

EASTERN ARIZONA COLLEGE

Pattern Making and Foundry

Course Design
2015-2016

Course Information

Division Industrial Technology Education
Course Number MSP 260
Title Pattern Making and Foundry
Credits 2
Developed by Dee Lauritzen
Lecture/Lab Ratio 1 Lecture/3 Lab

Transfer Status

ASU	NAU	UA
OMT Dept. Elective	CM Departmental Elective	Non-transferable

Activity Course No
CIP Code 48.0500
Assessment Mode Portfolio
Semester Taught Upon Request
GE Category None
Separate Lab No
Awareness Course No
Intensive Writing Course No

Prerequisites

None

Educational Value

This will be a valuable experience for machine shop majors. Students will learn the processes of hot metal casting and how they interface with other production methods. Other technology students will receive a background in foundry methods. Generally this course will provide a history of casting methods which have been used for centuries.

Description

This course covers the technology of sand casting for part production and the creation of artistic pieces. It includes industrial pattern making techniques and foundry methods.

Supplies

None

Competencies and Performance Standards

1. Practice safe work habits in all foundry activities.

Learning objectives

What you will learn as you master the competency:

- a. Identify the causes of accidents in the shop environment.
- b. Point out the locations of fire extinguishers and other safety equipment in the shop.
- c. Recite the rules of safety applicable to all of the tools and equipment in the foundry area.
- d. Describe the chemical, physical, and mechanical processes that occur in all of the cutting operations.
- e. Demonstrate the correct usage of foundry safety gear.

Performance Standards

Competence will be demonstrated:

- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner works safely and uses the appropriate safety gear when working in the foundry area
- o learner is aware of and uses the proper precautions when operating the furnace and the muller

2. Design and build a pattern and use it to produce a casting.

Learning objectives

What you will learn as you master the competency:

- a. Identify the principles of good pattern design.
- b. Demonstrate the problems which can occur when patterns are incorrectly designed.
- c. Choose a design which will produce an effective mold and a strong useful casting.
- d. Produce a pattern from student's original design.
- e. Correctly use draft and fillets in completion of the pattern.

Performance Standards

Competence will be demonstrated:

- o in written activities
- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner demonstrates the correct use of patternmaking tools
- o learner produces a foundry pattern to specifications
- o learner follows guidelines and procedures to design an original and unique foundry pattern

3. Design and build a core box to produce a sand core.

Learning objectives

What you will learn as you master the competency:

- a. Design a core box which will produce an effective sand core.

- b. Use principles of sound craftsmanship to fabricate a core box which will produce an effective sand core.

Performance Standards

Competence will be demonstrated:

- o in homework assignments
- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner designs a core box used to produce a sand core
- o learner builds the core box to design specifications
- o learner tests the core box by producing a sand core to specifications

4. Produce four different types of sand molds.

Learning objectives

What you will learn as you master the competency:

- a. List the different types of molds used for sand casting.
- b. Enumerate the advantages and limitations of each type of sand mold.
- c. Describe the different types of sand, binders, and hydrates which are used in sand casting operations.
- d. Demonstrate the methods of producing sand molds for each of these patterns: flat parting line, cylindrical pattern, pattern with a core insert, and expendable pattern.
- e. Cut mold sprue using a sprue cutter and a sprue stick.
- f. List the steps in producing pouring basin and slag trap.
- g. Identify the procedures for producing runners and gates.
- h. Discuss the usage of vent holes in sand casting.

Performance Standards

Competence will be demonstrated:

- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner produces a sand mold from a pattern with a flat surface which can be used as a parting line
- o learner produces a sand mold from a pattern with no parting line surface so that coping out must be used
- o learner produces a sand mold using a match plate pattern
- o learner produces a sand mold using an expendable pattern

5. Produce integral castings from each of the prepared molds.

Learning objectives

What you will learn as you master the competency:

- a. Describe the procedures for pouring hot metals into sand molds.
- b. List the different tools which are used in the pouring process and describe their function.
- c. Identify the parameters for cooling a casting and preparing for shakeout.
- d. Demonstrate the correct procedures for safely shaking out a casting.

- e. Describe all of the processes which are used to trip flash, gates, and runner from a casting.

Performance Standards

Competence will be demonstrated:

- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner produces high quality castings from each type of sand mold
- o learner removes gates, runners, and flash from casting surface and effectively finishes the complete casting

6. Operate a crucible furnace and correctly melt and treat molten metals.

Learning objectives

What you will learn as you master the competency:

- a. List the procedures for firing, adjusting, and loading the crucible furnace.
- b. Demonstrate the correct use of safety equipment when using the crucible furnace.
- c. Show the correct way to use the pyrometer and measure the temperature of the molten metal.
- d. Identify the melting temperatures of various metals.
- e. Demonstrate the use of furnace, base block, turn table, crucible tongs, and shanks.
- f. Identify the correct flux and degasser for each type of molten metal.
- g. Describe the application process using fluxes and degassers.

Performance Standards

Competence will be demonstrated:

- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner uses all of the steps for firing and adjusting the crucible furnace
- o learner selects and uses the correct degassers and flux compounds for the metals being melted
- o learner selects and uses the correct plunger, skimmer, tongs, and shanks which are required for specified pouring conditions

7. Evaluate the causes of casting defects.

Learning objectives

What you will learn as you master the competency:

- a. Identify defects in sand castings.
- b. List the causes of each defect.
- c. Describe procedures for eliminating each of the defects.

Performance Standards

Competence will be demonstrated:

- o in class assignments
- o in lab activities

Criteria - Performance will be satisfactory when:

- o learner identifies the defects in poor quality castings

- learner describes the causes of each of the defects under consideration
- learner takes steps to eliminate casting defects in each of the assigned projects

8. Describe all of the major casting methods and outline their components.

Learning objectives

What you will learn as you master the competency:

- a. List the different types of castings.
- b. Describe the advantages and limitations of each method.
- c. Choose a type of casting for specific applications.

Performance Standards

Competence will be demonstrated:

- in written test

Criteria - Performance will be satisfactory when:

- learner reviews castings on display and identifies the casting processes which produced them
- learner describes the following casting processes, sand, die, centrifugal, shell mold, core mold, permanent mold, continuous rod, and investment
- learner describes the advantages and disadvantages of each of these processes

Types of Instruction

Classroom lecture and discussion

Lab work on assigned projects

Grading Information

Grading Scale

A	90%-100%
B	80%-89%
C	70%-79%
D	59%-69%
F	Less than 59%

Learning Plan 1

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

1. Practice safe work habits in all foundry activities.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 2

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

2. Design and build a pattern and use it to produce a casting.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 3

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

3. Design and build a core box to produce a sand core.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 4

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

4. Produce four different types of sand molds.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 5

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

5. Produce integral castings from each of the prepared molds.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 6

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

6. Operate a crucible furnace and correctly melt and treat molten metals.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 7

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

7. Evaluate the causes of casting defects.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.

Learning Plan 8

Overview

A standard method of instruction, practice, production, and evaluation that is applied to each competency.

8. Describe all of the major casting methods and outline their components.

Learning Activities

- ____1. Read the assigned chapters in the text.
- ____2. Participate in the lecture and discussion of each section.
- ____3. Participate in the demonstration of each process under consideration.
- ____4. Read the information, for each section, distributed to each student.
- ____5. Individually demonstrate correct procedural methods to the instructor.
- ____6. Complete the assigned project and submit it for a grade.
- ____7. Explain the causes for any defects in the project.
- ____8. Review all chapter tests and correct misunderstandings.

Assessment Activities

- ____1. Complete the assigned projects and turn them in to the instructor for evaluation.
- ____2. Complete chapter tests covering the technical details of the course.
- ____3. Complete a comprehensive final exam.