



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Engineering Analysis for Design and Simulation

WELDENG 7201

Credit Hours:

4.00 - 4.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture
Lab

Course Description:

Fundamentals of engineering analysis of heat flow, thermal and residual stresses, and fracture and fatigue with applications to design and simulation in welding and manufacturing.

Prerequisites and Co-requisites:

Prereq: Grad standing, or permission of instructor.

Course Goals / Objectives:

- Obtain fundamental understanding of heat flow including heat conduction with moving heat sources
 - Obtain basic understanding of causes for and development of thermal stresses, residual stresses and distortion
 - Obtain basic understanding of linear elastic fracture mechanics including ability to apply fracture criteria
 - Obtain basic understanding of high cycle fatigue, effect of mean stress using Goodman diagram, and life prediction for a variety of structures including welded structures
 - Ability to analyze and design simple welded joints
 - Obtain basic understanding of and ability to apply finite difference and finite element modeling to simple heat flow, stress analysis and fracture mechanics problems
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Course Topics:

- Introduction to heat flow including steady state conduction.
 - Finite difference and finite element modeling of heat flow.
 - Heat flow with moving heat sources including Cooling rates and peak temperature equations.
 - Introduction to thermal stresses, residual stresses and distortion.
 - Three-bar analogy analysis for residual stresses and distortion.
 - Residual stress measurement, stress relieving, and distortion analysis.
 - Introduction to fracture mechanics, stress intensity factors and fracture toughness.
 - Introduction to high cycle fatigue, Goodman diagram, and fatigue of welded structures.
 - Welded joint analysis and design.
 - Matlab programming and application to heat flow and finite difference modeling.
 - Abaqus modeling of steady state and transient heat flow.
 - Abaqus analysis of elastic, thermo-elastic and thermo-elastic-plastic problems.
 - Abaqus analysis of fracture.
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Designation:

Elective