This syllabus serves the following courses:

1. **ENU 4145** – Risk Assessment for Radiation Systems, Class 31352
2. **ENU 5142** – Reliability and Risk Analysis for Nuclear Facilities, Class 31353

Same class session for both:
MWF 0935-1025 (UF Period 3)
FLI 0121
No Final Exam
The undergraduate (ENU 4145) and graduate (ENU 5142) courses share common lectures and a fraction of common coursework.

1 Instructor

Ira Harkness, Ph.D.
Instructional Assistant Professor
104 Rhines Hall
`ira@mse.ufl.edu`
Office Hours: TBD, and by appointment. Beginning and end times of office hours will be enforced strictly. If you would like to meet on Zoom, please send me a message on Teams.

2 Course Description

ENU 4145: Three one-hour lectures discussing the study of radiation management systems, including reliability and probabilistic risk assessment

ENU 5142: Nuclear facilities' safety systems including reliability and probabilistic risk assessment

3 Course Prerequisites

ENU 4144 and STA 3032

4 Program Outcomes (ABET) – 4145 only

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (low coverage)
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (medium coverage)
3. n/a
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (high coverage)
5. n/a

6. n/a
7. n/a

5 Text/References

Risk and Safety Analysis of Nuclear Systems, John C. Lee and Norman J. McCormick, CRC Press, 3rd edition (2016), ISBN: 978-1498745871

To complete some of the homework in this course, access to a programming or scripting language such as MATLAB, Python, FORTRAN, C, C++ and/or a spreadsheet application will be helpful.

Additional useful references may include undergraduate textbooks on statistics, probability, and general reliability engineering.

6 Course Schedule

The course outline and schedule below is subject to change depending on the speed in which material is covered. HW deadlines will not be moved up, but may be moved back. Exam dates will not change, barring university closure.

There are seven major modules for the course. Notes and homework will be organized by module on Canvas.

1. Risk and Safety of Engineered Systems
2. Probabilities of Events
3. Reliability Data
4. Reliability of Multiple-Component Systems
5. Probabilistic Risk Assessment
6. Major Nuclear Power Plant Accidents and Incidents
7. PRA Studies of Nuclear Power Plants & Risk-Informed Regulations

Date	**Module**	**Due**	**Material**	**Reading**
Jan 9			Introduction and Syllabus Overview	
Jan 11	1		Risk and Safety of Engineered Systems	Ch. 1
Jan 13	1		Risk and Safety of Engineered Systems	Ch. 1
Jan 16			UF Holiday (No Class)	
Jan 18	2	HW 1	Probabilities of Events	Ch. 2
Jan 20	2		Probabilities of Events	Ch. 2
Jan 23	2		Probabilities of Events	Ch. 2
Jan 25	2		Probabilities of Events	Ch. 2
Jan 27	2		Probabilities of Events	Ch. 2
Jan 30	3	HW 2	Reliability Data	Ch. 3
Feb 1	3		Reliability Data	Ch. 3
Feb 3	3	HW 3	Reliability Data	Ch. 3
Feb 6			Exam 1 Review	
Feb 8		Exam 1	Exam 1	
Feb 10	4		Reliability of Multiple-Component Systems	Ch. 4
Feb 13	4		Reliability of Multiple-Component Systems	Ch. 4
Feb 15	4		Reliability of Multiple-Component Systems	Ch. 4
Feb 17	5	HW 4	Probabilistic Risk Assessment	Ch. 6
Feb 20	5		Probabilistic Risk Assessment	Ch. 6
Feb 22	5		Probabilistic Risk Assessment	Ch. 6
Feb 24	5		Probabilistic Risk Assessment	Ch. 6
Feb 27	5		Probabilistic Risk Assessment	Ch. 6
Mar 1	5	HW 5	Probabilistic Risk Assessment	Ch. 6
Mar 3	5		Probabilistic Risk Assessment	Ch. 6
Mar 6	5		Probabilistic Risk Assessment	Ch. 6
Mar 8	5		Probabilistic Risk Assessment	Ch. 6
Mar 10	5		Probabilistic Risk Assessment	Ch. 6
Mar 13-17			UF Holiday/Spring Break (No Class)	
Mar 20	5	HW 6	Probabilistic Risk Assessment	Ch. 6
Mar 22			Exam 2 Review	
Mar 24		Exam 2	Exam 2	
Mar 27	6		Major Nuclear Power Plant Accidents and Incidents	Ch. 9
Mar 29	6		Major Nuclear Power Plant Accidents and Incidents	Ch. 9
Mar 31	6		Major Nuclear Power Plant Accidents and Incidents	Ch. 9
Apr 3	6		Major Nuclear Power Plant Accidents and Incidents	Ch. 9
Apr 5	7	HW 7	PRA Studies of Nuclear Power Plants	Ch. 10
Apr 7	7		PRA Studies of Nuclear Power Plants	Ch. 10
Apr 10	7		PRA Studies of Nuclear Power Plants	Ch. 10
Apr 12	7		PRA Studies of Nuclear Power Plants	Ch. 10
Apr 14	7		Risk-Informed Regulations (ANS Student Conference)	Ch. 12
Apr 17		HW 8	Make-up Day/Special Topics	
Apr 19			Exam 3 Review	
Apr 21			Project Discussions	
Apr 24		Exam 3	Exam 3	
Apr 26		Project	Course Wrap-up	

7 Grading

Assessments in this course are worth a total of 1000 points.

- Homework – 200 points (8 HW @ 25 points each)
- Exam 1 – 200 points
- Exam 2 – 200 points
- Exam 3 – 200 points
- Project – 200 points

Final grades will be assigned using the following scale:

- A: 870+ points (87%+)
- A-: 850-869 points (85-86.99%)
- B+: 830-849 points (83-84.99%)
- B: 750-829 points (75-82.99%)
- C: 660-749 points (66-74.99%)
- E: $<$ 660 points ($<$ 66%)

Please note the following:

1. No single item exceeds 25% of your final grade.
2. Grading in this course is plus-based. You are awarded points at each correct step, rather than deducting points for errors. Note that points are awarded for correct steps, and getting the correct final answer. That is, an error at an intermediate step will prevent you from earning points for that step and for the final answer.
3. The grade cut-offs for A, B, and C are lower than some typical scales (90, 80, 70, etc.) under which many UF courses operate. The intention is not to inflate grades, but rather to account for the challenging nature of the course.
4. The gradebook on Canvas is not official. I reserve the right to correct errors, including transcription errors, from the official (spreadsheet) gradebook, until finalization of grades with the UF registrar.

More information on UF grading policy may be found at:
ENU 4145: `https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx`
ENU 5142: `http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades`

7.1 Grade Appeals

All appeals of grades, including those from clerical/grade-calculation errors, must be made within 1 week of the grade/assignment being returned to you.

Grade appeals must be provided in the following format:

- Email me a written summary of which problem(s) or part(s) you believe were graded inaccurately. Be as specific as possible.
- I will review your grade appeal, contact you via your ufl.edu email address, and adjust any grades if merited in Canvas and the official gradebook.

8 Course Policies

8.1 Attendance

Attendance is strongly recommended starting on the first day of class. However, attendance is not part of grade calculations.

Pursuant to HWCOE policy, the following statement is required: Excused absences are consistent with university policies in the undergraduate/graduate catalog and require appropriate documentation.

ENU 4145: `https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx`
ENU 5142: `http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance`

8.2 Assignments

Assignments must be submitted electronically via Canvas. The following restrictions apply for submission:

- All submissions must be a single PDF document.
- If you do not have access to a physical scanner and you choose to use a phone or tablet to "scan" your handwritten document, you must use the free Adobe Scan app.
- Fully electronic alternatives include a PDF from Word with Equation Editor or LaTeX.

The following penalties apply for late assignments:

- Late assignments submitted up to 24 hours after the due date will have 25% of the maximum possible points subtracted, except for excused absences as defined by university policy.
- Late assignments submitted more than 24 hours after the due date will receive no credit, except for excused absences as defined by university policy.

8.3 Electronic Communication and Course Website

Canvas is used extensively for the course including, but not limited to:

- Distributing and storing the course syllabus, along with any syllabus updates
- Maintaining student grades
- Regular communication with students through announcements
- Providing access to course materials

Microsoft Teams is used extensively for this course including, but not limited to:

- Regular communication with students through announcements and messages
- Communication between students and instructor through the "Chat" feature.

8.4 Changes to Syllabus

Changes to this syllabus will be provided via the Canvas platform. Such changes may include those required by policy changes, changes in the speed of course coverage, university closure, errors in previous syllabus versions, and other reasons.

9 Standardized Syllabus Content

The following statements were required to be inserted into all syllabi by the HWCOE and/or UF. While you may ask me questions about the statements, I may have to refer you to the appropriate UF unit responsible for the statement.

9.1 Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting `https://disability.ufl.edu/students/get-started/`. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

9.2 Course Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at `https://gatorevals.aa.ufl.edu/`students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via `https://ufl.bluera.com/ufl/`. Summaries of course evaluation results are available to students at `https://gatorevals.aa.ufl.edu/public-results/`.

9.3 In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person

injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

9.4 University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code:

`https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/`

specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

9.5 Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate/Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, `jpennacc@eng.ufl.edu`
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, `taylor@eng.ufl.edu`
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, `nishida@ufl.edu`

9.6 Software Use

All faculty, staff, and students 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.

9.7 Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

`https://registrar.ufl.edu/ferpa.html`

9.8 Campus Resources

9.8.1 Health and Wellness

U Matter, We Care
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact `umatter@ufl.edu` so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center:
`http://www.counseling.ufl.edu/cwc`, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, `title-ix@ufl.edu`

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or `http://www.police.ufl.edu/`

9.8.2 Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to `Learning-support@ufl.edu`

`https://lss.at.ufl.edu/help.shtml`

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling.

`https://www.crc.ufl.edu/`

Library Support, Various ways to receive assistance with respect to using the libraries or finding resources.

`http://cms.uflib.ufl.edu/ask`

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

`https://teachingcenter.ufl.edu/`

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

`https://writing.ufl.edu/writing-studio/`

Student Complaints Campus:

`https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/`

`https://care.dso.ufl.edu`

On-Line Students Complaints:

`https://distance.ufl.edu/state-authorization-status/#student-complaint`

10 Changelog

[1.0] - 2022-12-02

- Original version