4.1 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

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3 - -

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager. Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma pass-outs for enhancing their employability and self confidence.

LEARNING OUTCOME

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

- Explain the importance of generic skills
- Demonstrate self development
- Manage himself/herself physically, intellectually and psychologically
- Work effectively as a team member
- Manage tasks effectively
- Apply knowledge to solve problems
- Develop an entrepreneurial mindset.
- Identify entrepreneurial support system for new ventures and small businesses.
- Recognize a business opportunity.
- Prepare project report
- Demonstrate how to launch an individual's entrepreneurial career

DETAILED CONTENTS

1. Introduction to Generic Skills   (04 hrs)

    1.1   Importance of Generic Skill Development
    1.2   Global and Local Scenario of Generic Skill Development
    1.3   Life Long Learning and associated importance of Generic Skill Development

2.   Managing Self   (08 hrs)

    2.1   Knowing Self for Self Development
- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

    2.2   Managing Self - Physical
        Personal grooming, Health, Hygiene, Time Management

    2.3   Managing Self – Intellectual development
- Information Search: Sources of information
- Writing Skills – Official & business correspondence, Job application covering letter and resume
- Speaking Skills – Mock interview, Preparing for meeting, Group discussion

    2.4   Managing Self – Psychological
- Stress, Emotions, Anxiety-concepts and significance
- Techniques to manage stress

3.   Managing in Team   (06 hrs)

    3.1   Team - definition, team dynamics
    3.2   Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

4   Task Management   (03 hrs)

    4.1   Task Initiation, planning, execution, close out
    4.2   Exercises/case studies on task planning towards development of skills for task management

5.   Problem Solving   (05 hrs)

    5.1   Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
    5.2   Different approaches for problem solving.
    5.3   Steps followed in problem solving.
    5.4   Exercises/case studies on problem solving.

6.   Entrepreneurship   (22 hrs)

    6.1   Introduction
- Concept/Meaning and its need
- Qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2   Market Survey and Opportunity Identification (Business Planning)
- How to start a small scale industry
- Procedures for registration of small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection

6.3   Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Preparation of Detailed Project Report

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1.   Soft Skills for Interpersonal Communication by S. Balasubramanian Published by Orient Black Swan, New Delhi.
2.   Generic Skill Development Manual, MSBTE, Mumbai.
3.   Lifelong learning, Policy Brief (www.oecd.orf)

4.   A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)

5.   Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi

6.   Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	04	05
2.	08	15
3.	06	10
4.	03	10
5.	05	10
6.	22	50
Total	**48**	**100**

4.2   HYDRAULICS AND PNEUMATICS

L T P
4 - 2

RATIONALE

Diploma holders in this course are required to deal with problems of fluid and use of hydraulics and pneumatics in power generation. For this purpose, knowledge and skills about fluid mechanics and machinery, hydraulics and pneumatics systems are required to be imparted for enabling them to perform above functions.

Learning Outcomes

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

- Explain fluid properties, their units and conversion.
- Measure different types of pressures.
- Maintain different types of pressure gauges.
- Calculate flow and discharge of various liquids.
- Apply Bernoulli's theorem for calculating pipe diameter and height of pipe from ground.
- Calculate pipe friction and losses in pipelines.
- Specify hydraulic machines for different applications.
- Select maintain and resolve troubles in pumps.
- Apply Pascal's law in practical applications.
- Maintain hydraulic and pneumatic system.

DETAILED CONTENTS

1.   Introduction   (03 hrs)

Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility, surface tension, kinematic viscosity and dynamic viscosity and their units.

2.   Pressure and its Measurement   (06 hrs)

2.1   Concept of pressure (Atmospheric Pressure, gauge pressure, absolute pressure)

2.2   Pressure measuring devices: peizometer tube manometers - simple U-tube, differential single column, inverted U-tube, micromanometer including simple problems

2.3   Bourdon pressure gauge, Diaphragm pressure gauge, dead weight pressure gauge

3. Flow of Fluids   (07 hrs)

Types of fluid flow – steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; potential energy of a flowing fluid; total head; Bernoulli's theorem (statement and proof) and its applications. Discharge measurement with the help of venturi-meter, orifice meter, pitot-tube, limitations of Bernoulli's theorem simple problems.

4. Flow through Pipes   (10 hrs)

4.1 Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; Chezy's equation and Darcy's equation of head loss (without proof), Reynold's number and its effect on pipe friction; siphon, Nozzle - definition, velocity of liquid flowing through the nozzle, power developed. Water hammer, anchor block, syphon, surge tank (concept only).

4.2 Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings (without proof)

5. Hydraulic System   (05 hrs)

Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, selection of specification of above systems for different applications

6. Water Turbines and Pumps   (14 hrs)

6.1 Concept of a turbine, types of turbines –impulse and reaction type (concept only), difference between them. Construction and working of pelton wheel, Francis turbine, Propeller and Kaplan turbines. Unit speed, unit power, unit discharge, specific speed of turbines, selection of turbines based on specific speed.

6.2 Concept of hydraulic pump, single acting reciprocating pump (construction and operation only), vane, screw and gear pumps.

6.3 Construction, working and operation of centrigual pump. Performance, efficiencies and specifications of a centrifugal pump. Trouble shooting and problems in centrifugal pumps and remedial measures, pitting, cavitation, priming.

7. Introduction to Oil Power Hydraulics and Pneumatics   (03 hrs)

7.1 Introduction to oil power hydraulics and pneumatic system
7.2 Statement of Pascal law and its applications
7.3 Industrial applications of oil power hydraulics and pneumatic system
7.4 Cavitation

8. Components of Hydraulic Systems   (08 hrs)

8.1 Basic components of hydraulic system, function of each component in a hydraulic circuit.

8.2 Oil reservoirs, couplings, motors and pumps – definition and functions of the parts,

8.3 Filters- definition and purpose, classification

8.4 Seals and packing- classification of seals, sealing materials.

9. Components of Pneumatic Systems (08 hrs)

9.1 Basic components – function of each component

9.2 Air compressors – type, working

9.3 Air cylinder – types, function, single acting, double acting, rotating, non-rotating, piston type, diaphragm type, tanden cylinder, double ended cylinder, duplex cylinder.

9.4 Air filter, regulator and lubricator – their necessity in pneumatic circuit.

9.5 Installation, maintenance and application of air cylinders.

LIST OF PRACTICALS

1. Measurement of pressure head by employing.

   i) Piezometer tube
   ii) Single and double column manometer

2. To find out the value of coefficient of discharge for a venturimeter.

3. Measurement of flow by using venturimeter.

4. Verification of Bernoulli's theorem.

5. To find coefficient of friction for a pipe (Darcy's friction).

6. To study hydraulic circuit of an automobile brake and hydraulic ram.

7. Study the working of a Pelton wheel and Francis turbine.

8. To study a single stage centrifugal pump for constructional details and its operation to find out its normal head and discharge.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

RECOMMENDED BOOKS

1. Fluid Mechanics by KL Kumar; S Chand and Co Ltd., Ram Nagar, New Delhi.

2. Hydraulics and Fluid Mechanics Machine by RS Khurmi ; S.Chand & Co. Ltd., New Delhi.

3. Fluid Mechanics through Problems by RJ Garde; Wiley Eastern Ltd., New Delhi.

4. Fluid Mechanics by Dr AK Jain, Khanna Publishers, New Delhi.

5. Hydraulic and Pneumatic Control by K Shammuga Sundaram, S. Chand & Co. Ltd., New Delhi

6. Hydraulics and Hydraulic Machinery by Dr. Jagadish Lal; Metropolitan Book Company Ltd., Delhi.

7. Hydraulic and Pneumatic Power and Control Design, Performance and Application by Yeaple, McGraw Hill, New York..

8. Pneumatic Controls by Festo Didactic; Bangalore.

9. Pneumatics Control: An Introduction to the Principles by Werner Deppert and Kurt Stoll; Vogel – Verlag.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	06
2	06	10
3	07	10
4	10	16
5	05	08
6	14	20
7	03	06
8	08	12
9	08	12
Total	**64**	**100**

4.3   **STRENGTH OF MATERIALS**

L T P
4 - 2

RATIONALE

Diploma holders in this course are required to analyze reasons for failure of different components and select the required material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles in the solution of applied problems to develop the required competencies.

Learning Outcomes

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

- Interpret various concepts and terms related to strength of materials
- Calculate stresses in thin cylindrical shells.
- Calculate energy stored by materials subjected to axial loads.
- Calculate moment of inertia of different sections.
- Draw and calculate bending moment and shear force diagrams of beam under given loading
- Interpret the concept of bending and torsion and calculate stresses on different section of materials.
- Determine the diameter of a shaft under combined bending and torsion.
- Calculate critical axial loads on column under different end constraints.
- Determine the various parameters in closed coil helical and laminated springs
- Determine conformance of given materials sample to the prescribed Indian standards.

DETAILED CONTENTS

1.   Stresses and Strains   (08 hrs)

    1.1.   Basic assumptions; Concept of load, stress and strain

    1.2.   Tensile compressive and shear stresses and strains

    1.3.   Concept of Elasticity, Elastic limit and limit of proportionality.

        1.3.1.   Nominal and true stress-strain diagrams.

        1.3.2   Hook's Law

        1.3.3.   Young Modulus of elasticity

        1.3.4.   Nominal stress

        1.3.5.   Yield point, plastic stage

        1.3.6   Ultimate strength and breaking stress

   1.3.7. Percentage elongation

   1.3.8. Proof stress and working stress

   1.3.9. Factor of safety

   1.3.10 Poisson's Ratio

   1.3.11 Shear modulus

   1.3.12 Deflection and stiffness

 1.4. Concepts of fatigue, creep and stress concentration

 1.5. Longitudinal and circumferential stresses in seamless thin walled cylindrical shells.

2. Resilience   (04 hrs)

 2.1 Resilience, proof resilience and modulus of resilience

 2.2 Strain energy due to direct stresses

 2.3 Stresses due to gradual, sudden and falling load.

3. Moment of Inertia   (10 hrs)

 3.1. Concept of moment of inertia and second moment of area

 3.2 Radius of gyration

 3.3 Theorem of perpendicular axis and parallel axis (without derivation)

 3.4 Second moment of area of common geometrical sections :Rectangle, Triangle, Circle (without derivation); Second moment of area for L,T and I section

 3.5 Section modulus

4. Bending Moment and Shearing Force   (10 hrs)

 4.1 Concept of beam and form of loading

 4.2 Concept of end supports-Roller, hinged and fixed

 4.3 Concept of bending moment and shearing force

 4.4 B.M. and S.F. Diagram for cantilever and simply supported   beams with and without overhang subjected to concentrated and U.D.L.

5. Bending stresses   (06 hrs)

 5.1 Concept of Bending stresses

 5.2. Theory of simple bending

 5.3. Use of the equation $f/y = M/I = E/R$

 5.4. Concept of moment of resistance

5.5.   Bending stress diagram

5.6.   Calculation of maximum bending stress in beams of rectangular, circular, and T section.

5.7   Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.

6   Columns   (08 hrs)

6.1.   Concept of column, modes of failure

6.2.   Types of columns

6.3.   Buckling load, crushing load

6.4.   Slenderness ratio

6.5.   Factors effecting strength of a column

6.6   End restraints

6.7   Effective length

6.8   Strength of column by Euler Formula without derivation

6.9.   Rankine Gourdan formula (without derivation)

7.   Torsion   (10 hrs)

7.1.   Concept of torsion- difference between torque and torsion.

7.2.   Use of torque equation for circular shaft

7.3.   Comparison between solid and hollow shaft with regard to their strength and weight.

7.4.   Power transmitted by shaft

7.5   Concept of mean and maximum torque

7.6   Concept of Principal stresses, principal planes and max. shear stress.

7.7   Determination of shaft diameter under combined bending and torsion.

8.   Springs   (8 hrs)

8.1.   Closed coil helical springs subjected to axial load

    8.1.1.   Stress deformation

    8.1.2   Stiffness and angle of twist and strain energy

    8.1.3   Proof resilience

8.2   Determination of number of plates of laminated spring (semi elliptical type only)

LIST OF PRACTICALS

1. Tensile test on bars of Mild steel and Aluminium.

2. Bending tests on a steel bar or a wooden beam.

3. Impact test on metals

    a) Izod test

    b) Charpy test

4. Torsion test of solid specimen of circular section of different metals for determining modulus of rigidity.

5. To determine the stiffness of a helical spring and to plot a graph between load and extension.

6. Hardness test on different metals.

Note : All the tests need to be done as per prescribed Indian Standards.

INSTRUCTIONAL STRATEGY

1. Expose the students to real life problems.

2. Plan assignments so as to promote problem solving abilities and develop continued learning skills.

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RECOMMENDED BOOKS

1. SOM by Birinder Singh,; Katson Publishing House, New Delhi.

2. SOM by RS Khurmi; S.Chand & Co; New Delhi

3. Mechanics of Materials by Dr. Kirpal Singh; Standard Publishers Distribution, New Delhi.

4. Elements of SOM by D.R. Malhotra and H.C.Gupta; Satya Prakashan, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	12
2	04	06
3	10	16
4	10	16
5	06	10
6	08	12
7	10	16
8	08	12
Total	**64**	**100**

4.4   THERMODYNAMICS - I

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A diploma holder in this course is supposed to maintain steam generators, turbines, compressors and other power plant equipment. Therefore, it is essential to impart him basic concepts of thermodynamics, steam generators, steam turbines, compressors and about IC engines.

LEARNING OUTCOMES

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

- Apply thermodynamic laws.
- Solve basic problems of gas equation using perfect gas laws.
- Determine enthalpy, specific heat capacity and P-V-T surface of an ideal and real gas.
- Explain the working, construction and applications of steam boilers and steam generators
- Interpret different modes of heat transfer.

DETAILED CONTENTS

1.   Fundamental Concepts   (06 hrs)

Thermodynamic state and system, boundary, surrounding, universe, thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy.

2.   Laws of Perfect Gases   (05 hrs)

Definition of gases, explanation of perfect gas laws – Boyle's law, Charle's law, Avagadro's law, Regnault's law, Universal gas constant, Characteristic gas constants, derivation

Specific heat at constant pressure, specific heat at constant volume of gas, derivation of an expression for specific heats with characteristics, simple problems on gas equation

3.   Thermodynamic Processes on Gases   (08 hrs)

Types of thermodynamic processes – isochoric, isobaric, isothermal, hyperbolic, isentropic, polytropic and throttling processes, equations representing the processes

Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes

4. Laws of Thermodynamics   (12 hrs)

Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems – Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, evaporators, limitations.

Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck's statement, Classius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy.

5. Ideal and Real Gases   (06 hrs)

Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas, $P – V – T$ surface of an ideal gas, determination of triple point, real gases, Vander-Wall's equation

6. Properties of Steam   (05 hrs)

Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of stream, entropy of water, entropy of steam, T- S diagrams, Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes

Quality of steam (dryness fraction),

7. Steam Generators   (05 hrs)

Uses of steam, classification of boilers, comparison of fire tube and water tube boilers. Construction features of Lancashire boiler, Nestler boiler, Babcock & Wilcox Boiler. Introduction to modern boilers.

8. Air Standard Cycles   (06 hrs)

Meaning of air standard cycle – its use, condition of reversibility of a cycle

Description of Carnot cycle, Otto cycle, Diesel cycle, simple problems on efficiency, calculation for different cycles

Comparison of Otto, Diesel cycles for same compression ratio or same peak pressure developed

Reasons for highest efficiency of Carnot cycle and all other cycles working between same temperature limits

9.   Air Compressors   (08 hrs)

Functions of air compressor – uses of compressed air, type of air compressors

Single stage reciprocating air compressor, its construction and working, representation of processes involved on P – V diagram, calculation of work done.

Multistage compressors – advantages over single stage compressors, use of air cooler – condition of minimum work in two stage compressor (without proof), simple problems

Rotary compressors – types, descriptive treatment of centrifugal compressor, axial flow compressor, vane type compressor

10.   Introduction to Heat Transfer   (03 hrs)

Modes of heat transfer, Fourier's law, steady state conduction, composite structures, Natural and forced convection, thermal radiation

LIST OF PRACTICALS

1.   Determination of temperature by
      1.1   Thermocouple
      1.2   Pyrometer
      1.3   Infrared thermometer
2.   Demonstration of mountings and accessories on a boiler.
3.   Study of boilers (through industrial visit)
4.   Demonstrate the working of air compressor.
5.   Demonstration of heat transfer through conduction, convection and Radiation
6.   Study of working of high pressure boiler
7.   Study the working of Lancashire boiler and Nestler boiler

INSTRUCTIONAL STRATEGY

1.   Expose the students to real life problems.
2.   Plan assignment so as to promote problem solving abilities.

RECOMMENDED BOOKS

1.   Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi.
2.   Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi.
3.   Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi.
4.   A Treatise on Heat Engineering by VP Vasandani and DS Kumar; Metropolitan Book Company.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	10
2	05	08
3	08	12
4	12	20
5	06	10
6	05	08
7	05	08
8	06	10
9	08	10
10	03	04
Total	**64**	**100**

4.5   MECHANICAL ENGINEERING DRAWING-II

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- - 7

RATIONALE

Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components.   This subject aims at development of skills and understanding of mechanical engineering drawings.

Learning Outcomes

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

- Interpret and draw the drawings of mechanical machine parts like jig, vices and screw jack
- Interpret and prepare the drawings of boiler and J.C. engine parts.
- Interpret and draw different types of cams for different kinds of motions.
- Interpret gear terminology and draw spur gear teeth profile.

DETAILED CONTENS

1.   Introduction to drawing office equipment, through a visit to modern drawing office of an industry

2.   Drilling Jig (Detail and Assembly)   2 sheets

3.   Vices   3 sheets

    3.1   Machine vice (Detailed and Assembly drawing)

4.   I.C. Engine Parts   3 sheets

    4.1   Piston
    4.2   Connecting rod (Assembly drawing)
    4.3   Crankshaft and flywheel assembly

5.   Boiler Parts   2 sheets

    5.1   Steam Stop Valve (Assembled drawing)
    5.2   Blow off cock. (Assembled drawing)

6.   Mechanical Screw Jack (Assembled Drawing)   1 sheet

7.   Cams   4 sheets

    7.1   Types of cams and followers (Theoretical)

7.2   Profile of cams for imparting following motions with knife edge, roller and flat followers :
- Uniform motion
- Simple Harmonic Motion
- Uniformity accelerated and retarded motion:

8.   Gears   4 sheets

8.1   Nomenclature of gears and conventional representation
8.2   Drawing the actual profile of involute teeth of spur gear by different methods.

Note: 1.   1st angle projection should be followed. 20% of the drawings may be made using 3rd angle projection.

2.   SP- 46-1998 should be followed. The drawings should include dimensions with tolerance wherever necessary and material as per BIS/ISO specifications.

3.   Uses, specifications, material and functions of above components should also be explained in the class..

RECOMMENDED BOOKS

1.   Machine Drawing by P.S. Gill; S.K. Kataria & Sons, Ludhiana

2.   A Text Book of Machine Drawing by RK Dhawn; S.Chand & Co. Ltd., New Delhi.

3.   Machine drawing by N.D Bhatt, Charotar Book Depot, Anand

118

4.6   WORKSHOP TECHNOLOGY-II

L T P
3 - 7

RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes, modern machining methods, tools, jigs and fixtures is required to be imparted. Hence the subject of workshop technology.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Perform turning, step turning, taper turning, threading and knurling operation on lathe machine.
- Resharpen/grind single point tool.
- Select material and tool geometry for cutting tools on lathe.
- Perform drilling, reaming, counter boring, counter sinking and tapping operations on drilling machine.
- Explain the nomenclature of a drill
- Perform filing, cutting, Fitting and die tapping operations
- Perform keyway cutting and angular/step surface shaping on shaper.
- Explain geometry of single point tools, various types of lathe tools and tool materials.
- Explain uses of lathe accessories and different types of lathes.
- Explain boring operation, features of boring machine and boring tool.
- Explain the uses and features of jigs, fixtures, locating devices and clamping devices.
- Select cutting fluid for different materials and operations.
- Describe the features of various types of broaching machines.

DETAILED CONTENTS

1.   Cutting Tools and Cutting Materials   (06 hrs)

    1.1.   Cutting Tools - Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect

    1.2   Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.

2.   Lathe   (10 hrs)

    2.1   Principle of turning
    2.2   Description and function of various parts of a lathe

2.3　Classification and specification of various types of lathe

2.4　Drives and transmission

2.5　Work holding devices

2.6　Lathe tools: Parameters/Nomenclature and applications

2.7　Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.

2.8　Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.

2.9　Speed ratio, preferred numbers of speed selection.

2.10　Lathe accessories:- Centers, dogs, different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment, tool post grinder, milling attachment, Quick change device for tools.

2.11　Brief description of capstan and turret lathe, comparison of capstan/Turret lathe, work holding and tool guiding devices in capstan and turret lathe.

3.　Drilling　(06 hrs)

3.1　Principle of drilling.

3.2　Classification of drilling machines and their description.

3.3　Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.

3.4　Speeds and feeds during drilling, impact of these parameters on drilling, machining time.

3.5　Types of drills and their features, nomenclature of a drill

3.6　Drill holding devices.

3.7　Types of reamers.

4.　Boring　(04 hrs)

4.1　Principle of boring

4.2　Classification of boring machines and their brief description.

4.3　Specification of boring machines.

4.4　Boring tools, boring bars and boring heads.

4.5　Description of jig boring machine.

5.　Shaping and Planing　(08 hrs)

5.1　Working principle of shaper and planer

5.2　Type of shapers

5.3　Type of planers

5.4　Quick return mechanism applied to shaper and planer machine.

5.5　Work holding devices used on shaper and planer

5.6　Types of tools used and their geometry.

5.7　Specification of shaper and planer .

5.8　Speeds and feeds in above processes.

6.   Broaching   (04 hrs)

    6.1   Introduction
    6.2   Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.
    6.3   Elements of broach tool, broach tooth details – nomenclature, types, and tool material.

7.   Jigs and Fixtures   (06 hrs)

    7.1   Importance and use of jigs and fixture
    7.2   Principle of location
    7.3   Locating devices
    7.4   Clamping devices
    7.5   Types of Jigs – Drilling jigs, bushes, template jig, plate jig, channel jig, leaf jig.
    7.6   Fixture for milling, turning, welding, grinding
    7.7   Advantages of jigs and fixtures

8.   Cutting Fluids and Lubricants   (04 hrs)

    8.1   Function of cutting fluid
    8.2   Types of cutting fluids
    8.3   Difference between cutting fluid and lubricant
    8.4   Selection of cutting fluids for different materials and operations
    8.5   Common methods of lubrication of machine tools.

PRACTICAL EXERCISES

Turning Shop

Job 1. Grinding of single point turning tool.
Job 2. Exercise of simple turning and step turning.
Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

Advance Fitting Shop

Job 1. Exercise on drilling, reaming, counter boring, counter sinking and taping
Job 2. Dove tail fitting in mild steel
Job 3. Radius fitting in mild steel
Job 4. Pipe threading with die

Machine Shop

Job 1. Prepare a V-Block up to ± 0.5 mm accuracy on shaper machine
Job 2. Exercise on key way cutting and spline cutting on shaper machine.

INSTRUCTIONAL STRATEGY

1. Teachers should lay emphasis in making students conversant with concepts and principles of manufacturing processes.
2. Focus should be on preparing jobs using various machines in the workshop.
3. Foreman Instructor should conduct classes of each workshop explaining use of tools, jobs to be made and safety precautions related to each workshop prior to students being exposed to actual practicals.

RECOMMENDED BOOKS

1. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons; Delhi

2. Elements of Workshop Technology by SK Choudhry and Hajra; Asia Publishing House

3. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2	10	22
3	06	14
4	04	08
5	08	16
6	04	08
7	06	12
8	04	08
Tot1al	**48**	**100**

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?

2. Need for entrepreneurship, entrepreneurial career and wage employment

3. Scenario of development of small scale industries in India

4. Entrepreneurial history in India, Indian values and entrepreneurship

5. Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations

6. Considerations for product selection

7. Opportunities for business, service and industrial ventures

8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)

9. Legal aspects of small business

10. Managerial aspects of small business