<table>
<thead>
<tr>
<th>COURSE #: NERS 484; CREDITS: 4/Required</th>
<th>COURSE TITLE: Radiological Health Engineering Fundamentals</th>
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</thead>
<tbody>
<tr>
<td>TERMS OFFERED: Fall</td>
<td>For each prerequisite below, “E” denotes Enforced and “A” denotes Advised.</td>
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<tr>
<td>TEXTBOOKS/REQUIRED MATERIAL: Instructor course notes, Martin, <em>Physics for Radiation Protection</em>, 2nd Ed.</td>
<td>PREREQUISITES: NERS 312 or equivalent or permission of instructor (A)</td>
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<td>INSTRUCTOR(S): Kimberlee Kearfott</td>
<td>COGNIZANT FACULTY: Kearfott</td>
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<tr>
<td>CoE BULLETIN DESCRIPTION: Fundamental physics behind radiological health engineering and topics in quantitative radiation protection. Radiation quantities and measurement, regulations and enforcement, external and internal dose estimation, radiation biology, radioactive waste issues, radon gas, emergencies, and wide variety of radiation sources from health physics perspective.</td>
<td>COURSE TOPICS: Nuclear physics (0.5h), making assumptions (1h), radiation interactions (1h), kinetics (3.5h), radiation protection philosophy and limits (1.5h), radiation quantities (1.5h), external dose measurement, assessment, and reduction (4h), internal dose assessment (8h), radiation health risks (2h), special topics in radiation protection (15h) (selected from non-ionizing radiation, public communication, environmental radiation, nuclear reactor health physics, health effects of weapons, nuclear emergencies, radiation contamination and control, vent transportation, low level waste, high level waste, radon gas, radiation regulations), project presentations (6.5h), team function discussions (1h)</td>
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<td>COURSE STRUCTURE/SCHEDULE Lecture: 2 per week @ 80 minutes, Recitation: 1 per week @ 50 minutes</td>
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<td>COURSE OBJECTIVE</td>
<td>For each Course Objective, links to the Program Educational Objectives are shown</td>
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<tr>
<td>1. Understand how fundamental nuclear physics applies to radiation protection [1,2]</td>
<td>1. Demonstrate applied competence in applying basic physics knowledge to analyze problems of radiation interactions [2, 3</td>
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<td>2. Appreciate the appropriate application of analytical methods and computational tools, with simplifying assumptions, for radiation safety problems [1,2]</td>
<td>2. Formulate simple first order kinetics problems relating to radiation protection problems [2, 3</td>
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<td>3. Become familiar with elements of applied radiation protection through the study of specialized topics in health physics [1-3]</td>
<td>3. Solve problems in external dose assessment, including simple shielding, using basic and standardized approaches [2,3</td>
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<tr>
<td>5. Be aware of the career opportunities in radiological health engineering [3]</td>
<td>5. Show understanding of the risks of low and high level radiation dose and limitations in knowledge of these [8,9,11</td>
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<td>6. Develop team skills [3]</td>
<td>6. Solve problems or prepare materials relating to one or more specialized topics in radiation protection [2,3,8,9,11</td>
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<tr>
<td>COURSE OUTCOMES</td>
<td>For each Course Outcome, links to The Program/ABET Student Outcomes are shown [#,#,a-k]</td>
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<tr>
<td>1. Demonstrate applied competence in applying basic physics knowledge to analyze problems of radiation interactions [2, 3</td>
<td>ABET k,e]</td>
</tr>
<tr>
<td>2. Formulate simple first order kinetics problems relating to radiation protection problems [2, 3</td>
<td>ABET k,e]</td>
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<tr>
<td>3. Solve problems in external dose assessment, including simple shielding, using basic and standardized approaches [2,3</td>
<td>ABET k,e]</td>
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<td>5. Show understanding of the risks of low and high level radiation dose and limitations in knowledge of these [8,9,11</td>
<td>ABET h,f,j]</td>
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<td>6. Solve problems or prepare materials relating to one or more specialized topics in radiation protection [2,3,8,9,11</td>
<td>ABET k,e,h,f,j]</td>
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<td>7. Produce a significant written team report containing analysis of a radiological health engineering problem</td>
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<td>ASSESSMENT TOOLS</td>
<td>1. Two tests will be used to measure outcomes [1-6] for individual students.</td>
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<td>2. Problem sets measure outcomes [1-6] under less time pressure and with student collaborators.</td>
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<td>3. Team Function Evaluations (~monthly) and three Peer Evaluations monitor team performance [7, 8].</td>
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<td>4. Optional extra credit for attendance at guest lecturers and other seminars encourages career exploration and assists in preparation of team project [6, 7, 8].</td>
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<td>5. Written team report [1-7].</td>
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<td>6. Oral team presentation [1-8].</td>
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<td>7. Course evaluation by each student at the end of the course assesses all outcomes [1-8].</td>
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<td>8. Faculty self-assessment provides self-assessment data on all outcomes. [1-8].</td>
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Revision History: September, 1998; December, 2004; August, 2005; November, 2006; September 2010.