

WMT - WELDING AND METALLURGICAL ENGINEERING TECHNOLOGY

WMT 3000 Welding Quality and Safety Cr. 3

Provides the basic knowledge of welding engineering as related to the inspection of welds. Includes an in-depth review of how various national, international structural and automotive welding standards relate to the quality of automatic, semi-automatic and manual welding processes. Understanding weld quality to determine if weldment(s) are fit for purpose is critical in developing a quality program that optimizes design and production requirements for automotive, military and aerospace weldments. Emphasis will be on process selection that minimizes rework, scrap or premature fracturing of production weldments. Examines the interrelationship between weld process, quality standards, material properties, and their effect on the performance of the weldment. Offered Yearly.

WMT 3100 Engineering Alloys Cr. 3

A firm and thorough knowledge of engineering alloys is critical in developing an optimal design for a given application while minimizing the risk of material failure. This course examines the interrelationships between processing, structure, properties, and performance of various engineering metals such as ferrous and non-ferrous metals with an emphasis on welding. The intent is to develop the ability both to select appropriate materials to meet engineering design criteria and to understand the effects of thermal treatments, hot and cold work, imperfections, forming, welding and chemical environments upon material properties and performance. Offered Yearly.

Prerequisites: ET 2200 with a minimum grade of C-

WMT 3200 Thermodynamics of Welding and Metallurgy Cr. 3

The principles and application of the fundamental laws of thermodynamics to metallurgical systems and welding engineering processes. The fundamentals will be used to obtain a thorough understanding of the basic relationships of thermodynamic driving force for phase transformations in metal and alloy systems. These fundamentals will be applied to understand the solid-solid, solid-liquid, and liquid-solid phase transformations occurring during heat-treatment and during welding processes. Offered Yearly.

Prerequisites: (ET 2200 with a minimum grade of C- or BE 1300 with a minimum grade of C-) and CHM 1020 with a minimum grade of C-

WMT 3451 Mechanical Metallurgy Cr. 3

The course will examine the strength, deformation, and failure of engineering materials from a first-principles materials science principles point of view. Established relationships between the mechanical behavior of materials and their microstructure as well as the control of mechanical behavior through materials processing and microstructural change will be studied. Emphasis will be placed on the behavior of structural defects associated with the welding of metallic alloys and how these defects affect the mechanisms of yielding, plastic deformation, strengthening, fatigue, fracture, and creep. Offered Yearly.

Prerequisites: WMT 3100 with a minimum grade of C- (may be taken concurrently)

WMT 3452 Physical Metallurgy Cr. 3

This course provides foundational knowledge of microstructural evolution during solidification, thermodynamics and phase transformation kinetics, alloy design, heat treatment, and the relationship between processing-microstructure-properties of metals and alloys. This course aims to teach students the crystallography principles of metallic systems, experimental tools, and techniques, solidification of metals and alloys, crystal defects in metals, diffusion kinetics, binary and ternary phase diagrams, cold working, and heat treatment. Students will also gain hands-on experience in heat treatment, metallography, and microscopy through the laboratory component. Offered Yearly.

Prerequisites: WMT 3100 with a minimum grade of C-

WMT 4453 Advanced Welding Metallurgy Cr. 3

This course provides students with the knowledge and skills they need to become a welding professional. Both theoretical foundation on advanced welding metallurgy and hands-on practical training will be focused of the course. Offered Yearly.

Prerequisites: WMT 3452 with a minimum grade of C- (may be taken concurrently)

WMT 4500 Failure Fracture Analysis Cr. 3

The scope of this course is to understand various types of failure modes in metals and alloys, contributing factors to failures and analytical and detection methods employed to identify and resolve failure issues. The discussion of the failures of structural members will include design considerations, material selection and mechanical and chemical loading. Offered Yearly.

Prerequisites: WMT 3451 with a minimum grade of C-

Restriction(s): Enrollment limited to students in a BS in Weld & Metal Engg Tech degree.

WMT 4600 Metallurgy of Welding Processes Cr. 3

This course teaches the principles and applications of welding processes in addition to the standard fusion processes of shielded metal arc, gas metal arc, gas tungsten arc and flux-cored arc welding. The welding and metallurgical principles of resistance welding, gas welding, solid state welding, plasma arc, submerged arc, laser beam and electron beam welding will be addressed. There will be strong focus on the relationships between weld parameters and metallurgical fundamentals. Offered Yearly.

Prerequisites: WMT 3452 with a minimum grade of C-

WMT 4700 Welding Design Cr. 3

Offers a practical understanding and application of the design process for projects in welding engineering. The engineering aspects of the production of welded structures from the perspective of program development, concept, design and metallurgy will be taught. Students will gain further understanding of welding theory as it applies to design. Offered Yearly.

WMT 5350 Resistance Welding Processes Cr. 3

This course teaches the principles and applications of resistance welding processes including Resistance Spot, Seam, Projection Welding as well as Resistance Mash, Flash-Butt, High Frequency and Stud Welding processes. The course will include the basic electrical and physical changes that occur during welding. The principles of both basic fusion and solid-state welding mechanisms will be discussed and related to metallurgical principles and process specific equipment requirements. Overall, there will be strong focus on the relationships between weld parameters, metallurgical implications, and how these affect the equipment requirements. Weld quality control, corporate and industry specifications, and spot weld analysis techniques will be taught through laboratory and homework assignments. Offered Yearly.

Restriction(s): Enrollment is limited to students with a major in Weld & Metal Engg Tech; enrollment limited to students in the BS in Weld and Metal Engg Tech program.

WMT 5800 Welding Automation and Robotics Cr. 3

The scope of this course is to understand the concepts and technology associated with the operation of automatic and robotic welding systems.

This course will incorporate automation and robotic technology with welding metallurgy. Students will learn to develop and edit programs to complete simple and complex welds and learn the effects of welding variables and options on weldment structural integrity as they are applied to automated and robotic weld systems. Offered Yearly.

Restriction(s): Enrollment is limited to students with a major in Weld & Metal Engg Tech.