

BMEN 4007
Course Syllabus
Fall 2026

Instructor: Dr. Brian Meckes

Office: K240D

Office Hours: R 11-12 PM; Or by appointment (in-person or Zoom)

Class: TR 1:50-3:10; E264

Email: brian.meckes@unt.edu

Course Description: An advanced course in the design of experiments and analysis of biological data sets. This course will cover topics such as advanced hypothesis testing, nonparametric models, and power analysis for experimental design. Software tools for interpreting and visualizing data will be covered.

References (Required):

Biostatistics with R: An Introduction to Statistics Through Biological Data by Shahbaba (freely available digitally through the university library)

Experimental Design and Data Analysis for Biologists by Quinn/Keough

R in Action by Rob Kabacoff

r-bloggers.com

Other Resources (Recommended)

[Modern Statistics for Modern Biology](#), by Susan Holmes and Wolfgang Huber

[Introductory Statistics for the Life and Biomedical Sciences](#) by Julie Vu and David Harrington

Prerequisites: None

Course Objectives:

1. To provide a fundamental understanding of how to design experiments to achieve statistically meaningful results.
2. To develop the skills to implement computational tools for data analysis across diverse data sets.
3. To develop a practical framework for understanding data analysis

Grading Policies:

Grade Breakdown	
Area	% Grade
Homework	50%
Midterm	25%
Final	25%

Attendance Policy

Attendance for classes is required. Materials will not be retaught in office hours to students who do not attend class.

Homework and Quizzes:

Homework will be given typically every other week. Quizzes will be held periodically (on Canvas during class time). Homework will only be accepted via Canvas. Please use appropriate apps to scan and submit as a PDF if done by hand. Smartphone photos will not be accepted. It is the student's responsibility to ensure that the material is legible. Apps that may be appropriate if you do not have a scanner (typed versions are always welcome, too) include Adobe Scan (free and highly dependable), Microsoft Office Lens, and Tiny Scanner.

Grade Evaluations:

A – 90-100%

B – 80-89%

C – 70-79%

D – 60-69%

F - < 60%

This scale may be lowered at the instructor's discretion (but not raised).

Disability Policy: The University of North Texas does not discriminate on the basis of an individual's disability and complies with Section 504 and Public Law 101-336 (Americans with Disabilities Act) in its admissions, accessibility, treatment, and employment of individuals in its programs and activities. A copy of the College of Engineering ADA Compliance Document is available in the Dean's Office. It is the responsibility of the student to inform the instructor of any disabling condition that will require modifications by the 12th class day. All reasonable accommodations will be made to facilitate special needs. Office of Disability Accommodation (ODA), Union Suite 322, (940) 565-4323. <http://www.unt.edu/oda>.

Late Work: Late work is accepted up to 3 days after the deadline. You lose 10% of the available points for each day late. After 3 days, you will receive a zero. All late work may not receive complete feedback, and only a score may be available.

Incomplete Grades: Incomplete grades are granted only for extenuating circumstances and require that the student be passing the course at the time of the documented circumstances.

Examination Policy: All exams are in person. You may utilize a single sheet of paper (front and back) with notes. Cell phones must be put away. Only pens, paper, and calculators may be on your desk. Any student found to have a cell phone on their desk during exam time will receive a zero.

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the instructor of any disabling condition that will require modifications by the 12th class day.

Student Conduct: Every student in this class should have the right to learn and engage within an environment of respect and courtesy from others. We will discuss our classroom's habits of engagement, and I also encourage you to review UNT's student code of conduct so that we can all start with the same baseline civility understanding (Code of Student Conduct) (<https://policy.unt.edu/policy/07-012>).

Academic Honesty: Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. Students who use other people's work without citations will be violating UNT's Academic Integrity Policy. Please read and follow this important set of [guidelines for your academic success](https://policy.unt.edu/policy/06-003) (<https://policy.unt.edu/policy/06-003>). If you have questions about this or any UNT policy, please email me or come discuss this with me during my office hours.

Schedule of classes (subject to change):

#	Date	Day	Topic Covered	Reading
1	Aug 18, 2026	T	Intro to Analysis and R	Appendix A Shahbaba
2	Aug 20, 2026	R	Basics of using R	Appendix B Shahbaba
3	Aug 25, 2026	T	Introduction to Descriptive Statistics	2.1-2.3 Shahbaba; 2 Quinn
4	Aug 27, 2026	R	Visualization of Data Using R	2.4-3 Shahbaba; 4 Quinn
5	Sep 01, 2026	T	Estimation	6 Shahbaba
6	Sep 03, 2026	R	Hypothesis Testing	3.1-3.7 Quinn, 7.1-7.3 Shababab
7	Sep 08, 2026	T	Correlation	7.4 Shahbaba
8	Sep 10, 2026	R	T Tests	7.4 Shahbaba
9	Sep 15, 2026	T	ANOVA (1 dimensional)	8 Quinn, 9.1-9.3 Shababa
10	Sep 17, 2026	R	ANOVA (factorial)	9 Quinn, 9.4 Shahbaba
11	Sep 22, 2026	T	Non-Parametric Hypothesis Testing	
12	Sep 24, 2026	R	Binary Outcomes Hypothesis Testing	
13	Sep 29, 2026	T	Power Analysis	10 Kabacoff
14	Oct 01, 2026	R	Regression Analysis	13 Quinn; 11 Shababa
15	Oct 06, 2026	T	Linear Regression Analysis	13 Quinn; 11 Shababa
16	Oct 08, 2026	R	Logistic Regression	13.2 Quinn
17	Oct 13, 2026	T	Review	
18	Oct 15, 2026	R	Midterm	
19	Oct 20, 2026	T	Biomedical Curve Fitting and Nonlinear Models	
20	Oct 22, 2026	R	No Class BMES	
21	Oct 27, 2026	T	ANCOVA	12 Quinn; https://www.r-bloggers.com/2021/07/how-to-perform-ancova-in-r/

22	Oct 29, 2026	R	Model Validation and Performance Evaluation	
23	Nov 03, 2026	T	No Class	
24	Nov 05, 2026	R	Principle Component Analysis	17 Quinn
25	Nov 10, 2026	T	Clustering	12 Shababa; 16 Kabacoff
26	Nov 12, 2026	R	Model Validation and Performance Evaluation	
27	Nov 17, 2026	T	Classification Decision Trees	17 Kabacoff
28	Nov 19, 2026	R	Classification Random Forest	
29	Dec 01, 2026	T	Common Statistical Mistakes in Biomedical Research	
30	Dec 03, 2026	R	REVIEW	
31	Dec 08, 2026	T	Final Exam starting at 3:30 – 5:30 p.m.	