

Reliability and Risk Analysis for Nuclear Facilities

ENU 5142, Class 25934, Spring 2021

MWF 0935-1025 (UF Period 3)

Online

Final Exam: Monday, April 26, 2020, 1000-1200

Instructor

Ira Harkness, Ph.D.

104 Rhines Hall

352-846-3329

ira@mse.ufl.edu

Office Hours: TBD, and by appointment. Beginning and end times of office hours will be enforced strictly. There are no office hours on days without classes. Zoom meeting links will be provided for office hours. If I do not respond on Zoom or if Zoom is not logged in, please send me an email or message on Microsoft Teams and I will respond as soon as possible.

Course Description

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

Course Prerequisites

ENU 4144 or 5005 and 4934 or ENU 6935

Text (Required)

Reliability Engineering and Risk Analysis: A Practical Guide, Mohammad Modarres, CRC Press, 3rd edition (2016), ISBN: 978-1498745871

Course Schedule

There will be two types of lectures/class sessions in this course:

1. **Recorded Lectures:** Recorded lectures will include discussion of slides that are complementary to the course pack materials. Expect slides to be covered concisely and require your full attention. While recorded lectures will vary in length, they will usually be shorter than a normal class period due to the lack of any Q&A or discussions. You should watch these *before* the associated synchronous discussion.
2. **Synchronous Discussions:** Discussion sessions replace the synchronous portion of a normal class. First, these are the main time to discuss homework assignments and exams. Second, questions posed to you during recorded lectures will be revisited. Lastly, these serve as a time to reinforce content that may not have made sense in the recorded lectures.

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 topics for the course, with 8 HW and 3 exams. Correspondence is as follows:

1. Introduction to Reliability and Risk Analysis (HW 1 and Quiz 1)
2. Probability in Reliability Evaluation (HW 2 and Quiz 1)
3. Probability Distributions (HW 3, HW 4, and Quiz 2)
4. Fault Trees (HW 5 and Quiz 3)
5. Event Trees (HW 6 and Quiz 3)
6. Failure Data (HW 7 and Quiz 4)
7. System/Network Reliability (HW 8 and Quiz 4)

Week	Day	Date	Due	Material
1	M	11 Jan		Syllabus and Course Policies
1	W	13 Jan		Introduction to Reliability and Risk Analysis
1	F	15 Jan		Introduction to Reliability and Risk Analysis
2	M	18 Jan		UF Holiday (NO CLASS)
2	W	20 Jan		Introduction to Reliability and Risk Analysis
2	F	22 Jan		Introduction to Reliability and Risk Analysis
3	M	25 Jan		Introduction to Reliability and Risk Analysis
3	W	27 Jan		Introduction to Reliability and Risk Analysis
3	F	29 Jan	HW 1	Probability in Reliability Evaluation
4	M	1 Feb		Probability in Reliability Evaluation
4	W	3 Feb		Probability in Reliability Evaluation
4	F	5 Feb		Probability in Reliability Evaluation
5	M	8 Feb		Probability in Reliability Evaluation
5	W	10 Feb	Quiz 1	Quiz 1
5	F	12 Feb		Probability Distributions
6	M	15 Feb	HW 2	Probability Distributions
6	W	17 Feb		Probability Distributions
6	F	19 Feb		Probability Distributions
7	M	22 Feb	HW 3	Probability Distributions
7	W	24 Feb		Probability Distributions
7	F	26 Feb		Probability Distributions
8	M	1 Mar	Quiz 2	Quiz 2
8	W	3 Mar		Fault Trees
8	F	5 Mar		Fault Trees
9	M	8 Mar		Fault Trees
9	W	10 Mar		Fault Trees
9	F	12 Mar	HW4	Fault Trees

Week	Day	Date	Due	Material
10	M	15 Mar		Fault Trees
10	W	17 Mar		Event Trees
10	F	19 Mar		Event Trees
11	M	22 Mar	HW5	Event Trees
11	W	24 Mar	Quiz 3	Quiz 3
11	F	26 Mar		Failure Data
12	M	29 Mar		Failure Data
12	W	31 Mar		Failure Data
12	F	2 Apr		Failure Data
13	M	5 Apr		Failure Data
13	W	7 Apr	HW6	Failure Data
13	F	9 Apr		System/Network Reliability
14	M	12 Apr		System/Network Reliability
14	W	14 Apr	HW7	System/Network Reliability
14	F	16 Apr		System/Network Reliability
15	M	19 Apr	Quiz 4	Quiz 4
15	W	21 Apr	HW 8	Course Review
17	M	26 Apr	Final Exam	Final Exam

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Grading

Assessments in this course are worth a total of 800 points.

- Homework – 200 points (8 HW @ 25 points each)
- Quiz 1 – 100 points
- Quiz 2 – 100 points
- Quiz 3 – 100 points
- Quiz 4 – 100 points
- Quiz 5 – 100 points

- Quiz 6 – 100 points

Final grades will be assigned using the following scale:

- A: 87%+
- A-: 85-86.99%
- B+: 83-84.99%
- B: 75-82.99%
- C: 66-74.99%
- E: < 66%

Please note the following:

1. No single item exceeds 12.5% 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:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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.

Course Policies

Attendance

Attendance is strongly recommended starting January 11 (first class). 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 catalog

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>

and require appropriate documentation.

Class Conduct

There is no tolerance for mobile phones or other electronic disruptions. Changing your Zoom settings to mute yourself upon joining a meeting is strongly recommended.

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 L^AT_EX.
- Excluding the make-up work policies, no late homework will be accepted.

Quizzes and Final Exam

Before each quiz and the final exam, you will receive a Quiz or Exam Preview. This will cover the procedures for the quiz/exam as well as a preview of the technical content that will be included. The document will also include specific topics addressed by the problem (for some problems), the way points are distributed among problems, and a brief list of topics within the scope of the quiz.

No collaboration is permitted during the quizzes or final exam, though you may prepare before however you choose. Use of any unauthorized materials or any communications is grounds for being reported to Student Conduct & Conflict Resolution for a violation of the UF Honor Code.

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 and messages (course email listserv may also be used)
- Providing access to course materials
- Scheduling Zoom meetings

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.

ENU 4145 vs. 5142

The undergraduate (ENU 4145) and graduate (ENU 5142) courses share common lectures and a fraction of common coursework.

Standardized Syllabus Content

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.

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/>.

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.

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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@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

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.

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>

Campus Resources

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/>

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 Resource 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://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

On-Line Students Complaints:

<http://www.distance.ufl.edu/student-complaint-process>