WELDENG 4303 (Approved): Ultrasonic Nondestructive Testing

Course Description

Principles of ultrasonic wave generation, interaction of ultrasonic waves with material structures with emphasis on characterization of material properties, quantitative ultrasonic evaluation of material discontinuities.

Prior Course Number: 732
Transcript Abbreviation: Ultrasonic NDT
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Senior
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Odd Years
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: 4103, and enrollment as WeldEng-BS major; or permission of instructor.
Exclusions: Not open to students with credit for WE 732.
Cross-Listings:

Course Rationale: Existing course.

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: Baccalaureate Course

Programs

Abbreviation	Description
WELDENG	Welding Engineering

Course Goals

Achieve basic understanding of main concepts and aims of ultrasonic NDT.
Learn theoretical principles of ultrasonic methods and their capabilities and limitations.
Learn ultrasonic wave interaction with interfaces between materials and ultrasonic spectroscopic methods.
Learn applications of ultrasonics for material characterization.
Obtain some basic laboratory experience with ultrasonic testing.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to course.	1.5							
Vibrations and ultrasonic waves.	1.5							
Physical principles and interaction with interface between materials.	3.5							
Oblique incidence of ultrasonic wave on liquid solid interface.	4.0							
Ultrasonic transducers. Radiation field of ultrasonic transducer.	3.0							
Measurements of velocity and attenuation. Ultrasonic laboratory.	3.0		3.0					
Ultrasonic spectroscopy. Sepectroscopic evaluation of adhesive joints laboratory.	2.0		3.0					
Ultrasonic evaluation of joints.	3.0							
Homework siposia presentations and practical examples.	5.0		6.0					
Modeling of ultrasonic systems as a linear system.	4.0							
Ultrasonic scattering. Ultrasonic laboratory.	1.5		3.0					
Ultrasonic scattering in polycrystalline materials.	2.0							
Reflection from defects.	1.0		3.0					
Ultrasonic NDT and damage tolerance concept.	3.0							

Representative Assignments

Homework problem assignment

Grades

Aspect	Percent
Homework	33%
Laboratory	33%
Final	34%

Representative Textbooks and Other Course Materials

Title	Author
Class notes	S. I. Rokhlin

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.

Course Contribution		College Outcome
	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.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
**	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	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: Mark Cooper