WELDENG 7102 (Approved): Welding Metallurgy II

Course Description

This course addresses the welding metallurgy and weldability principles associated with stainless steels, and nickel-base, aluminum-base, and titanium-base alloys. (Graduate Level)

Prior Course Number: 612
Transcript Abbreviation: Weld Met II
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Masters, Doctoral
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: Prereq: Graduate Standing and 4101 or 7101 or permission of instructor.
Exclusions: Not open to students with credit for 612 or 4102.
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: 14.9999
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
WELDENG	Welding Engineering

General Information

This is a graduate level course that will be taught at the same time as WE4102. Lecture content will be the same as 4102, but graduate students will be required to conduct detailed review of research papers related to welding metallurgy and provide brief class presentations.
Additional content has been added to the course to account for an additional semester credit hour relative to the direct conversion from the quarter course (3 qtr credits/2 semester credits).

Course Goals

Provide a basic understanding of the physical and welding metallurgy of stainless steels, including the use of phase diagrams and constitution diagrams.
Describe the weldability aspects of stainless steels, including susceptibility to various forms of cracking that occur during fabrication and service.
Provide a basic understanding of the physical and welding metallurgy of important nonferrous alloy systems, including nickel-, titanium-, and aluminum-base alloys.
Provide guidelines for selection of these alloy systems based on their welding metallurgay and welability characteristics.
Review basic concepts regarding characterization and failure analysis.
Allow students to conduct detailed review/critique of technical papers and provide a review to the class.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction and History of Stainless Steels	1.0							
Effect of alloying additions to stainless steel, and use of phase diagrams and constitution diagrams	3.0							
Physical metallurgy, welding metallurgy, and weldability of the major classes of stainless steels	15.0							
Dissimilar welding of stainless steels	2.0							
Welding Metallurgy of Ni-base alloys	6.0							
Welding Metallurgy of Al-Alloys	5.0							
Welding Metallurgy of Ti-alloys and Mg-alloys	2.0							
Welding Metallurgy of other nonferrous alloys	1.0							
Characterization and failure analysis	4.0							
Computational modeling of microstructure evolution	3.0							

Grades

Aspect	Percent
Midterm 1	30%
Midterm 2	30%
Final Exam	40%

Representative Textbooks and Other Course Materials

Title	Author
Welding Metallurgy and Weldability of Stainless Steels	J.C. Lippold and D.J. Kotecki
Welding Metallurgy and Weldability of Ni-base Alloys	J.N. DuPont, J.C. Lippold, and S.D. Kiser

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.

Course Contribution		College Outcome
	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.

WELDENG ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
***	l	an ability to select and design welding materials, processes and inspection techniques based on application, fabrication and service conditions
*	m	an ability to develop welding procedures that specify materials, processes and inspection requirements
*	n	an ability to design welded structures and components to meet application requirements

Additional Notes or Comments

This is a graduate level course that is offered at the same time as WEENG4102.

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