

4.1 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

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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 OUTCOMES

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

- Explain the importance of generic skills
- Manage himself/herself physically, intellectually and psychologically
- Work effectively as a team member
- Manage tasks effectively
- Develop an entrepreneurial mindset.
- Identify entrepreneurial support system for new ventures and small businesses.
- Recognize a business opportunity.
- Conduct market survey and prepare project report.

DETAILED CONTENTS

1. Introduction to Generic Skills (04 hrs)

Importance of Generic Skill Development
Life Long Learning and associated importance of Generic Skill Development

2. Managing Self (07 hrs)

Knowing Self for Self Development

- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

Managing Self - Physical

Personal grooming, Health, Hygiene, Time Management

Managing Self – Intellectual development

- Information Search: Sources of information
- Communication: Official & business correspondence, Job application covering letter and resume

Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance
- Techniques to manage stress

3. Managing in Team (06 hrs)

Team - definition, team dynamics

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

4 Task Management (03 hrs)

Task Initiation, planning, execution, close out

Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (05 hrs)

Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving

Different approaches for problem solving.

Steps followed in problem solving.

Exercises/case studies on problem solving.

6. Entrepreneurship (20 hrs)

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.

Obtaining financial assistance through various government schemes like Prime Minister Employment Generation Program (PMEGP) Pradhan Mantri Mudra Yojana (PMMY), Make in India, Start up India, Stand up India, National Urban Livelihood Mission (NULM); Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale unit/ industry
- Procedures for registration of small-scale unit /industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection

Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on 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. Balasubramanian, S., "Soft Skills for Interpersonal Communication", Orient Black Swan, New Delhi.
2. "Lifelong learning"; Policy Brief (www.oecd.org).
3. Rathore, BS, and Dr JS Saini, "A Handbook of Entrepreneurship", Aapga Publications, Panchkula (Haryana).
4. Gupta, CB, and P Srinivasan, "Entrepreneurship Development", Sultan Chand and Sons, New Delhi.
5. "Entrepreneurship Development ", Tata McGraw Hill Publishing Company Ltd., New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	04	06
2.	07	08
3.	06	06
4.	03	04
5.	05	06
6.	20	20
Total	45	50

HYDRAULICS AND PNEUMATICS

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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, vapour pressure, kinematic viscosity and dynamic viscosity and their units.

2. Pressure and its Measurement (06 hrs)

Concept of pressure (Atmospheric Pressure, gauge pressure, absolute pressure)
Pascal's law and its applications

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

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)

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. Cavitation in turbine, Unit speed, unit power, unit discharge, specific speed of turbines, selection of turbines based on specific speed.

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

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

7. Hydraulic System (08 hrs)

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

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

Filters- definition and purpose, classification

Seals and packing- classification of seals, sealing materials.

Industrial applications of hydraulic system

8. Pneumatic System (08 hrs)

Basic components function of each component

Air compressors type, working

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

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

Industrial applications of pneumatic system

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 the venturimeter and measure the flow.
3. To find out the value of coefficient of discharge for orifice meter and measure the flow.
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. Kumar, KL, "Fluid Mechanics", S Chand and Co Ltd., Ram Nagar, New Delhi.
2. Khurmi, RS, "Hydraulics and Fluid Mechanics Machine", S.Chand & Co. Ltd., New Delhi.
3. Jain, Dr AK, "Fluid Mechanics", Khanna Publishers, New Delhi.

4. Shammuga Sundaram, K, "Hydraulic and Pneumatic Control", S. Chand & Co. Ltd., New Delhi.
5. Lal, Dr. Jagadish, "Hydraulics and Hydraulic Machinery", Metropolitan Book Company Ltd., Delhi.
6. Deppert, Werner and Kurt Stoll, "Pneumatics Control: An Introduction to the Principles", Vogel – Verlag.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	02	02
2	05	06
3	05	05
4	08	09
5	04	04
6	12	14
7	05	06
8	04	04
Total	45	50

4.3 STRENGTH OF MATERIALS

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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)

Basic assumptions; Concept of load, stress and strain

Tensile compressive and shear stresses and strains

Stress strain diagram

Concept of Elasticity, Elastic limit, Hooke's law, Poisson's ratio, elastic constants and their relationship, limit of proportionality.

Percentage elongation, factor of safety, strength and rigidity criteria of design

Strain energy due to direct stresses
 Resilience, proof resilience and modulus of resilience
 Stresses due to gradual, sudden and falling load.

2. Thin Cylindrical Shells

Longitudinal and circumferential stresses in seamless thin walled cylindrical shells.

3. Moment of Inertia (10 hrs)

Concept of moment of inertia and second moment of area

Radius of gyration

Theorem of perpendicular axis and parallel axis (without derivation)

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

Section modulus

4. Bending Moment and Shearing Force (10 hrs)

Concept of beam and form of loading

Concept of end supports-Roller, hinged and fixed

Concept of bending moment and shearing force

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

Theory of simple bending

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

Concept of moment of resistance

Bending stress diagram

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)

Concept of column, modes of failure

Types of columns

Buckling load, crushing load

Slenderness ratio

Factors effecting strength of a column

End restraints

Effective length

Strength of column by Euler Formula without derivation

6.9. Rankine Gordon formula (without derivation)

7. Torsion (10 hrs)

Concept of torsion- difference between torque and torsion.

Use of torque equation for circular shaft

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

Power transmitted by shaft

Concept of mean and maximum torque

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

Determination of shaft diameter under combined bending and torsion.

8. Springs (8 hrs)

Closed coil helical springs subjected to axial load - Stress deformation, Stiffness and angle of twist and strain energy, 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.

RECOMMENDED BOOKS

1. Singh, Birinder, "SOM", Katson Publishing House, New Delhi.
1. Khurmi, RS, "SOM". S.Chand & Co; New Delhi.
2. Singh, Dr. Kirpal, "Mechanics of Materials", Standard Publishers Distribution, New Delhi.
3. Malhotra, D.R., and H.C.Gupta, "Elements of SOM", Satya Prakashan, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	06	06
2	03	03
3	08	10
4	07	08
5	06	06
6	05	06
7	05	06
8	05	05
Total	45	50

THERMODYNAMICS - I

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3	2

RATIONALE

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 and compressor.

LEARNING OUTCOMES

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

- Apply thermodynamic law.
- Solve basic problems of gas equation using perfect gas laws.
- Explain the properties of a ideal gas through P-V-T relationships
- Analyze various thermodynamic processes using Mollier diagram
- Explain the working, construction and applications of steam boilers.
- Explain the working, construction and applications of steam boilers.
- Analyze performance of various air standard cycles
- Explain the working of air compressor.
- Interpret different modes of heat transfer.

DETAILED CONTENTS

1. Fundamental Concepts (04 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 (04 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, Triple point, Vander-Wal’s equation.
3. Thermodynamic Processes on Gases (06 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 (07 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 (03 hrs)
- Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas, $P-V-T$ -surface of an ideal gas, real gases.
6. Properties of Steam (04 hrs)
- Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of steam, 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 (04 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 Compressor (06 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 compressor –advantages over single stage compressor, use of air cooler –condition of minimum work in two stage compressor (without proof), simple problems

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

10. Introduction to Heat Transfer (01 hrs)

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

LIST OF PRACTICALS

1. Determination of temperature by
Thermocouple
Pyrometer
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 (any one)
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. Nag, PK, “Engineering Thermodynamics”, Tata McGraw Hill, Delhi.
2. Chaudhary, Roy, “Basic Engineering Thermodynamics”, Tata McGraw Hill, Delhi.
3. Arora, CP, “Engineering Thermodynamics”, Tata McGraw Hill, Delhi.
4. Vasandani, VP and DS Kumar, “A Treatise on Heat Engineering ”, Metropolitan Book Company.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	04
2	04	05
3	06	07
4	07	08
5	03	03
6	04	04
7	04	04
8	06	07
9	06	07
10	01	01
Total	45	50

MECHANICAL ENGINEERING DRAWING-II

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- 6

RATIONALE

Diploma holders 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 CONTENTS-CUM- PRACTICAL EXERCISES

- | | | |
|----|--|----------|
| 1. | Drilling Jig (Detail and Assembly) | 2 sheets |
| 2. | Vices | 3 sheets |
| | Machine vice (Detailed and Assembly drawing) | |
| 3. | I.C. Engine Parts | 3 sheets |
| | Piston | |
| | Connecting rod (Assembly drawing) | |
| | Crankshaft and flywheel assembly | |
| 4. | Boiler Parts | 2 sheets |
| | Steam Stop Valve (Assembled drawing) | |
| | Blow off cock. (Assembled drawing) | |
| 5. | Mechanical Screw Jack (Assembled Drawing) | 1 sheet |
| 6. | Cams | 4 sheets |
| | Types of cams and followers (Theoretical) | |
| | Profile of cams for imparting following motions with knife edge and roller followers : | |
| | <ul style="list-style-type: none"> • Uniform motion • Simple Harmonic Motion • Uniformity accelerated and retarded motion | |

7. Gears

4 sheets

Nomenclature of gears and conventional representation
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. Gill, P.S., "Machine Drawing", S.K. Kataria & Sons, Ludhiana.
2. Dhawn, RK, "A Text Book of Machine Drawing", S. Chand & Co. Ltd., New Delhi.
3. Bhatt, N.D, "Machine drawing", Charotar Book Depot, Anand.

WORKSHOP TECHNOLOGY-II

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3	6

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, Description of insert bit type tool holders, insert grades & selection of insert bits.
 - 1.2 Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. . High-speed steel, carbides, cobalt steel, stellite, ceramics, CBN and diamond.
2. Lathe (08 hrs)
 - 2.1 Principle of turning
 - 2.2 Description and function of various parts of a lathe

Classification and specification of various types of lathe

Drives and transmission

Work holding devices on lathe

Lathe tools: Parameters/Nomenclature and applications

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

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

Speed ratio, preferred numbers of speed selection.

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.

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)

Principle of drilling.

Classification of drilling machines and their description.

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

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

Types of drills and their features, nomenclature of a drill

Drill holding devices.

Radial Drilling Machine: Construction, working principle and applications.

Types of reamers.

4. Boring (04 hrs)

Principle of boring

Classification of boring machines and their brief description.

Specification of boring machines.

Boring tools, boring bars and boring heads.

Description of jig boring machine.

5. Shaping and Planing (08 hrs)

Working principle of shaper and planer

Type of shapers

Type of planers

Quick return mechanism applied to shaper and planer machine.

Work holding devices used on shaper and planer

Types of tools used and their geometry.

Specification of shaper and planer .

Speeds and feeds in above processes.

6. Broaching (04 hrs)

Introduction

Types of broaching machines—Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down. Continuous broaching and rotary broaching.

Elements of broach tool, broach tooth details nomenclature, types, and tool material.

7. Jigs and Fixtures (05 hrs)

Importance and use of jigs and fixture

Principle of location

Locating devices

Clamping devices

Types of Jigs – Drilling jigs, bushes, template jig, plate jig, channel jig, leaf jig.

Fixture for milling, turning, welding, grinding

Advantages of jigs and fixtures

8. Cutting Fluids and Lubricants (04 hrs)

Function of cutting fluid

Types of cutting fluids

Degradation, replacement and disposal of cutting fluids. Testing of cutting fluids. Various hazards associated with the storage and use of cutting fluids.

Difference between cutting fluid and lubricant

Selection of cutting fluids for different materials and operations

Common methods of lubrication of machine tools.

PRACTICAL EXERCISES

Turning Shop

Job 1. Sharpening of single point turning tool on a Tool & Cutter grinder as per tool signature.

Job 2. Exercise of simple turning and step turning.

Job 3. Demonstration of grinding process on surface grinding machine

Job 4. Preparation of a composite job involving turning, taper turning, external thread cutting, knurling and parting-off.

Advance Fitting Shop

Job 1. Exercise on drilling, reaming, counter boring, counter sinking and tapping

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.
 Job 3. Exercise on making a simple fixture for milling 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. Raghuwanshi, B.S., "Workshop Technology", Dhanpat Rai and Sons, Delhi.
2. Choudhry, SK, and Hajra, "Elements of Workshop Technology", Asia Publishing House.
3. Sharma, PC, "A Text Book of Production Engineering", S Chand and Company Ltd. Delhi
4. Rao, pN, "Manufacturing Technology VolI, II andIII", McGraw Hill Publication, Noida, UP.

SUGGESTED DISTRIBUTION OF MARKS

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5	08	10
6	04	04
7	05	06
8	04	04
Total	45	50

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
11. Preparation of Project Report

INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 6 weeks duration to be organised during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

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|--------------------------------------|-----|
| a) Punctuality and regularity | 15% |
| b) Initiative in learning new things | 15% |
| c) Relationship with workers | 15% |
| d) Industrial training report | 55% |