NUC K261 Nuclear Materials Science Lab

☒ Required ☐ Elective

Catalog Description: This lab will focus on performance of experiments in metallographic examination, mechanical testing and heat treatment of a variety of ferrous and non-ferrous metals. Experiments to determine properties of materials such as strain, fatigue, corrosion, compression and tensions. Brittle fracture and thermal stress will be performed as well as effects of irradiating materials.

Prerequisites: MAT K254, NUC K100, NUC K110/111, NUC K117, NUC K118

Textbook(s) or other materials:
1) Mechanics of Materials, Beers and Johnson, 3rd Edition
2) Design of Machine Elements, Faires

Course learning outcomes/Expected performance criteria:

Perform metallographic examination, mechanical testing and heat treatment of ferrous and non-ferrous materials.

Perform laboratory experiments to demonstrate the effects of a variety of mechanical properties on materials.

Perform laboratory experiments to demonstrate the effects of nuclear irradiation on various materials.

Topics covered:

COURSE TOPICS/CONTENT

	HOURS
The following experiments will be performed on a variety of ferrous and non-ferrous metals.	
METALLOGRAPHIC EXAMINATION	10
Preparations of specimen, mounting etching, microscopic examination and photographing	
MECHANICAL TESTING	10
Hardness: Rockwell, Brinell, etc; tension compression, impact, ductility.	
HEAT TREATMENT	10
Hardening: water, oil and air quench, carburizing, annealing and tempering; hardenability: Jomily End Quench Test	
1. Laboratory introduction	
2. Strain gage (installation and use)	
3. Fatigue testing (commence long term testing)	
4. Corrosion testing (commence long term testing)	
5. Tension-compression (uniaxial, bending, torsion)	
6. Brittle fracture impact testing	
7. Stress concentration testing	
8. Thermal stress-strain testing	
9. Fatigue testing (complete)	
10. Corrosion testing (complete)	
11. Material irradiation	
TOTAL HOURS	30

Class/Lab schedule: One lab session per week

Relationship of course to Criterion 5 and Program Outcomes:

Prepared by: James R. Sherrard Date: