

WELDENG 7023 (Approved): Brazing and Soldering

Course Description

Brazing and soldering processes with emphasis on physical and metallurgical principles, materials, design and application considerations.

Prior Course Number: 703

Transcript Abbreviation: Brazing&Soldering

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, and 4102 or 7102 or permission of instructor.

Exclusions: Not open to students with credit for 703 or 4023

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 in the Welding Engineering program. It describes the basic processes and physical metallurgy principles of Brazing and Soldering. One team assignment (written report on) and three laboratory exercises are incorporated in the course.

Course Goals

Describe the basic principles of brazing and soldering processes, and of microstructure, properties, quality, and reliability of brazed and soldered joints. Provide specific knowledge about brazing and soldering of metals, ceramics, and composites.

Provide basic understanding of surface energy, wetting, and capillary flow in brazing and soldering. Interaction of solid and liquid metals, solidification, diffusion, phase transformations. Formation of oxides, carbides, nitrides and intermetallics.
Provide basic knowledge about the brazing and soldering filler metals and fluxes, their composition, properties, application, compatibility to base metals, selection, and classification.
Describe the basic principles and considerations in the design and strength of brazed and soldered joints, including joint geometry and gaps, strength calculation, thermal expansion mismatch, stress concentration, testing, and quality control.
Provide basic knowledge about the inspection and quality control of brazed and soldered joints, and about the safety considerations in brazing and soldering.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction, definitions, and general characterization of brazing and soldering	3.0							
Physical and metallurgical phenomena in brazing and soldering	6.0							
Wetting and capillary flow of brazing and soldering filler metals			3.0					
Brazing and soldering processes	7.0							
Brazing and soldering filler metals and fluxes	3.0							
Base materials and brazeability, brazing and soldering of metals and metallic alloys.	6.0							
Effect of preplacing of brazing and soldering filler metals on filling the joint gap and joint quality.			3.0					
Brazing and soldering of non-metallic materials.	2.0							
Design and strength of brazed and soldered joints.	6.0							
Inspection of brazed and soldered joints.	2.0							
Microstructure characterization and defects in brazed and soldered joints.			3.0					
Safety considerations in Brazing and soldering	1.0							

Grades

Aspect	Percent
Lab reports	15%
Exam 1	25%
Exam 2	25%
Final Exam	25%
Team assignment(written report)	10%

Representative Textbooks and Other Course Materials

Title	Author
<i>Lecture Notes</i>	A. Shapiro, A. Rbinkin, B. Alexandrov, M. Lucas, P. Ditzel, Y. Flom
<i>Brazing Handbook</i>	AWS
<i>Soldering Handbook</i>	AWS

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.

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

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