those of other varieties of fuels
 - 2.4 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) Compressed Natural gas (CNG)
 - 2.5 Octane Number and Cetane Number
3. Corrosion (08 Periods)
 - 3.1 Meaning of the term 'corrosion' and its definition

- 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
- 3.3 Prevention of corrosion by
 - (a) Alloying
 - (b) Providing metallic coatings
 - (c). Sacrificial cathodic protections:
- 4 Lubricants (08 Periods)
 - 4.1 Definition of (i) lubricant (ii) lubrication
 - 4.2 Classification of lubricants
 - 4.3 Principles of lubrication
 - (i) fluid film lubrication
 - (ii) boundary lubrication
 - 4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility, oxidation, oiliness, acidity, emulsification, flash point, fire point and pour point.
 - 4.5 Importance of additives in lubricants
 - 4.6 Dewaxing and solvent refining of liquid lubricants
- 5 Cement and Glass (04 Periods)
 - 5.1 General introduction to cement and glass
 - 5.2 Manufacture of Cement
 - 5.3 Manufacture of ordinary glass and lead glass
- 6. Classification and Nomenclature of Organic Compounds (16 Periods)
 - 6.1 Classification of Organic Compounds, functional group, Homologus Series
 - 6.2 Physical and Chemical properties, and industrial use of Organic Compound
 - 6.3 IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines (first six members of each series only).

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Estimate the amount of moisture in the given sample of coal
4. Esterification and ceric ammonium tests of alcohol
5. Sodium carbonate and Ester test of carboxylic acids
6. To determination the amount of copper in the given sample of copper sulphate with the help of N/20 sodium thiosulphate solution.
7. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given)
8. Demonstration to determine calorific value of a solid fuel with the help of Bomb Calorimeter

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. A Text Book of Applied Chemistry-II by SS Kumar; Tata McGraw Hill, Delhi
4. A Text Book of Applied Chemistry-II by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M,
6. Chemistry of Engineering by Aggarwal CV,
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Applied Chemistry-II by Dr. J K Sharma, Abhishek Publications, Sector 17-C, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures and Tutorials (Periods)	Marks Allotted (%)
1	12	15
2	16	25
3	08	20
4	08	20
5	04	10
6.	16	10
Total	64	100

2.5 ENVIRONMENTAL SCIENCE

L T P
Periods/Week 3 - -

RATIONALE

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 eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Basics of ecology, eco system and sustainable development (03 Periods)
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table (04 Periods)
3. Sources of pollution - natural and man made, their effects on living and non-living organisms, Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms, Pollution of air-causes and effects of man, animal, vegetation and non-living organisms, Sources of noise pollution and its effects (18 Periods)
4. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods (06 Periods)
5. Mining, blasting, deforestation and their effects (03 Periods)
6. Legislation to control environment (04 Periods)
7. Environmental Impact Assessment (EIA), Elements for preparing EIA statements (04 Periods)
8. Current issues in environmental pollution and its control, role of non-conventional sources of energy in environmental protection (06 Periods)

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Engineering and Management by Suresh K Dhamija; SK Kataria and Sons, New Delhi.
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	03	6
2	04	10
3	18	40
4	06	12
5	03	04
6	04	08
7	04	08
8	06	12
Total	48	100

2.6 ENGINEERING DRAWING – II

L T P
Periods/Week - - 8

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

- Note:
1. First angle projection is to be followed
 2. Minimum of 15 sheets to be prepared by each student
 3. SP 46 – 1988 should be followed
 4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Section of Solids by Different Cutting Planes
2. Development of Surfaces (2 sheets)

Development of surfaces – cubes, prisms, (square, pentagonal and hexagonal), cylinders, pyramids (square, pentagonal, hexagonal) and cones
3. Detail and Assembly Drawing (2 sheets)
 - 3.1 Principle and utility of detail and assembly drawings
 - 3.2 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 Mortise and Tenon joint
4. Threads (2 sheets)
 - 4.1 Nomenclature of threads, types of threads (metric), single and multiple start threads
 - 4.2 Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
 - 4.3 Simplified conventions of left hand and right hand threads, both external and internal threads
5. Locking Devices (1 sheet)

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

6. Nuts and Bolts (3 sheets)
Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck, bolts with hexagonal and square nuts and washers. Foundations bolts – Rag bolt and Lewis bolt
7. Screws, Studs and Washers (1 sheet)
 - 7.1 Drawing various types of machine screws
 - 7.2 Drawing various types of studs and set screws
8. Keys and Cotters (2 sheets)
 - 8.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position
 - 8.2 Cotter joints (i) gib and cotter joint (ii) knuckle joint
9. Rivets and Riveted Joints (2 sheets)
 - 9.1 Types of structural and general purposes rivet heads
 - 9.2 Caulking and fullering of riveted joints
 - 9.3 Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting
10. Welded Joints (1 sheet)
 - 10.1 Various conventions and symbols of welded joints (IS 696)
 - 10.2 Practical applications of welded joints say joints on steel frames, windows, doors and furniture
11. Couplings (2 sheets)
 - 11.1 Muff or Box coupling, half lap muff coupling
 - 11.2 Flange coupling (Protected and non-protected)
 - 11.3 Flexible coupling
12. AutoCAD (for practicals and viva only)
 - 12.1 Practice on drawing commands, editing commands
 - 12.2 Practice on sectioning and hatching
 - 12.3 Practice on preparing simple drawings

RECOMMENDED BOOKS

- 1 Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
- 2 Elementary Engineering Drawing by ND Bhatt, Charotar Publishing House
- 3 A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai and Co. Delhi
- 4 Engineering Drawing by PS Gill, SK Kataria and Sons, New Delhi
- 5 Machine Drawing by RB Gupta, Satya Prakashan, New Delhi.

Note:

- 1 A minimum of 15 sheets should be prepared by each student
2. No table is suggested for distribution of marks, instead it is emphasized that the examination paper should contain exercises for evaluation of all necessary skills envisaged in the curriculum.
3. It is also suggested that a comprehensive viva of each students should be conducted by an external examiner during or just after the examinations to ascertain understanding of the subject e.g. reading and interpreting drawings and development of necessary skills etc.

2.7 GENERAL WORKSHOP PRACTICE - II

Periods/Weeks L T P
 - - 8

RATIONALE

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

DETAILED CONTENTS (PRACTICALS)

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. Carpentry and Painting shop-II
2. Fitting and Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Electronic shop-II or Machine Shop

Note:

1. The branches e.g. Civil Engineering, Mechanical Engineering, Mechanical (Automobile), Chemical Engineering, Chemical (R&P), Agriculture Engineering, Electrical Engineering and Automobile Engineering will do **Machine Shop** instead of Electronic shop- II
2. The branches e.g. Electronics and Communication Engineering, Computer Engineering and Information Technology will do **Electronic shop-II** instead of Machine shop.
3. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

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

- 1.1 Introduction to joints, their relative advantages and uses.
Job I Preparation of dovetail joint and glued joint.
Job II Preparation of mitre joint
Job III Preparation of a lengthening Joint
Job IV Preparation of at least one utility job with and without lamination.

- 1.2 Demonstration of job showing use of rip saw, bow saw and tenon saw, method of sharpening various saws.
- 1.3 Demonstration of job on band saw and circular saw, chain and chisel, universal wood working machine, Saw re-sharpening machine, saw brazing unit.
- 1.4 Importance and need of polishing wooden items. Introduction to polishing materials.

Job V Polishing on wooden items.

2. Fitting and Plumbing Shop

- 2.1 Introduction to various types of threads (internal and external)-single start, multi-start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies
Selection of dies for threading, selection of drills, taps and reamers for tapping operations.
Job I Making internal and external threads on a job by tapping and dieing operations (manually)
- 2.3 Precautions while drilling soft metals, e.g. copper, brass, aluminium etc.
Job II Drilling practice on soft metals such as aluminum, brass and copper
Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of $\pm 0.2\text{mm}$
Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps etc

3. Welding Shop – II

- 3. Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.
Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding and tacking practice on simple jobs.
- 3.2 Common welding joints generally made by gas welding.
Job II Preparation of butt joint by gas welding.
Job III Preparation of small cot frame from conduit pipe by gas welding.
Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).
Job V Exercise of preparing a job on spot/seam welding machine.
- 3.3 Demonstration and use of TIG and MIG welding equipment

4. Electric Shop – II

- 4.1 Importance and demonstration of three-phase wiring on three-phase panel with the help of a demonstrating panel.
Job I Laying out 3-phase wiring for an electric motor or any other 3-phase machine.
Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

- Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.
- Job IV Finding fault in simple electric machine and its rectification
- 4.2 Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, electric heater, geyser, electric oven, air conditioner etc.
- Job V Testing single phase/three phase electrical motor by using voltmeters, ammeter, clip-on meter, tachometer etc.
- Job VI Reversing the rotation of a motor.

5. Electronic Shop- II

- 5.1 Uses of the items mentioned below:
- a) Various types of single, multi-cored insulated screened wire and cables - power, audio video, co-axial, general purpose wires/cables
 - b) Various types of plugs, sockets, connectors suitable for general purpose audio and video use, 2 and 3 pin mains plugs and sockets, RF plugs and sockets.
Banana-plugs, and sockets, BNG, RCA, DIN, UHF, ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.
 - c) Various types of switches such as normal/miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way master mains switch.
 - d) Various types of protective devices such as : wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.
 - e) Materials: Conducting, insulating and magnetic materials.
 - f) Demonstration and uses of single beam simple cro, signal generator and function-generator
 - g) Regulated power supply-fixed and variable voltage, single output as well as dual output.
- 5.2 Identification and familiarization with active and passive components; types and colour code of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including diode, LED, transistor, LCD, UJT, FET, coils, relays, reed relays, transformers, linear and digital ICs, thyristors.
- 5.3 Demonstrate the following:
- To make perfect solder joints and soldering on PCBs
 - To remove components/wires by unsoldering
 - To assemble components on boards, chassis, tape strips
 - Various laying methods of cables
 - Exposure to modern soldering and de-soldering processes

- Field visits to relevant work-places
- Identification of active and passive components

1. Use of multimeter and testing of active and passive components.

Job I Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc) on a PCB.

Job II Soldering practices

Job III Temperature controlled soldering station

Job IV De-soldering pump

Job V De-soldering strip/wik

Job VI De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tag strip.

Job VII Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

OR

5 Machine Shop

Introduction to various machines used in machine shop

Job I: Exercise on simple turning

Job II: Exercise on taper turning

Job III: Marking and drilling practice on mild steel piece

Job IV: Marking and drilling practice on aluminium piece

Job V : Demonstration of various functions of CNC Machine

RECOMMENDED BOOKS

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