MACH A190: ELEMENTARY METALLURGY

Item	Value
Curriculum Committee Approval Date	12/02/2020
Top Code	095630 - Machining and Machine Tools
Units	2 Total Units
Hours	36 Total Hours (Lecture Hours 36)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

An elementary course describing the relationship between microstructure, composition, heat, and mechanical treatment and physical properties of metal and alloys; their relationship to design and machining. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Demonstrate proper use of Tensile and Rockwell Testing machines to measure the strength of common aluminum and steel samples.
2. Identify the basic machining characteristics of aluminum, steel and copper based alloys.
3. Describe the cutting characteristics of high speed steel and carbide cutting tools on aluminum, carbon steel, and copper based alloys.

Course Objectives

- 1. Describe the properties of metals and alloys which are used in industry.
- 2. Converse effectively in the metallurgical language.
- 3. Define the role of metallurgy to the designer, machinist, tool, and diemaker.
- 4. Describe the relationship to speeds and feeds to alloys.
- 5. Converse accurately about why common metals and metal groups machine as they do.
- 6. Accurately perform a Rockwell hardness test.
- 7. Discuss how hardness affects the machining process.

Lecture Content

History discovery refining Physical Metallurgy atomic and crystal structure of metals Physical Metallurgy, continued melting and solidification characteristics crystal structure defects and deformation Properties and testing of metals stress, strain, elasticity, strength, hardness, toughness, plasticity, ductility, malleability, and brittleness Rockwell, Brinell and Shore hardness testing tensile, impact, torsion, and fatigue testing Properties and testing of metals, continued grain, spark, and corrosion testing x ray, magnetic particle, and liquid penetrant specimen preparation mounting etching and microscopes macroscopic examination The nature of plastic deformation of metals slip strain hardening cold and hot working of metals rolling, forging, extrusion, shearing, forming, drawing, and spinning The iron carbon diagram carbon solubility and definition grain size changes and allotropy critical temperature Carbon, alloy, and tool steels classification of carbon steels, AISI and SAE effects of alloy elements Carbon, alloy, and tool steels, continued specific alloy steels high speed tool steels selection of steels Cast and alloy cast irons alloying elements in irons and types Heat treatments for steel Annealing and normalizing Hardening and quenching media Heat treatments, continued tempering treatments surface treatment, carburizing, and nitriding Light metals and alloys Aluminum, magnesium, titanium, and ber yllium Machinability Speed and feed as related to alloys Machinability Comparison of steels Comparison of light alloys welding metallurgy, heat, stress, and weld protection

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)

Instructional Techniques

Lecture; demonstrations; one field trip

Reading Assignments

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Writing Assignments

All students will create a simple report describing one type of metal. The focus and depth of the report is up to the student. The purpose is to expand the students knowledge of metals in an area of his or her interest.

Out-of-class Assignments

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Demonstration of Critical Thinking

Short weekly quizzes; mid-term exam Final exam and material report

Required Writing, Problem Solving, Skills Demonstration

All students will create a simple report describing one type of metal. The focus and depth of the report is up to the student. The purpose is to expand the students knowledge of metals in an area of his or her interest.

Textbooks Resources

1. Required Moinz, B.J.. Metallurgy, latest ed. Chicago: American Technical Publishers, 0 Rationale: -