Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and 2 copies. Attach a course syllabus to each.

1. This request is submitted by the Department of Civil Engineering

2. Course prefix, number and complete title CVEN 699 - Engineering Risk Analysis

3. Course description (not more than 50 words): This course introduces students to applications of probability
   theory, statistics, and decision analysis to civil engineering problems. Emphasis is placed on
   probabilistic modeling and analysis of civil engineering problems, Bayesian statistics, risk analysis,
   and decision under uncertainty.

4. Prerequisite(s): Stat 211 or approval of instructor Cross-listed with
   Cross-listed courses require the signatures of both department heads.

5. Is this a variable credit course? □ Yes ☐ No If yes, from _______ to _______.

6. Is this a repeatable course? □ Yes ☐ No If yes, this course may be taken _______ times. Will the course be
   repeated within the same semester/term? □ Yes ☐ No

7. Has this course been taught as a 489/689? ☐ Yes ☐ No If yes, how many times? _______ Indicate the
   number of students enrolled for each academic period it was taught. 19

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated
   with these departments. Attach approval letters.

10. Prefix Course # Title (exclude punctuation) CVEN 699 ENGRISK RISK ANALYSIS
    Lect. Lab SCH Subject Matter Content Code Admin. Unit Acad. Year 0630 0 0 10 8 71 00 3 8 3 2 FICE Code
    Do not complete shaded area.

Approval recommended by:

Head of Department Date 2/19/69

Chair, College Review Committee Date 5/8/09

Dean of College Date 5/8/09

Dean of College (if cross-listed course) Date 6/14/09

Submitted to Coordinating Board by:

Date

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
OARAS-564
Course title and number  Engineering Risk Analysis -- CVEN 699
Admin Unit  0630
Term  Fall 2009
Meeting times and location  TR – 12:45-2:00 PM

Course Description and Prerequisites

Course Description
Probabilistic considerations in engineering; probability concepts; probabilistic modeling and analysis; Bayesian statistics; risk analysis; decision-making under uncertainty; applications of probability theory, statistics, and decision analysis to engineering problems.

Prerequisites  Stat 211 or approval of instructor

Learning Outcomes or Course Objectives

Course Objectives
This course introduces students to applications of probability theory, statistics, and decision analysis to civil engineering problems. Emphasis is placed on probabilistic modeling and analysis of civil engineering problems, Bayesian statistics, risk analysis, and decision under uncertainty. For undergraduate students, this course provides a solid base in applied probability and Bayesian statistics as used by engineers, and introduces them to the increasingly important topic of engineering risk analysis. For graduate students, in addition, this course provides a strong background for pursuing more advanced courses on non-deterministic methods, such as CVEN 655 and CVEN 675.

Instructor Information

Name  Paolo Gardoni
Telephone number  (979) 845-4340
Email address  pgardoni@civil.tamu.edu
Office hours  TBD
Office location  Room 705F, CE/TTI Building

Textbook and/or Resource Material

Suggested Textbook
Additional Resources


Grading Policies

Grading

- Homework 20%
- Midterm Examination 30%
- Final Examination 50%

Grade Scale: A letter grade will be determined by the quantity $P$ shown below:

$$P = 10 \left( \frac{\text{Total homework scores earned}}{\text{Total homework scores possible}} \right) + 60 \left( \frac{\text{Total midterm scores earned}}{\text{Total midterm scores possible}} \right) + 30 \left( \frac{\text{Final exam score earned}}{\text{Final exam score possible}} \right)$$

A: $P \geq 90$; B: $90 > P \geq 80$; C: $80 > P \geq 70$; D: $70 > P \geq 60$; F: $60 > P$

Course Topics, Calendar of Activities, Major Assignment Dates

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<tr>
<th>Week</th>
<th>Topic</th>
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<tr>
<td>1</td>
<td><em>Elements of set theory</em></td>
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<td>2</td>
<td><strong>Basic elements of probability theory</strong></td>
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<td>• Axioms of probability</td>
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<td>• Elementary rules of probability</td>
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<td>• Conditional probability and statistical independence</td>
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<td>• Bayes' rule</td>
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<td>• Theorem of total probability</td>
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<td>• Probability rules for conditional events</td>
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<td><strong>Random variables</strong></td>
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<td>• Discrete, continuous, and mixed random variables</td>
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<td>• Probability distributions</td>
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<td>• Partial descriptors of a random variable</td>
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<td>• Common distribution models</td>
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Distribution conditioned on events

Elements of fragility analysis

Multiple Random Variables
- Conditional moments
Multivariate distribution models

Function of random variables
- First and second moments of functions
- Distribution of functions

Probabilistic models
- Bernoulli trial
- Bernoulli sequence and related distributions
- Poisson and related distributions
- Asymptotic models

Statistical inference
- Method of moments
- Method of maximum likelihood
- Bayesian statistics and conjugate distributions

Formulation of the reliability problem
- Limit-state functions
- Capacity and demand safety format
- Component vs. system reliability problems

Elements of decision theory

Other Pertinent Course Information

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu)

Academic Integrity
For additional information please visit: [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor)

"An Aggie does not lie, cheat, or steal, or tolerate those who do."