

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Nondestructive Testing Technology Program
Revision Date: December 14, 2023

I. CATALOG DESCRIPTION

Course Number: NDTT1263
Course Title: Metallurgy
Prerequisite(s): NDTT1133 and MATH1050 or Higher
Corequisite(s): WELD1191
Catalog Description: Study of the nature of metals of metallurgical examination, mechanical testing, chemistry, and production of metals.
Credit Hours: 2.5
Class Hours: 23
Lab Hours: 45
Total Contact Hours: 68

II. COURSE OBJECTIVES: *Course will:*

- A. Establish a solid foundation for understanding metallurgical terms and practices for material processing currently used in the metals and material industry. The subject matter presented also prepares the student with a basic understanding of the mechanisms which cause material failure and those which prevent failures.
- B. Examine practical examples of material failure analysis, microstructure photographs, and the corrective actions taken to resolve processing and manufacturing problems in industry.
- C. Describe testing methods used to determine material properties and testing for specifications compliance.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Apply the basic principles of materials manufacturing and the properties that the various forming techniques impart on the finished project.
 - 2. Identify various anomalies associated with the various material types and manufacturing processes.
 - 3. Apply proficiency in establishing and implementation of structural analysis testing
 - 4. Identify appropriate nondestructive test arrangements based on material analysis.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
Outcome 1: Collect, identify, interpret, and analyze data.

IV. CONTENT/TOPICAL OUTLINE (*course outline may provide more detailed information*)

- A. AWS Clause 4 – Welder Qualification
- B. Nondestructive Testing
- C. Extracting metals from ores –*Review*
- D. The casting of metals –*Review*
- E. Physical and mechanical properties of metals –*Review*
- F. The crystal structure of metals, basic phase diagrams, and the metallographic sample preparation laboratory the casting of metals
- G. The iron-carbon phase diagram nonferrous metals

- H. Heat-treating equipment & annealing, stress relieving, normalizing, hardening, and tempering of steels
- I. Hardness testing
- J. Hazardous materials

V. INSTRUCTIONAL MATERIALS

- A. Required Text(s): Neely, John E., & Bertone, Thomas J., *Practical Metallurgy and Materials for Industry*
- B. Supplies:
 - 1. Scientific calculator
 - 2. Pocket pen light (with batteries/flashlight)
 - 3. 0-1 in OD micrometer (with Vernier scale)
 - 4. 6" steel rule
 - 5. Notebook and ¼" graph paper
 - 6. Vis-à-vis water markers (pkg. of 4)
 - 7. Writing utensil (pencil or pen)
 - 8. 8" pliers
 - 9. 12 ft. tape measure
 - 10. French curves (set)
 - 11. 1 GB capacity removable drive
 - 12. PPE (safety glasses, denim/flannel shirt, and leather work boots)

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 - 1. Lecturing
 - 2. Small and large group discussion
 - 3. Video presentations
 - 4. Demonstrations
 - 5. Handouts
 - 6. Observations
 - 7. Assigned lab projects
 - 8. Field trips

VII. METHODS OF EVALUATION (*course outline may provide more detailed information*)

- A. Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 - 1. Notebook (if required)
 - 2. Quizzes
 - 3. Tests
 - 4. Lab grades
 - 5. Attendance/class conduct

VIII. SPECIFIC COURSE REQUIREMENTS:

- A. Attendance
- B. Examination
- C. Homework
- D. Lab Projects
- E. Must earn a final grade of 70% (2.0) or higher.