ENRE 645 / ENSE 698G Human Reliability Analysis
Spring 2019 Syllabus

Instructor:
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Class Meeting Times:
Lecture on Tuesday   9:00 to 11:40 AM in JMP 2217

Office Hours
Phone and in-person office hours   Tuesday 12:00 - 1:00 PM
                                                           Friday   1:00 - 2:00PM *or by appointment*

Catalog Description: ENRE 645 Human Reliability Analysis (3 credits). Formerly ENRE 734. Also offered as ENSE698G. Methods of solving practical human reliability problems, cognitive and behavioral modeling, task analysis, performance shaping factors, error classification, distribution of human performance and uncertainty bounds, sources of human error probability data, human error risk mitigation, examples and case studies.

Text:
Required readings in the form of digital book chapters, case-studies, reports, and journal publications will be provided on the ELMS Canvas website.

Introduction:
In complex and safety-critical systems, Human Reliability Analysis (HRA) is used to provide a complete description of the human contribution to risk and identify the ways to mitigate that risk. HRA employs a set of tools to estimate the likelihood of human error. These likelihoods can then be incorporated into the overall risk assessment and combined with other probabilities (equipment faults, environmental hazards, operator constraints, etc.) to estimate the overall likelihood of system error. The study of human reliability can be seen as hybrid between human factors, reliability engineering, and systems engineering. Modeling, predicting and supporting human performance requires an interdisciplinary approach due to the consideration of multiple aspects of human behavior and system processes. This course will discuss HRA in the context of safety-critical domain examples and case-studies in the areas of health care, transportation, consumer products, energy, and defense. Existing generalized HRA tools will be discussed. In addition, students will be given the knowledge to build new context-specific HRA tools.

This course will provide students with the background to:
1) Build cognitive, behavioral and social theoretical models to explain human error in different application domains.
2) Quantify the theoretical model factors though empirical data collection, expert elicitation, simulations, and data repositories
3) Analyze HRA data using probabilistic and descriptive statistical tools, heuristics, and other methods
4) Use HRA data to inform system risk mitigation strategies

General Course Logistics:
ENRE 645 will use the Canvas course environment semester. Students can login to their course(s) by going to https://umd.instructure.com/. A University ID and password is required to access Canvas courses. Information on changing or resetting your University ID is available from https://ldap.umd.edu/cgi-bin/chpwd. Students are required to maintain their current e-mail address in Testudo as Canvas uses this address to send course related e-mail.

Grading Policy:
It is the policy of the course Instructor to apply the same performance expectations to all course participants regardless of their academic, employment, or linguistic background.

Student grades will be assessed as follows:
- 20%   In-class or Online Participation (case studies and discussion board)
- 45%:   6 Individual Homework Assignments
- 35%:   Individual Project Report

Participation Grades: Online and on-campus students are required to actively and thoughtfully participate in class discussions.

- For **ENRE and ENSE Section 0101** (on-campus students), participation will involve in-class case studies, which will require group work and presentation of work during class time. Outside of case studies, there are opportunities to participate in less formal in-class discussions. Active participation in discussions and case studies will require preparation before class by reading weekly required material. On-campus students are welcome to participate in the Canvas discussion board, but the primary form of participation grade assessment will be derived from in-person classroom discussions and activities.

- **ENRE Sections ER01 and RE01** (online students) can participate in class discussions through online live participation (occurs during lecture), Canvas discussion boards (occurs online after lecture), or Canvas case studies (occurs online after lecture). The case studies and discussion board will mirror the activities performed in class and are expected to be performed while watching the lecture video. The online activities are posted immediately following class each week.
    1. **Online Live Participation:** Online live participation is for students who are available during the lecture time and can be performed in lieu of the Canvas discussion board and case studies for that week. Special permission is not required for online live participation prior to the lecture. Online students may switch weekly between live and post-lecture online participation, depending on their schedule. However, the student is expected to participate for the entire lecture time if they are participating live online. The student is required to provide their own camera and microphone. The mic should be muted when not speaking. The student's camera is required to be on throughout the entire class period (excluding mid-lecture breaks) to receive full participation points. The live participation function is accessed through Canvas (Zoom software) using the Video Conference link found on the left side of the screen. Further instructions for the Zoom software can be found here: http://www.dets.umd.edu/support.
    2. **Case Study Discussion:** Online students who do not participate live will be randomly assigned to a case study group on select weeks. The student is expected to watch the lecture and then participate in the case study by pausing the lecture at the specified time. Two rounds of case study participation are expected. The first round, which is the completion of the student's individual post, should occur within the first three days after lecture for the student to receive participation credit (by Saturday at 11:59pm - 60% of the individual case study grade, late submissions not accepted). The second round, which is the peer review of two student posts, should occur within two days after the first round is completed (by Monday at 11:59pm – 40% of the individual case study grade, late penalties applied). The case study discussion is not expected to rise to the workload level of a homework assignment, but will require that the student thoughtfully consider each case study and post responses that take into account the relevant lecture content. The total workload time estimation (30-90 min) is based on the time allotted for on-campus students to perform the same activities in class, but is expected to be significantly lower than on campus time allotment since the discussion is asynchronous. A case study guide, meant to represent an answer key, will be posted after the deadline for round 1 to aid in peer reviews and self-evaluation.
    3. **Discussion Topic Exchange:** On the weeks when a case study discussion is not active, a discussion topic exchange will be posted. Similar to the case study, the discussion boards are required for online students who do not participate live in the lecture for that particular week. The Instructor will initiate discussions and also respond to discussion posts. To receive full participation credit, all posts must reference at least one other post and provide a direct affirmation or contradiction to another student's statement. Individual posts are limited to 150 words. However, multiple posts can be made in response to other posts. Although discussions will remain active for the entire semester, the posting deadline is 11:59pm on the Sunday after the discussion is activated (late penalties applied). Students are strongly encouraged to post within the first 3-4 days of an active discussion to stimulate additional discussion among classmates. Students may also generate new discussion posts on topics of interest related to the courses, however, these exchanges will not be graded.

Assignment Grades: All assignments should be uploaded to Canvas by 11:59pm on the due date. Assignments submitted between 1 minute and 24 hours late will receive 80% of the credit. Assignments that are more than 24 hours late will receive 50% of the credit. Exceptions will be made in accordance with University policy regarding major grading events. Due to the cumulative knowledge required to complete each subsequent assignment, students who receive a grade of 75% or lower on their initial submission will be given the option to resubmit within five days of the grade posting to receive formal feedback on their submission revisions. Resubmitted assignment grades will not exceed 75% of the credit.

A portion of all assignment scores (10%) will be allocated to technical writing professionalism, which includes grammar, formatting, and the proper use of citations. Students are strongly encouraged to take advantage of free University resources,

such as the Graduate School Writing Center for online or in-person writing consultations: https://www.gradschool.umd.edu/graduate-school-writing-center.

Student Project Logistics: Students will develop a project that employs tools and techniques learned in the course. This may include the modification of an existing HRA method or the development of a new HRA method applied to a chosen domain problem. Students are not expected to collect or analyze data, but will be required to detail a HRA data collection and analysis plan and suggest implementation strategies, similar to what would be expected in a real-world funding proposal for an HRA project. Project topic selection is at the discretion of the student, but must be relevant to human reliability. Guidance will be provided on acceptable project topics.

Attendance Policy: Regular attendance for registered on-campus students is expected. University policy excuses the absences of students for illness (self or dependent), religious observances (http://www.president.umd.edu/policies/iii510a.html), participation in University activities at the request of University authorities, and compelling circumstances beyond the student's control. For more information, see the University's Attendance and Assessment Policy (http://www.testudo.umd.edu/soc/atedasse.html)

Academic Integrity and Academic Dishonesty: Please review the university policy on academic integrity and academic dishonesty at http://www.jpo.umd.edu/ and http://www.studenthonorcouncil.umd.edu/code.html. Also note that no form of plagiarism will be tolerated. All work presented to the Instructor is assumed to be the original work of the course participant(s). The course Instructor may request evidence of references for any submitted work. A useful website on Academic Integrity and Plagiarism is maintained by the UM Library at http://www.lib.umd.edu/UES/honesty.html. Words, diagrams, figures, or original contributions of anyone other than a student must be referenced when included in a student's work. Plagiarism is considered an act of academic dishonesty and will be reported according to University policy. All assignments will be automatically processed through the Canvas Turnitin Originality Checker https://umd.service-now.com/itsc?id=kb_article&sys_id=c0116d8f0f7ef2007f232ca8b1050e63. Students should apply formal referencing practices in all submissions. Students should select a reference style from the link provided and consistently use this style for all submitted course material: https://owl.english.purdue.edu/owl/resource/585/2/.

University wide Honor Code: The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit: http://www.shc.umd.edu.

Online Course Evaluation: Students can go directly to the website (www.courseevalum.umd.edu) to complete their evaluations. They will be alerted via their official University e-mail account about the dates of the evaluation period and provided more information closer to that time. Students who complete evaluations for all of their courses in the previous semester (excluding summer), can access the posted results via Testudo's CourseEvalUM Reporting link for any course on campus that has at least a 70% response rate.

	Course Lecture Schedule[1]	
Week	**Lecture Topics**	**Individual Assignments** *(see due date notes below)*
1	Introduction to HRA, course expectations	Discussion Board (only online students)
2	HRA process overview, project guidelines	Homework 1. Human reliability in the news. Update Canvas picture and profile.
3	Cognitive and social theories	Case Study 1. Human Error Responsibility
4	Problem solving and decision making theories	Case Study 2. Theory Selection
5	HRA Components Part 1, task analysis	Homework 2. Project Proposal
6	HRA Components Part 2, unsafe acts, performance shaping factors	Discussion Board (only online students)
7	HRA Methods Part 1, first generation	Homework 3. Theory Integration
	SPRING BREAK	
8	HRA Methods Part 2, second generation, third generation	Case Study 3: Prospective HRA Method Comparison
9	HRA Method Selection	Homework 4. Task Analysis Case Study 4. Prospective HRA Method Comparison
10	Data Integration Part 1, Existing Data	
11	Data Integration Part 2, New Empirical Data	
12	Data Integration Part 3, Expert Elicitation	Homework 5. Unsafe Acts and PSFs Case Study 5. Application of Data Collection Approaches
13	Risk Mitigation and Adverse Event Investigation	Case Study 6. Risk Mitigation
14	Additional Case Studies	
15	Additional Case Studies	Homework 6: Retrospective HRA Method Comparison

ASSINGMENT DUE DATES

- Project report due on Friday May 22nd by 11:59 pm.
- All homework assignments are due by 11:59pm on the Monday before class on the listed week.
- All case studies are due by 11:59 on Saturday (first round) after class on the listed week. Peer reviews (second rounds) are due on Monday, 48 hours after the first round due date.
- All discussion board posts are due on Sunday at 11:59 after class on the listed week.

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[1] Individual assignment topics and lecture topics and orderings may be subject to change