

NUC K260 Nuclear Materials Science

Required                       Elective

Catalog Description:        This course will acquaint the student with constitution, properties and characteristics of engineering materials and provide a foundation for stress analysis on structures in equilibrium with emphasis on applications to nuclear power, including effects of material irradiation.

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

Textbook(s) or other materials:        Mechanics of Materials, Beers and Johnson, 3rd Edition

Course learning outcomes/Expected performance criteria:

- Develop a working understanding of physical metallurgy skills in metallographic techniques.
- Study forces on structures in equilibrium, primarily two dimensional structures.
- Develop concepts of centroids, center of gravity and moment of inertia.
- Develop understanding of mechanics of materials including: stress-strain, torsion, bending, buckling, fatigue, creep, pressure, vessel strength, and weld strength.
- Understand the basis for selection of typical nuclear power plant materials.
- Understand the effects of material irradiation on nuclear materials.

Topics covered:

| COURSE TOPICS/CONTENT   |  | HOURS |
|---|--|-------|
| 1. Structural Imperfections and Atom Movement                   |  | 4     |
| 2. Metallic Phases and their Properties                         |  | 4     |
| 3. Modification of Properties                                   |  | 4     |
| 4. Statics of Rigid Bodies in Two Dimensions                    |  | 3     |
| 5. Centroids and Centers of Gravity                             |  | 3     |
| 6. Moments of Inertia   |  | 3     |
| 7. Mechanics of Materials                                       |  | 3     |
| 8. Basis for Selection of Typical Nuclear Power Plant Materials |  | 3     |
| 9. Effects of Material Irradiation                              |  | 3     |
| TOTAL HOURS   |  | 30    |

Class/Lab schedule:        2 lecture sessions per week

Relationship of course to Criterion 5 and Program Outcomes:

All students are required to maintain an online learning portfolio in Digication that uses the college template. Through this electronic tool students will have the opportunity to monitor their own growth in college-wide learning. The student will keep his/her learning portfolio and may continue to use the Digication account after graduation. A Three Rivers General Education Assessment Team will select and review random works to improve the college experience for all. Student work reviewed for assessment purposes will not include names and all student work will remain private and anonymous for college improvement purposes. Students will have the ability to integrate learning from the classroom, college, and life in general, which will provide additional learning opportunities. If desired, students will have the option to create multiple portfolios.

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