

WELDENG 7112 (Approved): Weldability

Course Description

This course teaches the basic concepts of weldability and focuses on failure mechanisms in welded construction. Failure phenomena that occur during fabrication, repair, and during service are discussed.

Prior Course Number: 714, 715

Transcript Abbreviation: Weldability

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: Spring, Summer

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 714, 715 or 4112.

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 course reviews basic concepts of weldability with respect to failure mechanisms commonly encountered in welded construction. In addition to lecture notes, there is considerable outside reading. Also, the students are assigned a topic that they research and write a technical paper. They make a presentation to the class based on this paper. This course is the graduate student equivalent of WEENG4112. Graduate students will be expected to conduct more in-depth research (relative to UGs) in the preparation of a review paper based on a specific assigned topic.

Course Goals

Provide a basic understanding of the types of failures that occur in welded construction, including failure during primary fabrication, repair, or during service.
Review the failure mechanisms that occur during primary fabrication, including solidification and liquation cracking, solid-state cracking, and hydrogen induced cracking.
Review failure mechanisms that occur in service, including fracture, fatigue, creep, and corrosion.
Review weldability tests that are used to quantify weldability.
Provide a basic overview of techniques that are used to conduct a failure analysis of welded structures.
Give students experience in writing a detailed technical paper on a specific topic and to review and critique papers written by other students.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
General types of failures in welded construction	1.0							
Review of welding metallurgy fundamentals	3.0							
Solidification and liquation cracking	6.0							
Solid-state cracking	6.0							
Hydrogen cracking	4.0							
Fatigue and fracture	4.0							
Creep and stress-rupture	2.0							
Corrosion and corrosion-related failures	4.0							
Weldability testing	2.0							
Failure analysis techniques and case studies	4.0							
Student presentations	6.0							

Grades

Aspect	Percent
Midterm exam	30%
Final exam	40%
Paper and presentation	30%

Representative Textbooks and Other Course Materials

Title	Author
<i>Weldability of Materials, Course notes by J.C. Lippold, 2009.</i>	J.C. Lippold

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.

Course Contribution		College Outcome
*	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

Prepared by: John Lippold