

2.1 ENGLISH AND COMMUNICATION SKILLS - II

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RATIONALE

Communication skills play an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills.

LEARNING OUTCOMES

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

- Make proper oral presentations.
- Speak confidently.
- Debate properly.
- Write accurate official/business letters.
- Respond to telephone calls effectively.
- Overcome communication barriers.

DETAILED CONTENTS

1. Functional Grammar and Vocabulary (12 hrs)

Theory and Practical exercises on following:

One word substitution

Functional Grammar and Vocabulary

Prefixes and Suffixes

Punctuation

Narration

Idioms and Phrases

2. Reading (9 hrs)

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

Section-I

- The Last Leaf - O' Henry
- Sparrows - K A Abbas
- The Postmaster - Rabindra Nath Tagore

Section-II

- Night of the Scorpion - Nissim Ezekiel
- All the World is a Stage - William Shakespeare
- Success – Emily Dickenson
- Daffodils – William Wordsworth

3. Writing (24 hrs)

Writing Resume and Cover letter
Correspondence: Business and Official
Report Writing – Introduction and features of good report.
Press Release
Memos and Circulars
Notices (lost, found, and auction)
Agenda and Minutes of Meetings
Filling-up different forms such as bank form and on-line form for placement etc.
Precis Writing
E mail writing

LIST OF PRACTICALS

1. Group discussion on some current topic of interest.
2. Small speech using voice modulation.
3. Debate
4. Manners and Etiquette
5. Power point presentation
6. Telephonic conversation: General etiquette for making and receiving calls.
7. Mock interviews

INSTRUCTIONAL STRATEGY

Open source software should be used to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1. Revathi, Srinivas, “Communicating Effectively in English, Book-I”, Abhishek Publications, Chandigarh.
2. Mohan, Krishna & Meera Banerji, “Developing Communication Skills (2nd Edition)”, Published by Macmillan Publishers India Ltd; New Delhi.
3. Eastwood, John, “Oxford Practice Grammar”, Oxford University Press, London

4. Chadha, R. K., “Communication Techniques and Skills”, Dhanpat Rai Publications, New Delhi.
5. Wren & Martin, “High School English Grammar and Composition”, S. Chand & Company Ltd., Delhi.
6. Kumar, Sanjay & Pushp Lata, “Communication Skills”, Oxford University Press, New Delhi

WEBSITES FOR REFERENCE

1. [http://www.mindtools.com/ page 8.html](http://www.mindtools.com/page 8.html)
2. <http://www.letstalk.com.in>
3. <http://www.englishlearning.com>
4. <http://learnenglish.britishcouncil.org/en/>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	12	12
2	9	12
3	24	26
Total	45	50

APPLIED MATHEMATICS – II

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3 -

RATIONALE

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

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Apply differential calculus to solve max/min and related rate measure problems.
- Apply concepts of definite integrals to calculate the area of a curve bounded by axes.
- Evaluate complex integrals in a simpler way by applying definite integral.
- Solve engineering problems by making use of ordinary differential equations.

DETAILED CONTENTS

1. Differential Calculus (18 hrs)

Definition of function; Introduction to limit and continuity(definition only).

Standard differentiation of algebraic, trigonometric, inverse trigonometric functions, logarithmic function and exponential function.

Differentiation of sum, product and quotient of functions, Differentiation of function of a function, differentiation of implicit functions and parametric functions.

Logarithmic differentiation and successive differentiation (excluding nth order).

Application of differential calculus in:

- (a) Rate Measures
- (b) Maxima and minima (single variable functions) using second order derivative only
- (c) Equation of tangent and normal to a curve (for explicit functions only)

2. Integral Calculus (22 hrs)

Indefinite integrals, Integration as inverse operation of differentiation with simple examples.

Standard integrals and related simple problems

Simple integration by substitution, by parts and by partial fractions (for linear factors only)

Evaluation of definite integrals (simple problems)

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

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

Applications of integration for evaluation of area bounded by a curve and axes (Simple problems).

3. Differential Equations (5 hrs)

Definition, order, degree of ordinary differential equations.

Formation of differential equation (up to 2nd order). Solution of Differential equations with Variable separation and Linear Differential equations.

INSTRUCTIONAL STATREGY

Basic elements of Differential Calculus, Integral Calculus, and Differential Equations 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. Grewal, BS, "Elementary Engineering Mathematics", Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Sabharwal, SS & Dr Sunita Jain, "Applied Mathematics, Vol. I & II", Eagle Parkashan, Jalandhar

4. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
5. Sastry, SS, "Engineering Mathematics, Vol I & II", Prentice Hall of India Pvt. Ltd.,
6. Pal, Srimanta and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	18	20
2	22	25
3	5	05
Total	45	50

2.3 APPLIED PHYSICS – II

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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

LEARNING OUTCOMES

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

- Apply the concept of wave motion
- Illustrate laws of reflection and refraction of light.
- Comprehend the phenomenon related to electrostatics
- Comprehend the terms and laws related to electricity and magnetism.
- Make use of laser for engineering applications.

DETAILED CONTENTS

1. Wave motion and its Applications (6 hrs)

Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

Free, forced and resonant vibrations with examples

Acoustics of buildings reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications

Ultrasonics Introduction and applications.

2. Optics (6 hrs)

Laws of reflection and refraction, refractive index, lens formula for thin lenses, power of lens, magnification

Total internal reflection and its applications, Critical angle and conditions for total internal reflection

Simple and compound microscope, astronomical telescope in normal adjustment, magnifying power (Only formula).

3. Electrostatics (6 hrs)

Coulombs law, unit of charge,
Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference
Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor (No derivation), Series and parallel combination of capacitors (numericals)
Dielectric and its effect on capacitance, dielectric break down

4. Electricity and Magnetism (9 hrs)

Electric Current and its Unit, Direct and alternating current,
Resistance and its Units, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Superconductivity (concept only)
4.3 Ohm's law and its verification
Kirchhoff's laws, Wheatstone bridge principle
Heating effect of current, Electric power, Electric energy and its units(related numerical problems)
Introduction to magnetism, Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,
Magnetic field and its units, magnetic lines of force, magnetic flux and their units
Concept of electromagnetic induction, Faraday's Laws and Lenz's law,
Galvanometer and its use.

5. Modern Physics (3 hrs)

Lasers: its characteristics, spontaneous and stimulated emission, population inversion; Principle, construction and working of Ruby laser, engineering applications of lasers.

LIST OF PRACTICALS (To perform minimum 8 experiments)

1. To find the time period of a simple pendulum
2. To determine and verify the time period of cantilever
3. To verify laws of reflection from a plane mirror.
4. To find the focal length of convex lens by parallax method.
5. To determine the magnifying power of an astronomical telescope
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To verify laws of resistances in series and parallel combination.
8. To find resistance of galvanometer by half deflection method
9. To measure very low resistance and very high resistances using Slide Wire bridge
10. Use of CRO in plotting AC and DC waveforms.
11. To find wave length of the laser beam.

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 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 (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. Practical Physics by C. L. Arora, S Chand Publications
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allotted (Out of 50)
1	06	10
2	06	10
3	06	10
4	09	15
5	03	05
Total	30	50

ENVIRONMENTAL STUDIES

L P
2 -

RATIONALE

Engineering activities require the use of natural resources which results in wide-ranging adverse effects on the environment. Natural replenishment of these resources is practically impossible. This necessitates that all technicians should know about the basics of ecology, environment and its functions, environmental pollution and management and environmental legislation which will enable them to accomplish their professional work with environmental compatibility. Hence this subject.

LEARNING OUTCOMES

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

- Comprehend the importance of ecosystem and environment.
- Demonstrate interdisciplinary nature of environmental issues.
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of environmental pollutions.
- Compute the impact of human activities on the environment.
- Understand purpose of environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.

DETAILED CONTENTS

1. Introduction: (4 hrs)
Basics of ecology, eco system and environment. Review of carbon, nitrogen, sulphur and water cycle)
2. Conservation of land reforms: (3 hrs)
Desertification, Causes, effects and prevention. rain water harvesting, maintenance of ground water, deforestation – its effects and control measures
3. Environmental Pollution: (10 hrs)
Sources of pollution - natural and man made, causes, effects and control measures of pollution (air, water, noise, soil and radioactive). Concept of BOD, COD and AQI, Prevention of Pollution- Introduction to Cleaner Production Technologies, Waste Minimization Techniques, Concept of Zero Discharge, Impact of Energy

Usage on Environment: Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain.

4. Solid Waste management (3 hrs)
Classification of refuse material, sources, effects and control measures.
Introduction to E-waste Management
5. Environmental Legislation (4 hrs)
Introduction to Water (prevention and control of pollution) Act, Air (Prevention and Control of Pollution) Act and Environmental Protection Act, Role and Function of State Pollution Control Board, Introduction to Energy Conservation Act & its importance, Concept of Environmental Impact Assessment (EIA)
6. Energy Conservation and Sustainable Development (6 hrs)
Introduction to Energy Management, Energy Conservation, Energy efficiency and its need. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio mass energy, hydro energy) in environmental protection. Sustainable development, Concept of Green building and eco friendly materials.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits etc. may also be organized.

RECOMMENDED BOOKS

1. Sharma, BR, "Environmental and Pollution Awareness", Satya Prakashan, New Delhi.
2. Khitoliya, Dr. RK, "Environmental Pollution", S Chand Publishing, New Delhi.
3. Deswal and Deswal, "Environmental Science", Dhanpat Rai and Co. (P) Ltd. Delhi.
4. Bharucha, Erach, "Environmental Studies", University Press (India) Private Ltd., Hyderabad.
5. Dhamija, Suresh K, "Environmental Engineering and Management", SK Kataria and Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	4	06
2	3	05
3	10	16
4	3	05
5	4	06
6	6	12
Total	30	50

APPLIED MECHANICS

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3 **2**

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, laws of motion, moment, friction, centre of gravity, 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.

LEARNING OUTCOMES

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

- Interpret various types of units and their conversion from one to another.
- Analyze different types of forces acting on a body and draw free body diagrams.
- Determine the resultant of coplanar concurrent forces.
- Solve problems by using principle of moment.
- Calculate the co-efficient of friction for different types of surfaces.
- Calculate the least force required to maintain equilibrium on an inclined plane.
- Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
- Determine velocity ratio, mechanical advantage and efficiency of simple machines

DETAILED CONTENTS

1. Introduction (2 hrs)

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

1,2 Concept of rigid body, scalar and vector quantities

2. Laws of forces (10 hrs)

Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, contact and non contact forces, effects of force, characteristics of a force

motion, Newton's gravitation, Newton's laws of Difference between mass and weight

Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position

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

Free body diagram

Equilibrant force and its determination

Lami's theorem (concept only) [Simple problems on above topics]

3. Moment (9 hrs)

Concept of moment

Moment of a force and units of moment

Varignon's theorem (definition only)

Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (9 hrs)

4.1 Definition and concept of friction, types of friction, force of friction

4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

- a) Acting along the inclined plane Horizontally
- b) At some angle with the inclined plane

5. Centre of Gravity (6 hrs)

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

6. Simple Machines (9 hrs)

Definition of effort, velocity ratio, mechanical advantage and efficiency of -a machine and their relationship, law of machines

Simple and compound machine (Examples)

Definition of ideal machine, reversible and self locking machine

Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

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]

LIST OF PRACTICALS

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
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.

RECOMMENDED BOOKS

1. Ramamurtham, S, "A Text Book of Applied Mechanics", Dhanpat Rai Publishing Co. Ltd.
2. Khurmi, RK, "A Text Book of Engineering Mechanics (Applied Mechanics)", S Chand and Co. Ltd., New Delhi.
3. Rajput, RK, "A Text Book of Applied Mechanics", Laxmi Publications, New Delhi.
4. Singh, Birinder, "Text Book of Applied Mechanics", Kaption Publishing House, New Delhi.
5. Upadhya, AK, "Text Book of Applied Mechanics", SK Kataria & Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	2	2
2	10	12
3	9	10
4	9	10
5	6	6
6	9	10
Total	45	50

ENGINEERING DRAWING - II

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- 6

RATIONALE

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

Note:

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

LEARNING OUTCOMES

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

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

DETAILED CONTENTS-CUM- PRACTICAL EXERCISES

1. Detail and Assembly Drawing (02 sheets)

Principle and utility of detail and assembly drawings

Wooden joints i.e. corner mortise 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, furniture drawing - freehand and with the help of drawing instruments.

2. Screw Threads (03 sheets)

Thread Terms and Nomenclature

Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.
Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)

3. Nuts and Bolts (02 sheets)

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

4. Locking Devices (02 sheets)

Different types of locking devices-Lock nut, castle nut, split pin nut,locking plate, slotted nut and spring washer.
Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.
Drawing of various types of studs

5. Keys and Cotters (03 sheets)

Various types of keys and cotters - their practical application, drawings of various keys and cotters showing keys and cotters in position

Various types of joints

- Spigot and socket joint
- Gib and cotter joint
- Knuckle joint

6. Rivets and Riveted Joints (04 sheets)

Types of general purpose-rivets heads
Caulking and fullering of riveted joints

Types of riveted joints

- (i) Lap joint-Single riveted, double riveted (chain and zig-zag type)
- (ii) Single riveted, Single cover plate butt joint
- (iii) Single riveted, double cover plate butt joint
- (iv) Double riveted, double cover plate butt joint(chain and zig-zag type)

7. Couplings (02 sheets)

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

- *8. Use of CAD software (03 sheets)

Draw any three joints/coupling using CAD software from the following:

- i) Sleeve and cotter joint
- ii) Knuckle joint
- iii) Spigot and socket joint
- iv) Gib and cotter joint
- v) Flange coupling
- vi) Muff coupling

*** CAD drawings will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Singh, Surjit, "A Text Book of Engineering Drawing", Dhanpat Rai & Co., Delhi
2. Gill, PS, "Engineering Drawing", SK Kataria & Sons, New Delhi
3. Bhatt, ND, "Elementary Engineering Drawing in First Angle Projection", Charotar Publishing House Pvt. Ltd., Anand
4. Layall, JS, "Engineering Drawing I & II", Eagle Parkashan, Jalandhar
5. Goel, DK, "Engineering Drawing I", GBD Publication.
6. AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo and D. Sarvanan; Wiley India Pvt. Ltd., Delhi.

GENERAL WORKSHOP PRACTICE - II

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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 including machining. 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.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Select materials, sequence of operations, select tools to make a given job based on interpretation of drawing as per given specification with close tolerances using at least the resources of three shops.
- Prepare a job as per given specifications for a given shop.
- Specify and read/understand specifications of different types of tools, equipment and machines used in various shops.
- Inspect visually to identify various types of defects in different type of materials.
- Analyze a given job and identify various operations required to make it.
- Follow safety procedures and measures.
- Maintain good housekeeping practices.

DETAILED CONTENTS-CUM- PRACTICAL EXERCISES

Note: The students are supposed to come in proper workshop uniform 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 workshops will be explained for conduct of practical. The students should prepare sketches of various tools/jobs sequence of operations etc. in their practical notebook.

The following shops are included in the syllabus.

- 1 Welding Shop – II
- 2 Fitting Shop – II
- 3 Sheet Metal Shop – II
- 4 Electric Shop -II
- 5 Carpentry Shop – II
- 6 Smithy Shop – II or Additive Manufacturing Shop - II

1. WELDING SHOP - II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to gas welding (Oxy-acetylene welding, Air acetylene welding, Oxy-hydrogen welding). Introduction to gas welding equipment: - Gas welding torch, cylinders, Blow pipe and Pressure regulators etc. Types of gas welding flames. Functions of filler materials and fluxes. Introduction to soldering and brazing. Difference between welding, soldering and brazing. Introduction to resistance welding.

Demonstration of Gas welding equipment, TIG, MIG and spot-welding machines. Demonstration of brazing and soldering.

Jobs to be prepared:

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| Job I | Making a lap joint on 75 mm × 35 mm × 3mm M.S. plate using gas welding (Oxy-acetylene). |
| Job II | Making a butt joint on 75mm×35mm×3mm M.S. flat using gas welding (Oxy-acetylene). |
| Job III | Making a square pyramid from M.S. rod by welding (Oxy-acetylene Gas welding). |
| Job IV | Making a simple job on spot welding machine. |

2. FITTING SHOP – II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, function and specification of different types of cutting tools (chisels and scrapers etc.), tightening tools (pliers, screw driver, wrenches etc.) types of drill and drilling machines used in fitting shop. Classification of files: according to cut, grade, and shape. Measuring devices (Fillet/radius gauge, screw pitch gauge, wire gauge, telescopic gauge), Vernier height gauge. Surface gauge and universal surface gauge. Description of drill, reamer, tap and die set. Selection of dies for threading, selection of drill size for tapping.

Demonstration on use of various measuring tools (Vernier caliper, Vernier height gauge and outside and inside micrometers etc.), finding least count and checking of zero error. Demonstration of various types of drills, taps and dies.

Jobs to be prepared:

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| Job I | To make a job by drilling and tapping (manually) process on soft metals- Aluminum or Copper or Bronze. |
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- Job II To Make 'U' type cut-out profile from a square piece of MS flat using hand hacksaw, filing, marking, drilling and measuring operations up to an accuracy of 0.1 mm.
- Job III Making external threads by die on a job (GI Pipe, PVC pipe, Steel bars etc.) and assembly of different types of elbows, tee, union, socket.

3. SHEET METAL SHOP - II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and functions of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Wood Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Fly press etc. Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing, Introduction to metal spinning process. Introduction of various types of nuts, bolts, screws etc.

Demonstration of various machines and types of nuts, bolts, screws etc.

Jobs to be prepared:

- Job I To prepare a utility job like soap case/tray/canister box.
- Job II To prepare a job involving soldering or brazing process.
- Job III To prepare a cup with the help of simple die and punch on fly press.
- Job IV To fabricate a funnel/conduit pipe from GI sheet.

4. ELECTRIC SHOP - II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE), Introduction and use of single phase and three phase supply, its wiring system and importance. Introduction and function of an electric motor for any three-phase electric machine. Estimating and costing of power consumption. Identification and familiarization with the following tools: Tweezers, Screw Drivers (Different sizes), Insulated pliers, Cutters, Sniper, Philips Screw driver (star screw driver), L-Keys.

Demonstration of dismantling, servicing and reassembling of table/ceiling fan, air-cooler, auto electric iron, heater etc. Testing and reversing direction of rotation of single phase and three phase motors and their wiring methods.

Job Practice :

- Job I Laying 3 phase wiring for an electric motor or any three phase machine.
- Job II Connection of single-phase energy meter with supply and load including reading and working out power consumption and cost of energy.
- Job III Finding faults in electric circuits, machines, with series testing lamp and multimeter.

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|--------|--|
| Job IV | Assembly, dismantling and servicing of any electrical appliances. |
| Job V | Practice on testing single phase and three phase motors by using voltmeter, ammeter and tachometer. |
| Job VI | Connection and wiring practice for reversing direction of rotation of single phase and three phase motors. |

5. CARPENTRY SHOP – II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, parts and functions of Jig saw and radial saw wood working machine, Band saw, Circular saw and Electric Planer. Introduction and basic functions of Wood working lathe and its tools. Saw re-sharpening machine, wood working lathe, Saw Brazing unit.

Demonstration of Rip Saw, dovetail saw and Tenon saw. Method of sharpening various saws. Demonstration on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.

Jobs to be prepared:

- | | |
|---------|---|
| Job I | Preparation of single dovetail joint. |
| Job II | Preparation of mitre joint. |
| Job III | Preparation of a lengthening joint |
| Job IV | Practice of form turning on wood working lathe. |

6. SMITHY SHOP – II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE), Introduction to various heat treatment processes e.g annealing, hardening, case hardening, tempering, normalizing etc. Description of various types of power hammers and their usage (Demonstration only).

Demonstration of power hammer and various types of furnaces.

Jobs to be prepared

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|---------|---|
| Job I | To explain to the students with simple idea of hardening and tempering. |
| Job II | To forge a chisel (and a square) |
| Job III | To forge square shape on both ends of a circular rod. |
| Job IV | To prepare a job of upset forging process. |

6. ADDITIVE MANUFACTURING SHOP – II

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to Additive Manufacturing, Distinction between Additive Manufacturing and Subtractive Manufacturing, Steps involved in the process of Additive Manufacturing, Classification/types of Additive Manufacturing processes (VAT Photo polymerisation, Material

jetting, binder jetting, Material Extrusion-Fuse deposition modelling, The Powder Bed Fusion, Sheet lamination, Directed Energy Deposition (DED) etc.), Advantages of Additive Manufacturing and types of materials used for Additive Manufacturing (PLA-Polylactic acid, ABS-Acrylonitrile Butadiene Styrene, PET-Polyethylene terephthalate, Nylon, TPU-Thermoplastic polyurethane (Flexible) and PC- Polycarbonate etc.), applications of additive manufacturing.

Demonstration of Fused Deposition Modelling (FDM) process of additive manufacturing (particularly 3D printing) and the steps involved (concept, drawing, modelling, exporting CAD data to required format for printing, 3D printing), post processing of parts if required (Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement etc.), Basic maintenance, material (spool) loading, nozzle setting, nozzle cleaning, machine bed preparation

Jobs to be performed

Job I: Preparation of 3D model of a part using suitable CAD package and saving it in .PRT file format.

Job II: Conversion of .PRT file to .STL file and introduction to processing software (Flashprint)

Job III: Identification of .STL file problems and application of repair algorithms to make the model error-free using suitable software package.

Job IV: Preparation of a simple assembly component by 3D printing the individual parts and post processing if required.

Note :

1. Workshop instructors will guide and help the students throughout the practical class in order to explain and complete the job according to syllabus and for providing necessary facilities to the students during performance of practical by observing the safety precautions
2. The Workshop Superintendent or Foreman Instructor or Foreman will demonstrate and deliver the theoretical instructions with regard to introduction, functions, classification and specification of tools, instruments, equipment, apparatus etc. of all the topics covered in the syllabus.
3. The Workshop Superintendent or Foreman Instructor will also conduct the mid-term test and final practical exam of this subject.

RECOMMENDED BOOKS

1. Singh, Swaran, “Workshop Practice”, S. K. Kataria and Sons, New Delhi.
2. Bawa, H.S., “Workshop Practice”, Tata McGraw Hill Publishers, New Delhi.
3. Hajra, SK, “Workshop Technology I, II, III”, Choudhary and AK Choudhary Media Promoters and Publishers Pvt. Ltd. Mumbai.
4. Manchanda, “Workshop Technology Vol. I, II, III”, India Publishing House, Jalandhar.
5. Raghuwanshi, B.S., “Workshop Technology”, Dhanpat Rai and Co., New Delhi

TRAFFIC AWARENESS & ROAD SAFETY CAMP (II)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety. By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. Time management
2. Traffic light signals
3. Speed limits of vehicles
4. Schedule of offences
5. Dividing lines
6. Proper road Maintenance and Warnings
7. Test yourself

