ME 461: Introduction to Nuclear Engineering

Course description: Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety.

Number of credits: 3

Course Coordinator: J. Leachman

Prerequisites by course: MATH 315; admitted major in engineering or physical sciences; senior standing

Prerequisites by topic: Science/engineering background in lower-division math, chemistry, and physics

Postrequisites: None

Textbooks/other required materials: LaMarsh, J. and Barata, A. *Introduction to Nuclear Engineering.* Prentice Hall, 2001, 3/e.

Course objectives:

1. Energy from Nuclear Fission
2. Nuclear Reactions and Radiations
3. Neutron Transport Behavior
4. Nuclear Design Basics
5. Nuclear Steam Supply System
6. Radiation Protection and Shielding
7. General Nuclear Power Reactor Safety, Security and Environment Protection

Topics covered:

1. Atomic & Nuclear Physics
2. Interaction of Radiation and Matter
3. Nuclear Reactors & Power
4. Nuclear Fuel Cycle
5. Neutron Diffusion and Moderation
6. Nuclear Reactor Theory
7. Time-dependent Reactor
8. Reactor Heat Removal
9. Radiation Protection and Shielding
10. Nuclear Power Plant Licensing

Expected student outcomes:

1. An understanding of nuclear energy fundamentals, nuclear fissions, and fission reactors.
2. An understanding of nuclear reactions and radiations, and reactor heat generation.
3. An understanding of neutron transport behavior.
4. An understanding of a nuclear steam supply system, nuclear safety,

nuclear fuel cycle.
5. An understanding of radiation protection and ability to perform shielding calculations for a simple reactor system.
6. A general understanding of nuclear power plant systems, licensing, design, operation & maintenance, safety, and security.
7. Ability to perform a general design and nuclear safety analysis for a simple reactor system.

Class schedule: Two 75-minute or three 50-minute lecture sessions per week, for one semester

Laboratory schedule: None

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes: Meets:
1. School of MME ME educational objectives: 1, 2, 3
2. School of MME ME program outcomes: 1, 2, 3, 4, 5, 6, 7
3. ABET EC2019, Criterion 3 program outcomes: 1, 2, 3, 4, 5, 6, 7

Prepared by: Andrea Butcherite and J. Leachman *Date:* May 30, 2018

POLICIES

A. **Reasonable Accommodation** (the nature of the particular course determines which one applies):

- Pullman Campus. Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.
- WSU Online Course. Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (http://accesscenter.wsu.edu), Spokane (http://spokane.wsu.edu/students/current/studentaffairs/disability/), Tri-Cities (http://www.tricity.wsu.edu/disability), Vancouver (http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services).

B. **Academic Integrity**

WSU expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus and acknowledge the university's authority to take disciplinary action. The Standards of Conduct for Students can be found at http://conduct.wsu.edu.

C. **WSU Safety**

WSU is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, http://safetyplan.wsu.edu. It is highly recommended that you visit this web site as well as the University emergency management web site at http://oem.wsu.edu/ to become familiar with the information provided.