Degree Program: Nuclear Engineering and Radiological Sciences **Date: May, 2005 Revised**
Prepared by: Ronald Fleming

COURSE #: NERS 211	**COURSE TITLE:** Introduction to Nuclear Engineering and Radiologic Science
TERMS OFFERED: Fall, Winter	**For each prerequisite below, "E" denotes Enforced and "A" denotes Advised.**
TEXTBOOKS/REQUIRED MATERIAL: Lockheed Martin, *Nuclides and Isotopes,* 16th Edition	**PREREQUISITES:** Preceded or accompanied by Math 216 (A)
INSTRUCTOR(S): Fleming	**COGNIZANT FACULTY: Fleming**
CoE BULLETIN DESCRIPTION: This course will discuss the history of nuclear energy, the fundamentals of fission and fusion nuclear power, and a variety of radiological health applications. Current topics in the media such as radon, radioactive waste, and nuclear proliferation may also be covered.	**COURSE TOPICS:** Energy and Radioactivity (5 h), Radiation and Biological Effects (6 h), Introduction to Fission Reactors (14 h), Introduction to Fusion Reactors (4 h), Alternate Uses of Nuclear Radiation (8 h), Applications of Nuclear Technology to Industry And Agriculture (2 h), History of Nuclear Engineering (2 h), Environmental Effect of Nuclear Radiation (9 h), Ethical Issues Surrounding Nuclear Technology (2 h)
COURSE STRUCTURE/SCHEDULE Lecture: 2 per week @ 110 minutes; Discussion: 1 per week @ 1 hours	

COURSE OBJECTIVES	Links shown in brackets are to departmental educational outcomes: 1. To teach students how fundamental concepts apply to nuclear engineering design in a broad variety of nuclear applications [1, 2, 3] 2. To introduce students to the analytical methods and computational tools for nuclear engineering [1, 2, 3] 3. To prepare students to make decisions regarding ethical, economic, and environmental aspects of nuclear energy [8, 9] 4. To provide experience for students to work in teams addressing public information and ethics problems relating to nuclear engineering [6, 7, 8, 9, 10, 11] 5. To provide experience for student to practice oral and written communication skills [7] 6. To expose students to career opportunities in nuclear engineering and radiological sciences [12]

COURSE OUTCOMES For <u>each</u> course outcome, links to the Program Outcomes are identified.	Links shown in brackets are to course objectives: 1. Demonstrate knowledge of the fundamentals of energy and radioactivity [1, 2] 2. Formulate simple problems involving radioactive decay and radiation interactions[1, 2] 3. Be familiar with basic nuclear terminology and the breadth of current and potential nuclear applications[1, 6] 4. Understand the fundamentals of sustained neutron chain reactions and fission reactor design [1, 2, 6] 5. Understand the fundamentals of fusion and fusion/plasma applications [1, 2, 6] 6. Understand the fundamentals of one or more non-power-related nuclear applications [1, 2, 6] 7. Understand in general terms the risks and environmental concerns associated with ionizing radiation and limitations in knowledge of these[3, 4, 5] 8. Be generally familiar with the history of nuclear engineering [3, 4, 5] 9. Complete written and/or oral reports on one or more group activities relating to nuclear issues or nuclear design [1, 2, 3, 4, 5]
ASSESSMENT TOOLS For <u>each</u> assessment tool, links to the course outcomes are identified.	6. A combination of during-term test(s) and/or final examination will be used to measure outcomes [1-8] for individual students under a time constraint 7. Problem sets measure outcomes [1-6] under less time pressure and allow student collaborations. 8. Graded group activities relating to public communications, dealing with uncertainty, environmental impacts and issues and professional activities will measure outcomes [7-9] 4. Course evaluation by each student at the end of the course assesses all outcomes [1-9]