MATSCEN 5441 (Approved): Physical Metallurgy

Course Description

Physical metallurgy of ferrous and non-ferrous alloys. Emphasis on alloy design, processing and structure-property relations.

Prior Course Number: MSE661 and MSE663
Transcript Abbreviation: Phys. Met.
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral, Professional
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: MSE3141, MSE3261, or permission of instructor.
Exclusions:
Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.3101
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Goals

Understanding of principles of alloy design: Effect of alloying elements on phase stability and morphology, transformation kinetics, and alloy properties
Familiarity with major classes of ferrous and non-ferrous alloys
Understanding general principles and specific practices of thermo-mechanical processing of alloys
Understanding processing-structure-property relations in specific alloys

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Review of Liquid-Solid and Solid-Solid Transformations	9.0							
The Fe-C System & Plain-Carbon Steels (Austenite Decomposition Reactions, IT, CT)	4.0							
Hardenability, HSLA Steels, Surface Hardening	3.0							
Stainless Steels	2.0							
Tool Steels and other specialty steels (electrical)	2.0							
Advanced High-Strength Steels (AHSS)	2.0							
Cast Irons	2.0							
Aluminum Alloys & Magnesium Alloys (Cast & Wrought, Strain/Solution/Pcpt Strengthened Alloys)	4.0							
Titanium Alloys (alpha, alpha-beta, beta)	3.0							
Superalloys (Ni-base, Fe-base, Ni+Fe), Oxidation Resistance	4.0							
Copper Alloys (Copper, brasses, bronzes, Cu-Be)	2.0							
Metallic Glasses	2.0							

Representative Assignments

Periodic homework sets assigned to reinforce lecture materials.

Grades

Aspect	Percent
Homework & Quizzes	15%
Two Midterm Exams	50%
Final Exam	35%

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
**	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
*	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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