

*ENU 6937 – Advanced Nuclear Safeguards – SPRING 2016 – 3 credits*

**Description:** Background and overview of topics important to nuclear materials safeguards, accountability and non-proliferation.

**Course Prerequisites:** ENU-4001 and ENU-4605.

**Course Objectives:**

The course provides engineering students with a background and overview of topics important to nuclear materials safeguards, accountability and non-proliferation. This course addresses in depth the concepts behind nuclear materials controls and accountability, and discuss issues behind why nuclear safeguards continue to be a concern in our society.

**Instructor:**

Dr. Sedat Goluoglu, Professor  
168 Rhines Hall,  
352-294-1690,  
goluoglu@ufl.edu  
Office Hours: MWF 11:30-12:00 and by appointment

**Teaching Assistant:** None

**Meeting Times:** MWF, 2nd Period, 8:30 am to 9:20 am

**Meeting Location:** NSC 225

**Textbook:** NUCLEAR SAFEGUARDS, SECURITY AND NONPROLIFERATION by Doyle - Recommended. Notes and reference materials will be provided as needed.

**Software:** TBD

**Attendance:**

Since you are a graduate student, attendance is not required. However, if you miss pop quizzes there won't be any make-up opportunities for pop-quizzes.

**Grading Policy:**

|                  |     |
|------------------|-----|
| Quizzes/Homework | 25% |
| Midterm Exams    | 25% |
| Final Exam       | 25% |
| Projects         | 25% |

I reserve the right to curve at the end of the course.

**Grading Scale:**

|         |    |
|---------|----|
| 97 -100 | A  |
| 94-96   | A- |
| 91-93   | B+ |
| 88-90   | B  |

|       |    |
|-------|----|
| 84-87 | B- |
| 77-83 | C+ |
| 73-76 | C  |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D  |
| 60-62 | D- |
| <60   | E  |

In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit <http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html#grades>

**Course Schedule:**

*Depending on our progress, some topics maybe skipped.*

| <b>Course Outline</b>              |   |
|------------------------------------|---|
| <b>Course Title</b>                | <b>Advanced Nuclear Safeguards</b>                                      |
| <b>Assessment Method:</b>          | <b>Written examinations, reports, and class presentations</b>           |
| <b>ENU-AVD-Safeguards-0</b>        | <b>Course overview</b>  |
| <b>ENU-ADV-Safeguards-Review-1</b> | <b>Background: The Cold War Era</b>                                     |
| <b>ENU-ADV-Safeguards-Review-2</b> | <b>The Non-Proliferation Treaty</b>                                     |
| <b>ENU-ADV-Safeguards-Review-3</b> | <b>Nuclear Testing and Test Ban Treaties</b>                            |
| <b>ENU-ADV-Safeguards-Review-4</b> | <b>Nuclear Safeguards Agreements</b>                                    |
| <b>ENU-ADV-Safeguards-Review-5</b> | <b>What are Nuclear Safeguards?</b>                                     |
| <b>ENU-ADV Safeguards-1</b>        | <b>The Basic Principle of Nuclear Material Accountancy</b>              |
| <b>ENU-ADV Safeguards-2</b>        | <b>Statistical Aspects of Nuclear Material Accountancy and Auditing</b> |
| <b>ENU-ADV Safeguards-3</b>        | <b>Random Sampling in Nuclear Accountancy</b>                           |
| <b>ENU-ADV Safeguards-4</b>        | <b>Midterm #1</b>   |
| <b>ENU-ADV Safeguards-5</b>        | <b>Destructive Sample Analysis</b>                                      |
| <b>ENU-ADV Safeguards-6</b>        | <b>Non-Destructive Analysis</b>   |
| <b>ENU-ADV Safeguards-7</b>        | <b>Nuclear Forensic Methods</b>   |
| <b>ENU-ADV Safeguards-8</b>        | <b>Inverse Analysis of Spent Fuel for Nuclear Forensics</b>             |
| <b>ENU-ADV Safeguards-9</b>        | <b>Remote Environmental Sampling</b>                                    |
| <b>ENU-ADV Safeguards-10</b>       | <b>Environmental Sample Analysis</b>                                    |
| <b>ENU-ADV Safeguards-11</b>       | <b>Midterm #2</b>   |
| <b>ENU-ADV Safeguards-12</b>       | <b>US NMC&amp;A at the Department of Energy</b>                         |
| <b>ENU-ADV Safeguards-13</b>       | <b>US NMC&amp;A at the Nuclear Regulatory Commission</b>                |
| <b>ENU-ADV Safeguards-14</b>       | <b>Key elements of an NMC&amp;A program (NMC&amp;A Best Practices)</b>  |

| <b>Course Outline</b>        |  |
|------------------------------|--|
| <b>Course Title</b>          | <b>Advanced Nuclear Safeguards</b>   |
| <b>Assessment Method:</b>    | <b>Written examinations, reports, and class presentations</b>                                      |
| <b>ENU-ADV Safeguards-15</b> | <b>Safeguards Approaches at Nuclear Power Plants- Diversion Strategies and how to counter them</b> |
| <b>ENU-ADV Safeguards-16</b> | <b>Systematic Approach to Acquisition/Diversion Pathway Analysis</b>                               |
| <b>ENU-ADV Safeguards-17</b> | <b>Course Acquisition/Diversion Pathway Analysis</b>   |
| <b>ENU-ADV Safeguards-18</b> | <b>Detailed Pathway Analysis</b>   |
| <b>ENU-ADV Safeguards-19</b> | <b>Facility Safeguardability Assessment (FSA)</b>  |
| <b>ENU-ADV Safeguards-20</b> | <b>Fuel Cycle Assessment</b>   |
| <b>ENU-ADV Safeguards-21</b> | <b>CYCLUS – Nuclear Fuel Cycle Simulator</b>   |
| <b>ENU-ADV Safeguards-22</b> | <b>FINAL EXAM</b>  |

**Homework/projects:** Homework and projects must be turned in on time even if not complete. No submission, no credit.

**Exams:** Two in class mid-term exams and a final exam will be given. Instructor reserves the right to change exams to projects/take home exams (including the final exam that would be due on the scheduled final exam day).

**Make-Up Exam Policy:**

Requirements for make-up exams, assignments, and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

**Honesty Policy:**

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

**Accommodation for Students with Disabilities:**

Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

**UF Counseling Services:**

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.  
 Career Resource Center, Reitz Union, 392-1601, career and job search services.

**Software Use:**

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold

ourselves and our peers to the highest standards of honesty and integrity.

**Course Evaluation:**

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.