Affect the mechanisms of yielding, plastic deformation, strengthening, associated with the welding of metallic alloys and how these defects be studied. Emphasis will be placed on the behavior of structural defects behavior through materials processing and microstructural change will of materials and their microstructure as well as the control of mechanical engineering materials from a first-principles materials science principles.

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-

WMT 3451 Mechanical 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-

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- and WMT 3452 with a minimum grade of C-

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.

Prerequisites: WMT 3452 with a minimum grade of C-

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.

Prerequisites: WMT 4453 with a minimum grade of C-