

2.1 COMMUNICATION SKILLS – II

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3 - 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

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|-----|--------------------------------------|----------|
| 1. | Grammar and Usage | (15 Hrs) |
| 1.1 | Prepositions | |
| 1.2 | Pronouns | |
| 1.3 | Determiners | |
| 1.4 | Conjunctions | |
| 1.5 | Question and Question Tag | |
| 1.6 | Tenses (Simple Present, Simple Past) | |

Section B

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|-----|--|----------|
| 2. | Reading Skills | (15 Hrs) |
| | Unseen comprehension passages (at least 5 passages). | |
| 3. | Writing Skills | (18 Hrs) |
| 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 Telephonic Messages
- 3.7 Paragraph writing:
Simple and Current Topics should be covered.

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

INSTRUCTIONAL STRATEGY

Looking into the present day needs of effective communication in every field, it is imperative to develop necessary competencies in students by giving practical tips and emphasis on grammar, vocabulary and its usage in addition to practical exercises. The teacher should give report writing assignments, projects etc. while teaching this subject.

LIST OF RECOMMENDED 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 (Hrs)	Marks Allotted (%)
1	15	30
2	15	35
3	18	35
Total	48	100

2.2. APPLIED MATHEMATICS - II

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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 hrs)

1.1 Definition of function; Concept of limits.

$$\text{Lt } \frac{x^n - a^n}{x - a} \quad \text{Lt } \frac{\sin x}{x} \quad \text{Lt } \frac{a^x - 1}{x} \quad \text{Lt } \frac{(1+x)^{1/x} - 1}{x}$$

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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 hrs)

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 Evaluation of definite integrals (simple problems)-

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

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

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

3 Ordinary Differential Equations (10 hrs)

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

3.2 Formation of differential equations (upto second order)

3.3. Solution of first order differential equations by variable separable method only

4. Statistics (15hrs)

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

INSTRUCTIONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus, Ordinary Differential Equations and Statistics can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students.

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	40
2	25	30
3	10	10
4	15	20

Total	80	100
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2.3 APPLIED PHYSICS-II

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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 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. Waves and Vibrations (10 hrs)
 - 1.1. Definition of wave with examples
 - 1.2. Types of wave motion, transverse and longitudinal wave motion with examples
 - 1.3. Relation between velocity of wave, frequency and wave length of a wave ($v = n \lambda$)
 - 1.4. Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
 - 1.5. Vibration of spring mass system, cantilever and determination of their time period.
 - 1.6. Free, forced and resonant vibrations with examples

2. Applications of Sound Waves (10 hrs)
 - 2.1 Acoustics of buildings-reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
 - 2.2 Ultrasonics-Methods of production (magnetostriction oscillator only) and their engineering applications to cold welding, drilling, cleaning and SONAR

3. Principles of Optics (10 hrs)
 - 3.1 Lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual image, magnification.
 - 3.2 Power of lens, microscope, telescope (definition only)
 - 3.3 Total internal reflection, critical angle and conditions for total internal reflection.

4. Electrostatics (12 hrs)
- 4.1 Coulomb's law, unit charge
 - 4.2 Gauss's Law
 - 4.3 Electric field intensity and electric potential (definition and units only)
 - 4.4 Application of Gauss's Law to straight charged conductor, plane charged sheet
 - 4.5 Capacitance, capacitance of parallel plate capacitor, series and parallel combination of capacitors
 - 4.6 Dielectric and its effect on capacitors, dielectric constant and dielectric breakdown
5. Current Electricity (10 hrs)
- 5.1 Definition of electric current, resistance, potential & their units.
 - 5.2 Ohm's law
 - 5.3 Specific resistance, series and parallel combination of resistances, effect of temperature on resistance.
 - 5.4 Kirchhoff's laws, Wheatstone bridge
 - 5.5 Heating effect of current and concept of electric power
6. Semi Conductor Physics (6 hrs)
- 6.1 Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semi conductor, p-n junction diode and its characteristics
 - 6.2 Diode as rectifier-half wave and full wave rectifier, semi conductor transistor pnp and npn (introduction only)
7. Modern Physics (6 hrs)
- 7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; population inversion, Laser, types of lasers, ruby laser and applications of laser
 - 7.2 Fiber optics: Introduction and applications
 - 7.3 Super conductivity: Phenomenon of super conductivity, Type I and Type II super conductor and its applications

LIST OF PRACTICALS

1. To determine and verify the time period of cantilever.
2. To determine time period of Simple Pendulum.
3. To verify ohm's law.
4. To verify law of resistance in series.
5. To verify law of resistances in parallel.
6. To find resistance of galvanometer by half deflection method.
7. To convert a galvanometer into an ammeter of given range.
8. To convert a galvanometer into a voltmeter of given range.
9. To study and verify laws of reflection using mirrors.

INSTRUCTIONAL STRATEGY

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, semiconductor and modern physics etc to develop proper understanding of the physical phenomenon. Use of demonstration will make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Concept of Physics by H.C. Verma, Part-1, Bharti Bhawan, New Delhi
2. Concept of Physics by H.C. Verma, Part-2, Bharti Bhawan, New Delhi
3. A Text Book of Applied Physics by RA Banwat and SD Dogra, Eagle Parkashan, Jalandhar
4. Applied Physics by BL Arora, King India Publications, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

S.No	Time Allotted (Hrs.)	Marks Allotted (%)
1	10	14
2	10	14
3	10	14
4	12	20
5	10	16
6	06	12
7	06	10
Total	64	100

2.4 APPLIED CHEMISTRY-II

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3 - 2

RATIONALE

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products 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 demonstrations/ minor projects and with the active involvement of 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. Metallurgy (08 hrs)
 - 1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.
 - 1.2 Metallurgy of (i) Aluminium (ii) Iron
 - 1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys, monel metal, magnalium, duralumin, alnico, stainless steel and invar.

2. Fuels (10 hrs)
 - 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 determination of calorific value of a solid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values
 - 2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a coal. Importance of conducting the proximate and ultimate analysis of a fuel
 - 2.4 Merits of gaseous fuels over those of other varieties of fuels
 - 2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas
 - 2.6 Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol

- 2.7 Fuel rating
 - 2.7.1 Octane number for petrol
 - 2.7.2 Cetane number for diesel

- 3 Corrosion (06 hrs)
 - 3.1 Definition of corrosion
 - 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
 - 3.3 Passivity
 - 3.4 Prevention of corrosion by
 - 3.4.1 Alloying
 - 3.4.2 Providing metallic coatings
 - 3.4.3 Cathodic protections:
 - (a) Sacrificial
 - (b) Impressed voltage method
 - 3.4.4 Heat treatment (quenching, annealing, tempering & normalizing)

- 4 Lubricants (06 hrs)
 - 4.1 Definition of (i) lubricant (ii) lubrication
 - 4.2 Classification of lubricants
 - 4.3 Principles of lubrication
 - 4.3.1 fluid film lubrication
 - 4.3.2 boundary lubrication
 - 4.3.3 extreme pressure lubrication
 - 4.4 Properties of lubricants
 - 4.4.1 Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-pour point, oiliness, volatility, emulsification
 - 4.4.2 Chemical properties-Total acidity number (TAN) saponification and iodine value, coke number and aniline point.
 - 4.5 Criterion for selection of a good lubricant

- 5 Glass (04 hrs)
 - 5.1 Glass: Chemical composition, types of glasses and their applications
 - 5.2 Manufacture of ordinary glass and lead glass

- 6. Classification and Nomenclature of Organic Compounds (06 hrs)

Classification of Organic Compounds, functional group, Homologous Series, IUPAC-Nomenclature of various homologous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols. (First six members of each series only)

7. Polymers & Plastics (08 hrs)
- 7.1 Definition of polymer, monomer & degree of polymerization
 - 7.2 Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)
 - 7.3 Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples
 - 7.4 Applications of polymers & plastics in daily life.

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid
9. To determination the total acidity number of a lubricant
10. Detection of metal iron in the rust (solution of rust in concentrated HCl may be given)
11. To study the effect of metal coupling on corrosion of metals

INSTRUCTIONAL STATREGY

Teacher may take help of various models and charts while imparting instructions to make the concepts clear. More emphasis may be laid on discussing and explaining practical applications of various chemical processes and reactions. In addition, students should be encouraged/motivated to study those processes in more details, which may find practical applications in their future professional life.

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. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

5. Engineering Chemistry by Jain PC and Jain M Dhanpatrai publishers. New Delhi
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar
9. A Text Book of Applied Chemistry-II by Dr. J K Sharma (Hindi version), Abhishek Publications, Sec. 17-C, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	10	20
3	06	14
4	06	14
5	04	08
6	06	12
7	08	16
Total	48	100

2.5 APPLIED MECHANICS

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3 - 2

RATIONALE

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

DETAILED CONTENTS

1. Introduction (04hrs)
 - 1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.
 - 1.2 Definition, basic quantities and derived quantities of basic units and derived units
 - 1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration
 - 1.4 Concept of rigid body, scalar and vector quantities

2. Laws of forces (09 hrs)
 - 2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force
 - 2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position
 - 2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components
 - 2.4 Free body diagram
 - 2.5 Equilibrant force and its determination
 - 2.6 Lami's theorem (concept only)
[Simple problems on above topics]

3. Moment (09 hrs)
 - 3.1 Concept of moment
 - 3.2 Moment of a force and units of moment
 - 3.3 Varignon's theorem (definition only)
 - 3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)
 - 3.5 Parallel forces (like and unlike parallel force), calculating their resultant
 - 3.6 Concept of couple, its properties and effects

- 3.7 General conditions of equilibrium of bodies under coplanar forces
- 3.8 Position of resultant force by moment
[Simple problems on the above topics]
- 4. Friction (06 hrs)
 - 4.1 Definition and concept of friction, types of friction, force of friction
 - 4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
 - 4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.
- 5. Centre of Gravity (08 hrs)
 - 5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies
 - 5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion
 - 5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed
[Simple problems on the above topics]
- 6. Simple Machines (06 hrs)
 - 6.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines
 - 6.2 Simple and compound machine (Examples)
 - 6.3 Definition of ideal machine, reversible and self locking machine
 - 6.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
 - 6.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
 - 6.6 Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application
[Simple problems on the above topics]
- 7. Torsion (06 hrs)
 - 7.1 Torsion in shafts/bars
 - 7.2 Modulus of rigidity
 - 7.3 Torsional Equation (simple numerical problems)
 - 7.4 Power Transmission in shafts (simple numerical problems)

LIST OF PRACTICALS

1. Verification of the polygon law of forces using greaves and apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

INSTRUCTIONAL STRATEGY

Applied Mechanics, being a fundamental subject, the teachers are expected to emphasize on the applications of applied mechanics in various subjects so that students are able to appreciate the importance of the subject.

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	09	20
3	09	20
4	06	12
5	08	16
6	06	12
7	06	12
Total	48	100

2.6 ENGINEERING DRAWING – II

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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 SP 46 – 1988 should be followed

- Note:
1. First angle projection is to be followed
 2. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Detail and Assembly Drawing (2 sheets)
 - 1.1 Principle and utility of detail and assembly drawings
 - 1.2 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 Mortice and Tenon joint, furniture drawing - freehand and with the help of drawing instruments.

2. Screw threads and threaded fasteners (8 sheets)
 - 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)

 - 2.2 Nuts and Bolts
 - 2.2.1 Different views of hexagonal and square nuts and hexagonal headed bolt
 - 2.2.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.
 - 2.2.3 Assembly of square headed bolt with hexagonal and with washer.

 - 2.3 Locking Devices
 - 2.3.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.
 - 2.3.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.

- 2.4 Drawing of various types of machine screw, set screw, studs and washers
- 3. Keys and Cotters (3 sheets)
 - 3.1 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
 - 3.2 Various types of joints (3 sheets)
 - Spigot and socket joint
 - Gib and cotter joint
 - Knuckle joint
- 4. Rivets and Riveted Joints (4 sheets)
 - 4.1 Types of general purpose-rivets heads (4 Sheets)
 - 4.2 Caulking and fullering of riveted joints
 - 4.3 Types of riveted joints
 - (i) Lap joint-Single riveted, double riveted (chain and zig-zag type)
 - (ii) Single riveted, Single cover plate butt joint (chain type)
 - (iii) Single riveted, double cover plate butt joint (chain type)
 - (iv) Double riveted, double cover plate butt joint(chain and zig-zag type)
- 5. Couplings (2 sheets)
 - 5.1 Flange coupling (Protected and non-protected), muff coupling and half-lap muff coupling
- 6. Symbols and Conventions (2 sheets)
 - 6.1 Civil engineering sanitary fitting symbols
 - 6.2 Electrical fitting symbols for domestic interior installations
- 7. AUTO CAD (for practical and viva-voce only)
 - 7.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode
 - 7.2 Drawing commands – point, line, arc, circle, ellipse
 - 7.3 Editing commands – scale, erase, copy, stretch, lengthen and explode

Note: Minimum 20 drawing sheets will be prepared by the students.

INSTRUCTIONAL STRATEGY

Teacher should show model or 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 instrument and its proper use.

RECOMMENDED BOOKS

1. Engineering Drawing by KK Dhiman, Ishan Publications, Ambala, Haryana
2. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House, Anand, Gujarat
3. A Text Book of Engineering Drawing by Surjit Singh published by Dhanpat Rai and Co., Delhi
3. Engineering Drawing by PS Gill published by SK Kataria and Sons, Delhi
4. Engineering Drawing by RB Gupta published by Satya Prakashan, New Delhi
5. Engineering Drawing by NS Kumar published by King India Publication, New Delhi

2.7 GENERAL WORKSHOP PRACTICE - II

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- - 6

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 (PRACTICAL EXERCISES)

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 Shop-II
2. Plumbing Shop
3. Welding Shop -II
4. Electric Shop –II
5. Electronic Shop-II or Machine Shop
6. Painting Shop

Note:

1. The branches e.g. Civil Engineering, Civil Engg. (Spl. in Highway Engg.), Electrical Engineering, Fire Technology and Safety, Electrical and Electronics Engg., Power Station Engg., Mechanical Engineering and cluster branches, Chemical Engg. and cluster branches, Ceramic Engg., Printing Technology (Spl. Press Tech.), Printing Technology (Spl. in CAD/GAT) will do **Machine Shop** instead of Electronic shop- II
2. The branches e.g. Electronics and Communication Engineering, Electronics and Instrumentation, Instrumentation and Control, Electronics Engg. (Spl. Power Electronics), Computer Engineering, Medical Electronics and Food 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 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. 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

- 3.1 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 of three-phase wiring and its effectiveness. Demonstration of three-phase wiring 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 direction of rotation of a motor.

5. Electronic Shop- II

5.1 Identification, demonstration and 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) 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 Demonstration of the following:

- a) Making perfect solder joints and soldering on PCBs
- b) Removing components/wires by unsoldering.
- c) Assembling components on boards, chassis, tape strips.
- d) Laying of cables by various methods
- e) Modern soldering and de-soldering processes
- f) Working of active and passive components
- g) Testing of active and passive components by the use of multimeter

Note: For the above field visits to relevant place may be arranged.

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| Job I | Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc) on a PCB. |
| Job II | Soldering practice |
| 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 such as Lathe, Milling Machine, Shaper, Slotter, Drilling Machine , Radial drilling Machine, Surface grinder.

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| Job I | Simple exercise on lathe machine. |
| Job II | Simple exercise on milling machine. |
| Job III | Simple exercise on drilling machine. |

6. Painting Shop

Introduction to painting shop and its necessity. Different types of paints. Introduction of powder coating plant and spray painting with their uses.

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| Job I | Preparation of surface before painting such as cleaning, sanding, applying putty, filling procedure and application of primer coat and painting steel item. |
| Job II | Painting practice by brush on MS sheet |
| Job III | Practice of dip painting |

Job IV	Practice of lettering: name plates / sign board
Job V	Polishing and painting on wooden and metallic surfaces
Job VI	Practical demonstration of powder coating

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