WORKSHOP TECHNOLOGY

ENME 155

Lecture : 3 **Year : I**
Tutorial : 1 **Part : II**
Practical : 3

Course Objectives:
The subject aims at imparting knowledge and skill in the field of basic engineering workshop technologies and their applications. It deals with the use of different hand tools and machine applications required for manufacturing simple metal components and articles.

1 Workshop, its Applications and Safety Considerations (3 hours)

1.1 Introduction
1.2 Types of engineering workshops and their layout
1.3 Applications of workshop
1.4 Safety norms, rules and regulation for workshop operation
1.5 Fire hazards and types of fire extinguisher

2 General Hand Tools Used in the Workshop (3 hours)

2.1 Introduction
2.2 Bench tools
2.3 Machinist's hammers
2.4 Screw drivers
2.5 Punches
2.6 Chisels
2.7 Scrapers
2.8 Scribers
2.9 Files
2.10 Pliers and cutters
2.11 Wrenches
2.12 Hacksaw
2.13 Bench vise
2.14 Hand drill
2.15 Taps and dies
2.16 Hand shears
2.17 Rules, tapes and squares
2.18 Soldering iron

3 General Hand Working Operations (3 hours)

- 3.1 Introduction
- 3.2 Sawing
- 3.3 Filing
- 3.4 Threading
- 3.5 Scraping
- 3.6 Shearing
- 3.7 Soldering

4 Measuring and Gauging (2 hours)

- 4.1 Introduction
- 4.2 Semi-precision tools: Calipers, depth gauge, feeler gauge
- 4.3 Precision tools: Micrometers, Vernier calipers, Vernier height gauge, telescopic gauge, hole gauge, bevel protractor, dial indicator, gauge blocks and surface plate

5 Drills and Drilling Processes (4 hours)

- 5.1 Introduction
- 5.2 Types of drill presses
- 5.3 Work holding devices and accessories
- 5.4 Cutting tools
- 5.5 Geometry of drill bits
- 5.6 Grinding of drill bits
- 5.7 Operations: Drilling, counter- boring, counter- sinking, reaming, honning, lapping
- 5.8 Cutting speeds
- 5.9 Drilling safety

6 General Machining Processes “Chip-forming” (11 hours)

- 6.1 Introduction
- 6.2 Lathes
  - 6.2.1 Introduction
  - 6.2.2 Types of lathes
  - 6.2.3 Job and cutting tools mounting and control
  - 6.2.4 Lathe operations: Facing, turning, threading, etc.
- 6.3 Shapers
  - 6.3.1 Introduction
  - 6.3.2 Types of shapers
  - 6.3.3 Job and cutting tools mounting and control
  - 6.3.4 General applications

6.4 Milling machines
- 6.4.1 Introduction
- 6.4.2 Types of milling machines
- 6.4.3 Job and cutting tools mounting and control
- 6.4.4 Milling cutters: Plain, side, angle, end, form
- 6.4.5 Milling operations: Plain, side, angular, gang, end, form, keyway

6.5 Grinding process
- 6.5.1 Introduction
- 6.5.2 Types of grinding machines
- 6.5.3 Job and grinding tools mounting and control
- 6.5.4 General applications

7 Material Properties (2 hours)

7.1 Cutting tool and properties / materials: Low, medium and high carbon steels; Hot and cold rolled steels; Alloy steels; Carbide and ceramic materials

7.2 Heat treating methods for steels: Annealing, tempering, normalizing, hardening and quenching

7.3 Non-ferrous metals: Brass, bronze, aluminum and their properties

8 Sheet Metal Works (4 hours)

8.1 Introduction

8.2 Sheet metal tools and machines

8.3 Marking and layout

8.4 General sheet metal operations: Shearing, bending, cutting, rolling, punching, etc.

9 Forging Practice (4 hours)

9.1 Introduction

9.2 Forging tools

9.3 Operations: Upsetting, drawing, cutting, bending, punching, etc.

9.4 Forging presses and hammers

9.5 Advantages and limitations

10 Metal Joining Process (6 hours)

10.1 Introduction

10.2 Temporary and permanent joints

10.3 Riveting and other mechanical joints

10.4 Soldering and brazing

10.5 Welding: Gas welding, arc welding, resistance welding, tungsten inert gas welding (TIG), metal inert gas welding (MIG)

11 Screw Threads and Gear Manufacturing Methods (2 hours)

11.1 Production of screw threads by machining, rolling and grinding process
11.2 Manufacturing of gears

12 Jigs and Fixtures for Machine Shops (1 hours)

12.1 Purpose of jigs and fixtures
12.2 Design and application of typical jigs and fixtures

Tutorial (15 hours)

The tutorial sessions will focus on chapter-specific exercises aimed at enhancing understanding and application for manufacturing simple metal components and articles.

Practical (45 hours)

Bench tools and hand operations: Measuring, marking, layout, cutting, filling, drilling, tapping, assembly

1. Bench Tools and hand operations
2. Drilling machines
3. Measuring and gauging Instruments
4. Engine lathe: Basic operations (Plain turning, facing, cutting off, knurling)
5. Engine lathe: Taper turning, drilling and boring
6. Basic shaper operations
7. Milling machines
8. Grinding machines
9. Sheet metal works
10. Foundry practice
11. Forging practice
12. Electric arc welding
13. Gas welding

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Mark distribution*
1 and 2	6	8
3 and 4	5	8
5 and 7	6	8
6	11	14
8 and 9	8	10
10	6	8
11 and 12	3	4
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Anderson, J., Tatro, E.E. (1975). Shop Theory (Latest Edition). McGraw-Hill.
2. Hajra Choudhury, S. K., Hajra Choudhury, A. K. (2016). Elements of Workshop Technology: Vol. I: Manufacturing Processes (Vol. I). Media Promoters & Publishers.
3. Hajra Choudhury, S. K., Hajra Choudhury, A. K. (2016). Elements of Workshop Technology: Vol. II: Machine Tools (Vol. II). Media Promoters & Publishers.
4. Kalpakjian, S., Schmid, S.R. (2018). Manufacturing Processes for Engineering Materials. Pearson Education.
5. Kalpakjian, S., Schmid, S.R. (2020). Manufacturing Engineering and Technology. University of Notre Dame Press.
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7. Krar, S., Gill, A., Smid, P., Gerritsen, R.J. (2020). Technology of Machine Tool. McGraw Hill.
8. Lascoe, O.D., Nelson, C.A., Porter, H.W. (1973). Machine Shop Operations and Setups (Latest Edition). American Technical Society.
9. Miltrecht, K. (1981). Machine Shop Practice: Vol. I (Latest Edition). Industrial Press.
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13. Schey, J.A. (1999). Introduction to Manufacturing Processes (Latest Edition). McGraw Hill.
14. Shaw, M.C. (2005). Metal Cutting Principles. Oxford University Press.