COURSE OUTLINE

Course Number  
AMT 110

Course Title  
Machine shop techniques II

Credits  
3

Hours: Lecture.lab  
Co-or Pre-requisite

2/3  
AMT101, AMT102, AMT103

COURSE DESCRIPTION

Introduces students to the theory and practical concepts of manual machining. Topics include: Machine shop safety, Turning Machines, Vertical Milling Machines, Grinding and Abrasive Machining Processes. Corresponding labs reinforce lectures with practical examples which follow NIMS certification requirements.

Required Text: Machine Tool Practices  
By Richard Kibbe  
Publisher: Pearson

Optional Machinery's Handbook  
By Erik Oberg and Franklin D. Jones  
Publisher: Industrial Press  

Revision date: 4/4/2019

Course Instructor: Michael Hanna  
Ext. 3828,  
hannam@mccc.edu  
Office Hours: Thursday 3pm – 5:30 pm or by appointment
General Objectives
Course Competencies/Goals

Students 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 your work
5. Correctly temper the hardened piece of tool steel and evaluate your 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 Rockwell hardness test
9. Demonstrate safe work habits while operating turning machines
10. Identify and explain the function of engine lathe parts
11. Explain, demonstrate and perform the procedures for drilling, boring, reaming, knurling, recessing, parting, and tapping in the lathe.
12. Identify and describe the important components and controls on the horizontal milling machine
13. Safely operate the milling machine and perform (face milling, grooving, drilling)
14. Name and describe the components of the horizontal spindle surface grinder.
15. Describe the basic operating principles of common grinder chucks.

General Education Knowledge Goals

Goal 1. Communication. Students will communicate effectively in both speech and writing.
Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

MCCC Core Skills

Goal A. Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.
Goal D. 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.
Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.
Goal F. Collaboration and Cooperation. Students will develop the interpersonal skills required for effective performance in group situations.
Unit Objectives

Unit 0 - Safety Review
The student will be able to:
1. Identify common industrial safety issues and hazards
2. Select and use personal machine shop safety equipment

Unit I - Materials
The student will be able to:
3. Identify different types of metals by various means of shop testing.
4. Identify and classify nonferrous metals by a numerical system.
5. List the general appearance and use of various nonferrous metals.
6. Correctly harden a piece of tool steel and evaluate your work
7. Correctly temper the hardened piece of tool steel and evaluate your work.
8. Describe the proper heat-treating procedure for other tool steels
9. Explain the principles and differences between the various annealing processes.
10. Make a Rockwell test using the correct penetrator, major load and scale.

Unit II - Lathing
The student will be able to:
1. Demonstrate safe work habits while operating turning machines
2. Identify and explain the function of engine lathe parts
3. Identify places where an engine lathe should be lubricated
4. Make common adjustments such as cross slide, compound slide, and tailstock
5. Identify standard, quick-change, and turret-type toolholders mounted on a lathe carriage
6. Identify tool holding devices for the lathe tailstock.
7. Explain the purpose of rake and relief angles, chip breakers, and form tools
8. Explain the uses and care of independent and universal chucks.
9. Explain the limitations and advantages of collets and describe a collet setup.
10. Explain the use of a face driver or drive center.
11. Explain the uses and differences of drive plates and face plates.
12. Explain drives and shifting procedures for changing speeds on lathes.
13. Describe the use of various feed control levers.
14. Explain the relationship between longitudinal feeds and cross feeds.
15. State the differences in types of cross-feed screw micrometer collars.
16. Correctly set up a workpiece and face the ends.
17. Correctly center drill the ends of a workpiece.
18. Determine the proper feeds and speeds for a workpiece.
19. Explain how to set up to make facing cuts to a given depth and how to measure them.
20. Explain the procedures for drilling, boring, reaming, knurling, recessing, parting, and tapping in the lathe.
21. Set up to drill, ream, bore, and tap on the lathe, and complete each of these operations.
22. Set up for knurling, recessing, die threading, and parting on the lathe, and complete each of these operations.
23. Detail the steps and procedures necessary to cut a Unified thread to the correct depth.
24. Set up a lathe for threading and cutting several different thread pitches and diameters.
25. Identify tools and procedures for thread measurement.
Unit III – Milling machine
The student will be able to:
1. Identify the important components and controls on the horizontal milling machine
2. Describe the functions of machine parts and controls
3. Identify machine spindles and set up different cutting tool mounting systems used to drive milling cutters.
4. Identify common milling cutters, list their names and select a suitable cutter for a given machining task.
5. Select a work holding method and device for common milling tasks.
7. Select speeds and feeds for several different materials and milling cutters.
8. Set up the mill for plain milling.
9. Select and set up a work holding system.
10. Select and set up an appropriate cutter and arbor.
11. Mill surfaces flat and square to each other.
12. Set up side milling cutters and cut steps and grooves
13. Use side milling cutters for straddle milling
14. Use side milling cutters for gang milling
15. Identify face milling cutters.
16. Use face milling cutters to machine flat surfaces.

Unit IV – Grinding machines
1. Describe truing, dressing and balancing of grinding wheels.
2. Distinguish the difference between the objectives of truing and dressing grinding wheels.
3. Correctly position a single-point diamond dresser in relation to the grinding wheel.
4. Name the components of the horizontal spindle surface grinder.
5. Define the functions of the various component parts of the grinder.
6. Name and describe the functions of at least two accessories devices used to increase the versatility the surface grinder.
7. Describe the basic operating principles of common grinder chucks.
8. Describe methods of holding odd-shaped nonmagnetic and thin workpieces.

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.
<table>
<thead>
<tr>
<th>Evaluation Tools</th>
<th>Percentage of Grade</th>
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<tbody>
<tr>
<td>3 Unit Tests</td>
<td>50%</td>
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<tr>
<td>Lab Assignments/ Shop Projects</td>
<td>25%</td>
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<tr>
<td>Homework / In-Class Assignments</td>
<td>25%</td>
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<tr>
<td><strong>Total</strong></td>
<td>100%</td>
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