### Catalog Data
MSE 6766: Risk Assessment of Materials Systems, 2 credits
Prerequisite: G, U by permission of instructor

### Professor
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### Background and Purpose
Most organizations are interested in the risk of adopting new technologies, extending the service life of existing systems, or making modifications to a current system. The overall goal is to train materials scientists/engineers to be able to speak the language of probability and to understand the benefits and risks of different approaches. This course will discuss various approaches to combine materials behaviors with probabilistic analysis methods.

### Schedule:
WF, 1 hour, Timing to be determined, half-semester course

### Course material
No required textbook. Class notes and reading material will be available on Carmen and reserved in the library. Bayesian network software will be made available via download

### Topics
**Case Studies of Materials Failures:** The course will first present two or three major cases of materials failures resulting in significant consequence and involving materials failures. Examples could be the Challenger disaster, sub-sea bolt failure, Fukushima reactor decommissioning, etc. The idea is to start the class with real life examples to create a backdrop for the rest of the course.

**Qualitative approaches to risk assessment:** The idea here is to provide information on how many organizations approach risk assessment using for example risk matrices, fish bone diagrams, bow tie diagrams, etc. Then emphasize the issues with qualitative risk assessment methods.

**Statistical methods:** The objective would be to describe different probability distributions (Normal, Weibull, Extreme Value, etc.), their applicability to different situations. Monte Carlo and other probability drivers will be described with some examples that the students can practice. (Excel Add-on like @RISK could be useful)

**Quantitative Risk Methods:** This part of the course will cover analytical/numerical modeling linked to probabilistic driver, Fault-tree event tree methods, and Bayesian methods. This part would be the most extensive part of the course, with emphasis on
Bayesian methods (we can get academic license from BayesFusion for students to try to construct their own Bayesian network models).

Case Study Exercise: We will come back to the case studies presented at the beginning and apply use of different methods learnt in the course. The students will be sub-divided into teams to do this, emphasizing the inter-disciplinary nature of risk assessment. A case study report will be required followed by a presentation (can be given as a group or individually from different perspectives). Outstanding reports can be submitted to a journal.

How can risk assessment be used?: This is the final closure of the course taking more of a philosophical view of how risk assessment and risk communications work – may bring in a guest lecturer.

**Pre-requisites**

Mechanical properties of materials, corrosion, statistical methods

**Grading Plan**

Short quiz (4 times): 10% (make-up quiz if notified of absence before)
Case study report (collaborative effort): 70%.
Presentation of case study: 15%
Attendance and participation: 5%

**Reference Materials**


Other papers will be assigned during the course for discussion.

**COURSE EVALUATION:**
Students are requested to evaluate the course during the last weeks of the quarter. Further instructions on how to complete the evaluation will be provided by that time. As part of the course evaluation, students are requested to present any and all constructive criticism they believe would enhance this course in future offerings.

**DISABILITY SERVICES**
The Office for Disability Services ([http://ods.osu.edu/](http://ods.osu.edu/)) coordinates physical and academic support services for any student who has the need because of a permanent or temporary disability. Individuals eligible for services include, but are not limited to, those with mobility, hearing, visual, speech, or learning disabilities. Services are available on a self-referral basis. Successful accommodation often requires advance planning. Students are encouraged to make early contact with The Office of Disability services to identify their needs and ensure that services will be available in an effective and timely manner. The Office for Disability Services is located at 150 Pomerene Hall, 1760 Neil Avenue, telephone # 292-3307.

**Academic Misconduct**
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct [http://studentlife.osu.edu/csc/](http://studentlife.osu.edu/csc/).

**Mental Health**
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services.
services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Youkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Diversity

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.