

# **WORKSHOP TECHNOLOGY | SYLLABUS | IOE | FIRST YEAR**

## **WORKSHOP TECHNOLOGY**

ME 453

Lecture : 1

Year: I

Practical : 3

Part: I/II

Course Objective:

The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

Objectives:

After the completion of the course, the student shall be able to

1. Practice workshop safety rules effectively
2. Acquire knowledge and use simple hand tools
3. Acquire knowledge and use simple measuring and gauging instruments
4. Operate simple drilling machines for producing small holes
5. Operate various machine tools for producing simple metal components and articles
6. Acquire knowledge and practice on foundry, forging and welding

1. General safety Considerations (2 hours)

1.1. Bench Tools

1.2. Machinist's Hammers

1.3. Screw Drivers

1.4. Punches

1.5. Chisels

1.6. Scrapers

1.7. Scribes

1.8. Files

- 1.9. Pliers and Cutters
- 1.10. Wrenches
- 1.11. Hacksaw
- 1.12. Bench Vise
- 1.13. Hand drill
- 1.14. Taps and Dies
- 1.15. Hand Shears
- 1.16. Rules, Tapes and Squares
- 1.17. Soldering Iron
- 1.18. Rivets

## 2. Hand Working Operations (1 hours)

- 2.1. Sawing
- 2.2. Filing
- 2.3. Threading
- 2.4. Scribing
- 2.5. Shearing
- 2.6. Soldering
- 2.7. Riveting

## 3. Measuring and Gauging (1hours)

- 3.1. Introduction
- 3.2 Semi – Precision Tools – Calipers, depth Gauge, Feeler Gauge
- 3.3 Precision Tools – Micrometers, Vernier Calipers, Vernier Height Gauge, Telescopic Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate

## 4. Drills and Drilling Processes (1 hours)

- 4.1 Introduction
- 4.2 Types of Drill Presses

4.3 Work Holding Devices and Accessories

4.4 Cutting Tools

4.5 Geometry of Drill Bits

4.6 Grinding of Drill Bits

4.7 Operations – Drilling, Counter - boring, Counter - sinking, Reaming, Honning, Lapping

4.8 Cutting Speeds

4.9 Drilling Safety

5. Machine Tools (4 hours)

5.1. General Safety Considerations

5.2 Engine Lathes

5.2.1 Introduction

5.2.2 Physical Construction

5.2.3 Types of Lathe

5.2.4 Lathe Operations – Facing, Turning, Threading

5.3 Shapers

5.3.1 Introduction

5.3.2 Types of Shapers

5.3.3 Physical Construction

5.3.4 General Applications

5.4 Milling Machines

5.4.1 Introduction

5.4.2 Types of Milling Machines

5.4.3 Physical Construction

5.4.4 Milling Cutters – Plain, Side, Angle, End, Form

5.4.5 Milling Operations – Plain, Side, Angular, Gang, End, Form, Keyway

5.4.6 Work Holding Devices

5.4.7 Cutter Holding Devices

5.5 Grinding Machines

5.5.1 Abrasives, Bonds, Grinding Wheels

5.5.2 Rough Grinders – Portable Grinders, Bench Grinders, Swing Frame Grinders, Abrasive Belt Grinders

5.5.3 Precision Grinders – Cylindrical Grinders, Surface Grinders

## 6. Material Properties (1 hours)

6.1. Tool materials – Low, medium and high carbon steels; Hot and cold rolled steels; Alloy steels; Carbide and Ceramic materials

6.2. Heat treating methods for steels – Annealing, Tempering, Normalizing, Hardening and Quenching

6.3. Non – ferrous metals – Brass, Bronze, Aluminum – Comparative Properties

## 7. Sheet Metal Works (1 hours)

7.1. Introduction

7.2. Sheet Metal Tools

7.3. Marking and Layout

7.4. Operations – Bending, Cutting, Rolling

## 8. Foundry Practice (1 hours)

8.1. Introduction

8.2. Pattern Making

8.3. Foundry Tools

8.4. Core Making

8.5. Melting Furnace – Cupola

8.6. Sand Casting Process

## 9. Forging Practice (1 hours)

9.1. Introduction

9.2. Forging Tools

9.3. Operations – Upsetting, Drawing, Cutting, Bending, Punching

9.4. Forging Presses and Hammers

9.5. Advantages and Limitations

## 10. Metal Joining (2 hours)

10.1 Safety Considerations

10.2 Introduction

10.3 Soldering

10.4 Brazing

10.5 Welding – Gas Welding, Arc Welding, Resistance Welding, Tungsten Inert Gas Welding (TIG), Metal Inert Gas Welding (MIG)

Workshop Practice: 3 hours/week; 15 weeks

1. Bench Tools and hand operations: Measuring, Marking, Layout, Cutting, Filing, Drilling, Tapping, Assembly
2. Bench Tools and hand operations: (Contd.)
3. Drilling machines
4. Measuring and Gauging Instruments
5. Engine lathe: Basic operations such as Plain turning, facing, cutting off, knurling.
6. Engine lathe: Taper turning, drilling and boring
7. Basic Shaper Operations
8. Milling Machines
9. Grinding Machines
10. Sheet Metal works
11. Foundry Practice
12. Forging Practice
13. Electric Arc Welding
14. Gas Welding

## References

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2. "Machine shop operations and setups", O. D. Lascoe, C. A. Nelson and H. W. Porter, American Technical society, 1973
3. "Machine shop Practice – Vol. I", Industrial Press, New York, 1971
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5. "Technology of Machine Tools", Mc Graw Hill – Ryerson, 3rd Edition

6. "Machinery's Handbook", Oberg, Jones and Horton, 23rd Edition, Industrial Press, New York.
7. "Elements of Workshop Technology - Vol. I ( Manufacturing Processes)" – S. K. Hajra Choudhury and A. K. Hajra Choudhury – Media Promoters and Publishers Pvt. Ltd. , Bombay, INDIA, Tenth Edition, 1993
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