2.6 WORKSHOP TECHNOLOGY- I

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RATIONALE

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

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Classify various types of hand tools.
CO2: Explain working principle of vernier caliper and micrometer for measurement.
CO3: Explain the parts of lathe and their functions.
CO4: Select material and tool geometry for cutting tools on lathe.
CO5: Explain geometry of single point tool, various types of lathe tools and tool materials.
CO6: Explain the working of drilling and boring process.
CO7: Explain the nomenclature of a drill and boring tools.
CO8: Select most appropriate process, electrodes, various process parameters for a job.
CO9: Explain principle of gas welding and arc welding process.
CO10: Select a cutting fluid for an operation.

DETAILED CONTENTS

UNIT I

1. Hand Tools

Chisels – Types and uses of chisels, wood working chisels, metal working chisels – cold chisel, hard chisel, stone chisel, masonry chisel. Hammers – Types, Basic design and variations, Physics of hammering, Hammer as force multiplier, effect of head's mass, effect of handle.

Saw – Saw terminology, types of saws, types of saw blades, material used for saw, Hacksaw frame and its types. Pliers – Function and types. Wrenches/ Spanners – Common General wrenches/spanners, Specialized wrenches/spanners, Surface plate, V block, files, Surface Gauge.

2. Measuring Instruments

Calipers – Types – Inside, outside, divider, Odd leg caliper. Vernier Caliper- Parts, uses, checking error, least count, working principle. Outside micrometer - Introduction, parts, Principle, Least count, Checking zero error.

UNIT II

3. Cutting Tools and Cutting Materials

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.

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.

UNIT III

4. Welding

Welding Process - Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols. Safety precautions in welding.

Gas Welding - Principle of operation, Types of gas welding flames and their applications, Gas welding equipment - Gas welding torch, Oxygen cylinder, acetylene cylinder, cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes and personal safety equipment for welding.

Arc Welding - Principle of operation, Arc welding machines and equipment. A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes: Classification,

B.I.S. specification and selection, Flux for arc welding. Requirements of pre heating, post heating of electrodes and work piece. Welding defects and their testing methods.

UNIT IV

5. Lathe

Principle of turning, Description and function of various parts of a lathe. Classification and specification of various types of lathe, Drives and transmission, Work holding devices. 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.

UNIT V

6. Drilling

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. Types of reamers.

7. Boring

Principle of boring, Classification of boring machines and their brief description. Specification of boring machines. Boring tools, boring bars and boring heads. Description ofjig boring machine.

8. Cutting Fluids and Lubricants

Function of cutting fluid, Types 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, Certifying Organizations (such as SAE, ASTM) forrating standards of lubricants.

RECOMMENDED BOOKS

1. B.S. Raghuwanshi, “A Course in Workshop Technology (Vol. I, Manufacturing Processes)’’, Dhanpat Rai and Sons, New Delhi, 2015.
2. B.S. Raghuwanshi, “A Course in Workshop Technology (Vol. II Machine Tools)”, Dhanpat Rai and Sons, New Delhi, 2017.
3. R. K. Jain, “Workshop Technology Vol I & II’’, Khanna Publishers, New Delhi, First Edition, 2021.
4. T. L. Choudhary, “Workshop Technology Part - 1 & 2”, Khanna Publishers, New Delhi, Sixth Edition, 2019.
5. S. K. Choudhry and Hajra, “Elements of Workshop Technology (Vol. I Manufacturing Processes)”, Media Promoters and Publishers Pvt. Ltd., 2008.
6. S. K. Choudhry, Hajra and Nirja Roy, “Elements of Workshop Technology (Vol. II Machine Tools)’’, Media Promoters and Publishers Pvt. Ltd., Fifteenth Edition, 2016.

7. P. C. Sharma, "A Text Book of Production Engineering'', S Chand and Company Ltd., Delhi, Eleventh Edition, 2013.
8. R. K. Jain, "Production Technology", New Delhi, Nineteenth Edition, 2019.
9. P. N. Rao, "Manufacturing Technology Volume –I '', Tata McGraw Hill, Delhi, FifthEdition, 2019.
10. P. N. Rao, "Manufacturing Technology Volume –II'', Tata McGraw Hill, Delhi, Fourth Edition, 2019.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis in making students conversant with concepts and principles of manufacturing processes. This is theoretical subject and contains five units of equal weight age.