



COURSE OUTLINE

Course Number AMT 101	Course Title Machine shop techniques I	Credits 3
Hours: Lecture.lab 2/3	Co-or Pre-requisite none	Implementation Fall 2022

Catalogue Description

Introduces students to manufacturing careers, shop safety, manufacturing operations. Topics include shop safety, mechanical hardware and shop tools, sawing, grinding, layout, hole making and thread cutting. Corresponding labs reinforce lectures with practical examples

General Education

Category:
Not GenEd

Course coordinator:

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Required **Machinery's Handbook**

By Erik Oberg and Franklin D. Jones

Publisher: Industrial Press

ISBN-10: 083112900X ISBN-13: 978-0-8311-2900-2

Optional Text: **Machine Tool Practices**

By Richard Kibbe

Publisher: Pearson

Student Learning Outcomes (SLO):

Students will be able to:

1. Identify common shop hazards and use common shop safety equipment. **(ILG 4,10, PLO,1,10)**
2. Identify the correct tool for a given job and determine the correct use of a certain tool (vises, hacksaws, files, hand reamer. Taps, thread cutting dies and cutting bits). **(ILG 4,10, 11 PLO,5,10)**
3. Safely operate and arbor press to install and remove bushings, ball bearings and shaft keys. **(ILG 4,10, 11 PLO,1,5,10)**
4. Properly use horizontal and vertical band saw machine in cutoff operations. **(ILG 4,10, 11 PLO,1,5,10)**
5. Identify various kinds of semi-precision/precision measuring tools and use them in typical machine shop tasks (layout and inspection) in English and metric units. **(ILG 4,10, 11 PLO,2,3,4,10)**
6. Identify ferrous and non-ferrous metals by various means of shop testing (hardness and tensile test), appearance and numerical system. **(ILG 3,4,10, 11 PLO,5,10)**
7. Describe the principles and differences between the various heat-treating processes (hardening, annealing and tempering). **(ILG 3,4,10, 11 PLO,5,10)**

Institutional Learning Goals (ILG)

Institutional Learning Goal 2 Mathematics: Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3 Science: Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4 Technology: Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10 Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11 Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes (PLO)

1. Maintain a safe and organized workspace.
2. Interpret blueprints to manufacture parts.
3. Apply shop and tool room mathematics as needed.
4. Complete part inspection using appropriate instruments such as micrometers, calipers, and scales.
5. Set up and operate a manual drill press, lathe, milling machine, grinder and press brake.
6. Set up and operate CNC machines (lathe and mill).
7. Use NC programming (G and M codes) to control movement and cutting processes.
8. Understanding of statistical quality control.
9. Understanding of the broad spectrum of manufacturing technologies.
10. Pursue NIMS certification.

Unit Objectives

Unit I Induction and Shop Safety (SLO 1)

The student will be able to:

1. Identify common industrial safety issues and hazards.
2. Select and use personal machine shop safety equipment.

Unit II Hand tools (SLO 2,3)

The student will be able to:

1. Install and remove a bronze bushing, ball bearing, shaft key using an arbor press.
2. Identify various types of vises, their uses and their maintenance.
3. Identify the proper tools for a given job.
4. Identify, select and use hand hacksaws.
5. Identify eight common files and some of their uses.
6. Identify at least five types of hand reamers.
7. Hand ream a hole to a specific size.
8. Select the correct tap drill for a specific percentage of thread.
9. Determine the cutting speed for a given work material-tool combination.
10. Tap holes by hand or with drill press.
11. Identify dies used for threading and cut threads with a die.

Unit III Dimensional Measurement and Layout (SLO 5)

The student will be able to:

1. Identify common methods of measurement conversion.
2. Convert inch dimensions to metric equivalents and convert metric measurements to inch equivalents.
3. Identify various kinds of Rules and their applications.
4. Apply Rules in typical machine shop measurements.
5. Measure and record to an accuracy of plus or minus .001 inch with a Vernier Calipers.
6. Measure and record dimensions using outside micrometers to an accuracy of +.0001 inch using outside micrometers.
7. Define comparison measurement and identify common comparison measuring tools.
8. Wring gage blocks together correctly and disassemble gage block combinations and prepare the blocks properly for storage.
9. Identify common angular measuring tools, read and record angular measurements using a Vernier protractor.
10. Prepare the workpiece for layout and measure and scribe layout lines on the workpiece outlining the various features.
11. Locate and establish hole centers using a layout prick punch and center punch.
12. Layout a workpiece to a tolerance of +1/64 inch.

Unit IV Sawing machines (SLO 4)

1. Identify abrasive and cold saws wheel materials.
2. Describe the operation of abrasive cold sawing machines.
3. Operate the band machine controls.
4. Perform typical sawing operations on the vertical band machine.

Unit V Materials (SLO 6,7)

The student will be able to:

1. Identify different types of metals by various means of shop testing.
2. Identify and classify nonferrous metals by a numerical system.
3. List the general appearance and use of various nonferrous metals.
4. Correctly harden a piece of tool steel and evaluate their work.
5. Correctly temper the hardened piece of tool steel and evaluate their work.
6. Describe the proper heat-treating procedure for other tool steels.
7. Explain the principles and differences between the various annealing processes.
8. Make a Rockwell test using the correct penetrator, major load and scale.

Unit VI Drill Press (SLO 2,3)

1. Identify three basic drill press types and explain their differences and primary uses.
2. Properly choose cutting speeds and feeds.
3. Use proper procedures for drilling.
4. Use proper work holding techniques.
5. Operate the drill press safely.
6. Identify tools for countersinking and counterboring.
7. Select speeds and feeds for countersinking and counterboring.

Method of Instruction

Learning will take place via classroom instruction, demonstrations and student activities, as well as through textbook reading and homework assignments. Lab activities will augment this. Use of equipment and manual skills will be developed in the lab.

Student Evaluation

Students' achievement of the course objectives will be evaluated through the use of the following:

- Three-unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on shop projects and lab assignment results.
- In class participation, homework and attendance.

Evaluation Tools	Percentage of Grade
3 Unit Tests	50%
Lab Assignments/ Shop Projects	25%
Homework / In-Class Assignments	25%
Total	100%