

COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	Metallurgy
COURSE NUMBER	MACH 0106
DIVISION	Career and Technical Education
DEPARTMENT	MACH
CIP CODE	48.0501
CREDIT HOURS	1
CONTACT HOURS/WEEK	Class: 1 Lab:
PREREQUISITES	Fundamentals of Mathematics w/ a grade of "C" or higher or appropriate score on the Math assessment test.

COURSE DESCRIPTION

Metallurgy Fundamentals is designed for those who desire to learn the basics of the Behavior of metals and provide them with a broadened range of the industrial knowledge of The entire field of metals (metallurgy) the course content will provide the student learner the why and how of the selection of metals for their particular applications. It will also cover physical conditions that working or deforming may have on metals in relationship to being machined.

PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:
https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES

1. Students will be able to read and interpret drawings and translate them into physical parts made from a variety of materials using manually operated machine tools
2. Students will be able to set up and safely operate manually operated machine tools.
3. Students will be able to inspect machined parts to verify dimensions fall within specified tolerances using a variety on precision measuring tools.
4. Students will be able to plot tool paths for CNC lathe and CNC mill parts in G-code from technical drawings.
5. Student will be able to accurately calculate proper machining feeds, speeds, and formulas.

TEXTBOOKS

<http://kckccbbookstore.com/>

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. History of metal process.
 - A. Where metals come from
 - B. Early and present smelting methods
 - C. Production of metals
 - D. Refining of steel process
- II. Steel Production:
 - A. Production of ferrous and nonferrous material
 - B. Shaping and forming metals
 - C. Welding metallurgy
 - D. Power metallurgy
 - E. Surface treatments
 - F. SAE numbering system
 - G. Alloying
 - H. Bearing materials
- III. Testing materials:
 - A. Identify testing
 - B. Identify hardness
 - C. Identify strength
- IV. Heat treatment:
 - A. Heat ranges
 - B. Heat sensing methods
 - C. Oven operations
 - D. Precautions and safety

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. Understand the history of steel making process.
 1. Describe the history of iron and steel.
 2. Summarize the production of iron and steel.

- B. Identify metals by various methods.
 - 3. Identify ferrous and non ferrous metals.
 - 4. Define refining of steel.
 - 5. Differentiate alloys and special steel.
 - 6. Identify tool steels and their uses.

- C. Understand non destructive vs destructive testing.
 - 7. Perform safety precautions related to testing.
 - 8. Give examples of destructive testing.
 - 9. Perform non destructive test.

- D. Perform applications related to Metallurgy.
 - 10. Describe shaping of steel.
 - 11. Give examples of Powder Metallurgy.
 - 12. Identify materials by utilizing the SAE # system.
 - 13. Give examples of effects of welding metals.

- E. Operate heat treating ovens.
 - 14. Identify heat treating.
 - 15. Locate heat treatment hardening temperatures.
 - 16. Identify temperatures for heat treating materials.
 - 17. Identify quenching methods.
 - 18. Identify parts of heat treating equipment.
 - 19. Energize heat treating oven to specifications

- F. Test hardness by various methods
 - 20. Test metals for hardness range.
 - 21. Identify hardness tester.
 - 22. Identify hardness testing methods.

- G. Understand annealing.
 - 23. Perform annealing process.
 - 24. Perform tempering or normalizing process.
 - 25. Perform case hardening process.
 - 26. Record maintenance performed on equipment.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.