

**THE UNIVERSITY OF TEXAS AT EL PASO**  
**COLLEGE OF SCIENCE**  
**DEPARTMENT OF MATHEMATICAL SCIENCES**

Course #: STAT 5370/ STAT 6370  
(CRN: 14565/14604)  
Course Title: Statistical Reliability Theory  
Credit Hrs: 3  
Term: Fall 2024 (Instruction 08/26/2024-12/05/2024)  
Course Meetings & Location: 12:00pm – 01:20pm MW, Bell Hall 130  
Prerequisite Courses: Introductory level Probability and Statistics course; Some programming experiences would be plus, though not required.  
Instructor: Ritwik Bhattacharya  
Office Location: Bell Hall 223  
Contact Info: Phone: (915) 747-5761 [O]  
ritwik@utep.edu  
Fax: (915) 744-6502  
Office Hours: 10am-12pm Weekdays via Zoom. Please email to make an appointment.  
Class Web page: UTEP Blackboard Portal  
Textbook(s), Materials: W. Q. Meeker. and L. A. Escobar. (1998).  
Statistical Methods for Reliability Data, John  
Wiley and Sons, New York.  
J. F. Lawless (2002). Statistical Models and  
Methods for Lifetime Data, 2<sup>nd</sup> Edition, Wiley-  
Interscience.

Course Description and Learning Outcomes: Reliability theory is a beautiful application of statistical methods. Mechanical systems, such as electronics, automobiles, and others, often fail in our daily lives. Some are repairable, and some are not. Thence, the natural question arises: Is there any way to model that failure mechanism? Reliability theory answers such questions methodically. Manufacturing industries widely use reliability methods in their product design phases. Various statistical methods are applied in reliability theory to model uncertainty in the failure phenomenon. Reliability means the probability of non-failure of a random variable beyond a time point. In this course, several basic concepts of reliability theory, such as system reliability, censoring, life-testing, etc., will be taught. The students with basic knowledge of statistical methods will learn how those methods can be applied to real-world problems.

This course will provide a coverage of topics and methodologies common in Reliability theory. Students will have opportunities to gain hands-on experiences with real-world data projects.

Topic Outline

1. **Introduction:** Reliability concepts and data examples
2. **System Reliability:** Series system, Parallel System, k-out-of-n system, Cut sets, MOCUS.
3. **Lifetime Models and Censoring:** Type-I censoring, Type-II censoring, Hybrid censoring, Progressive Censoring and Interval Censoring.
4. **Nonparametric Methods:** KM Estimator, Nelson-Aalen Estimator.
5. **Regression Models:** Cox Proportional Models.
6. **Degradation models:** Estimation, Data Analysis
7. **Accelerated life testing:** Models, Likelihood Estimation.
8. **Prediction:** Methods for predicting future observations.
9. **Additional topics:** Step-Stress Testing, Repairable System, Competing Risks (If time permits)

Course

Activities/Assignments: Lecture notes in pdf format will be uploaded in BB. Additional supporting materials will be available in BB.

Course Schedule:	08/26	Class starts.
	11/01	Class drop deadline.
	12/04	Class ends.
	12/09 - 12/13	Final Exam Period.
	<u>Holidays</u>	
	09/02	Labor Day.

**Grading Policy:** There will be two midterms and one comprehensive final exam, plus two computer projects, which, in together, add up to the final grade. Homework, assignments will be made available on the course web page. No homework will be collected or graded. But you are highly recommended to do homework regularly and independently.

No make-up exam will be given and no late project submission is accepted without justifiable reasons.

	<b>Date and Time</b>	<b>Proportion</b>
<b>Midterm Exam I</b>	10/02 Wednesday	20%
<b>Midterm Exam II</b>	11/25 Monday	20%
<b>Computer Project I</b>	TBA	20%
<b>Computer Project II</b>	TBA	20%
<b>Final</b>	12/09 Monday	20%
<b>Total</b>		100

**Grade Score**

A	> 90
B	80-89
C	70-79
D	60-69
F	<60

**Make-up Policy:** There is NO make-up exam; if you must miss a midterm exam, e.g., with a university excuse or due to illness, the percentage of that exam will be re-distributed to other or future exams.

Incomplete grades are given only in extreme instances and only with prior permission of the instructor. All assigned projects must be turned in on time. No late coursework or project will be accepted, except extreme scenarios.

**Attendance Policy:** Class attendance is required. Students are expected to actively participate in class discussions and group activities. A late arrival of 15 minutes or more will be considered as an absence. Class attendance is **REQUIRED** and helpful to decide borderline grades. If a student must be absent from a particular class, he/she will be responsible for notifying the instructor and catching up with course material. **FOUR** or more unexcused absences will result in an instructor-initiated drop or grade failing / reduction. Your academic advisor will be consulted before final action is decided and taken. If you expect to miss **TEN** or more class hours for **ANY REASON**, please don't consider taking this course.

Academic Integrity Policy: The University policy is that all suspected cases or acts of alleged scholastic dishonesty must be referred to the Dean of Students for investigation and appropriate disposition. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Each student is responsible for notice of and compliance with the provisions of the Regents' Rules and Regulations, which are available for inspection electronically at <http://www.utsystem.edu/bor/rules/homepage.htm>

All students are expected and required to obey the law, to comply with the Regents' Rules and Regulations, with System and University rules, with directives issued by an administrative official in the course of his or her authorized duties, and to observe standards of conduct appropriate for the University. A student who enrolls at the University is charged with the obligation to conduct himself/herself in a manner compatible with the University's function as an educational institution.

Any student who engages in conduct that is prohibited by Regents' Rules and Regulations, U. T. System or University rules, specific instructions issued by an administrative official or by federal, state, or local laws is subject to discipline, whether such conduct takes place on or off campus or whether civil or criminal penalties are also imposed for such conduct.

Civility Statement: Calculators may not be shared during exams. Please do not use cell phones, pagers, iPods, MP3 players, blue tooth devices, etc. during class or exam time. Cell phones and pagers should be set to silent or vibrate, and any calls should be taken outside of class. Please do not wear headsets or blue tooth devices during class. Please don't talk in class. Cell phone calculators may not be used on exams. Active participation in class is expected, teamwork in class will be implemented.

Disability Statement: If a student has or suspects she/he has a disability and needs an accommodation, he/she should contact The Center for Accommodations and Support services (CASS) at 747-5148 or at <cass@utep.edu> or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any CASS accommodation letters and instructions.

Military Statement: If you are a military student with the potential of being called to military service and/or training during the semester, please contact me by the end of the first week of class.

UTEP College of Science Policies: The UTEP Fall 2024 drop/withdraws deadline is November 1st, 2024. The College of Science will remain aligned with the University and not approve any drop requests after that date.

All grades of Incomplete must be accompanied by an Incomplete Contract that has been signed by the instructor of record, student, departmental chair, and the dean. Although UTEP will allow a maximum of one year to complete this contract, the College of Science requests it be limited to month based upon completion data. A grade of Incomplete is only used in extraordinary circumstances confined to a limited event such as a missed exam, project, or lab. If the student has missed a significant amount of work (e.g., multiple assignments or tasks), a grade of Incomplete is not appropriate or warranted.