# CSCI 668: Reliability Spring, 2025 TR 2:00–3:20

Instructor: Larry Leemis

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Office hours: TR: 3:30 – 4:45 PM, or by appointment

#### **Purpose:**

This course introduces probabilistic models and statistical methods used in reliability. The first half of the course examines probabilistic models for the lifetime of a system of components, and the last half of the course considers statistical methods which can be applied to a data set of survival times. Specific goals include:

- (a) Provide a review of probability and statistics.
- (b) Understand reliability theory at the level of the current archival literature.
- (c) Understand the relationship between actuarial science/biostatistics/reliability.
- (d) Use R to analyze reliability and survival analysis problems.

#### **Prerequisites:**

Students should have a working knowledge of calculus-based probability, statistics, and computer programming.

#### Text:

Leemis, L. (2025), *Reliability: Probabilistic Models and Statistical Methods*, Third Edition, ISBN: 978-0-9829174-4-2.

#### Semester project:

A semester project on a research topic in reliability is due on the last day of class. The topic should be selected before spring break.

### Homework:

## Grades:

Course grades will be determined by these weights:

| Homework     | 25% |
|--------------|-----|
| Midterm exam | 25% |
| Project      | 20% |
| Final exam   | 30% |

The grading scale is (plus and minus grades may be assigned within each range)

| 90 - 100% | А            |
|-----------|--------------|
| 80-90%    | В            |
| 70-80%    | С            |
| 60-70%    | D            |
| 0 - 60%   | $\mathbf{F}$ |

The instructor reserves the right to move these thresholds downward, but they will not be moved upward.

## Course outline:

- 1. Introduction
- 2. Coherent Systems Analysis
- 3. Lifetime Distributions
- 4. Parametric Lifetime Models
- 5. Specialized Models
- 6. Repairable Systems
- 7. Lifetime Data Analysis
- 8. Parametric Estimation for Models Without Covariates
- 9. Parametric Estimation for Models with Covariates
- 10. Nonparametric Methods
- 11. Assessing Model Adequacy