



Mechanical Engineering Dept. Department

Syllabus

ME 468: Casting & Welding Engineering (2-3-3)

Course Catalog Description:

Metallurgical and engineering principles applied to melting, casting and solidification. Testing and Evaluation of castings. Foundry processes. Introduction to the metallurgy of welding. Material and process selection, codes and specifications, weldment design and testing. Welding defects. Analysis of industrial welding processes. Laboratory experience in foundry, production and evaluation of weldments.

Course Pre-requisites:

- ME 322: Manufacturing Processes

Course Objectives:

1. Teach the metallurgical and engineering principals of casting and welding processes.
2. Teach the influence of process variables on casting and weld quality is emphasized.
3. Provide insight into this area of manufacturing that will serve mechanical engineers working in design, analysis, and manufacturing positions.

Course Learning Outcomes:

- CLO1. Learn the basics of casting and welding metallurgy.
- CLO2. Learn the problems and common defects in casting and welding processes.
- CLO3. Learn the principles of designing casting pattern and mold.
- CLO4. Learn the methods of testing and evaluation of weldments
- CLO5. Learn welding design and process selection project.
- CLO6. Learn welding codes and specifications.

Learning Resources:

- S. Kalpakjian, and S. Schmid, Manufacturing Processes for Engineering Materials, 5th Edition, Prentice Hall, 2007.
- ME 468 Laboratory Manual.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
midterm	None	25.0%
homework	None	5.0%
project	None	15.0%
final exam	None	30.0%

Lab Assessment Plan:

Assessment Task	Week Due	Weight
reports	None	20.0%
final exam	None	5.0%

Lecture Weekly Schedule:

Week#	Topics
1	Melting, refining and control of liquid metal composition.
2	Mechanism and rate of solidification of metals and alloys.
3	Design and production of casting molds.
4	Mold materials.
5	Testing and evaluation of casting defects.
6	Overview of liquid state welding processes.
7	Welding metallurgy.
8	Testing and evaluation of welding defects.
9	Welding process selection, codes, and specifications
10	Automation in foundry and welding processes
11	Green sand quality testing and evaluation.
12	Mold and pattern design.
13	Welding design and process selection.
14	Pre-and post-process heat treatment of welds.
15	Application of welding codes and specifications.

Lab Weekly Schedule:

Week#	Topics
1	A tutorial on various casting processes and multimedia presentation on casting.

Week#	Topics
2	Permanent mold casting process.
3	Influence of wall thickness on the quality of casting.
4	Quality control and product design consideration in casting.
5	A tutorial on various processes and multimedia presentation on welding
6	Shielded Metal Arc welding (SMAW) process and practicing.
7	Electrode selection and designing of process variables.
8	Gas Tungsten Arc welding (GTAW), process and equipment.
9	Designing and setting of process variables.
10	Effect of process variables on weld quality.
11	Guided bend, Hardness and Tensile test on weldment.
12	Resistance Spot Welding (RSW), designing and setting of process variables.
13	Peel Test on spot weld.
14	industrial visits
15	industrial visits (Continue)