

STA 306: Applied Multivariate Analysis

PROFESSOR: Dr. Bill Franczak

OFFICE: P216

EMAIL ADDRESS: francza3@tcnj.edu (primary means of communication)

EXPECTED RESPONSE TIME: within 24 hours during the week, intermittently on weekends

OFFICE HOURS: Monday 11am-12pm
 Wednesday 9-10am

Zoom and Recording:

Class sessions are held in person. However, the Zoom link serves as a backup plan and study tool. Lectures will be recorded for later viewing, and you will be able to watch live in case you are unable to attend class in person.

College Policy for Recording in the classroom:

[Read the TCNJ Recording Policy](#)

Join URL: [Join the class Zoom call](#)

Passcode: 785938

Course Description:

Applied Multivariate Analysis is an upper level statistics option, both for statistics majors and statistics minors. The course meets twice weekly. Students must have completed STA 215 or STA 216 prior to enrolling. The course is suitable to students from many disciplines.

Course Materials:

The required text for the class is Multivariate Statistical Methods – A Primer, by Bryan F.J Manly and Jorge A. Navarro Alberto, ISBN-13: 978-1-4987-2896-6

We will also use the free software package R: [Download R here](#).

Learning Goals:

The American Statistical Association's guidelines for undergraduate programs in statistical science state that such programs should "emphasize concepts and tools for working with data and provide experience in designing data collection and in analyzing real data that goes beyond the content of a first course in statistical methods." More specifically, they recommend that programs should provide statistical topics that include random sampling, stratification in sample surveys, data exploration in observational studies, and a variety of formal inference procedures.

They also recommend that programs should require familiarity with a standard statistical software package.

This course covers aspects of statistical inference in cases where there are multiple variables. In contrast to Regression Analysis, the methods in multivariate analysis focus on areas of unsupervised data exploration and classification. It provides an introduction to methods such as clustering and PCA for exploration and linear discriminant analysis for classification. The rationale underlying each test will be conveyed and statistical software packages SAS or R as decided by the individual instructor.

While topics may expand with the field, on completion students will typically have covered

- (i) Matrices, eigenvalues and eigenvectors
- (ii) Principal components analysis
- (iii) Factor analysis
- (iv) Discriminant analysis (two and three group analyses)
- (v) Cluster analysis, using a variety of metrics and clustering algorithms
- (vi) Multi-dimensional scaling (classical and ordinal)
- (vii) Correspondence analysis
- (viii) Canonical correlation analysis

Missing Class/Homeworks/Exams:

In the event that you miss class, you should email me so that I have a record of it. A recording of the lecture for each day can be found in: Zoom Module → Zoom → Cloud Recordings tab (on the top right). Click on the lecture you wish to view. You will be prompted for a password, which will have been automatically copied to your clipboard. Paste it to view the content. No Makeups will be given for homework assignments, but extensions can be requested **before** the due date of the assignment. If you are ill and unable to attend an exam, a makeup can be arranged only if email me before the start of the exam, and if you get a doctor's note. Makeup exams may be more difficult than the original. If you are feeling ill, you may participate in class via Zoom.

Final:

There will be a cumulative final exam at the end of the semester. Final exams are scheduled for 5/13-5/20

***** PLEASE CONSIDER THESE DATES WHEN MAKING TRAVEL ARRANGEMENTS*****

Grading:

Homework = 15%

Quizzes = 10%

Exams = 50% (Note: The lowest exam grade will count for 10% of the final grade, with the remaining two test grades counting for 20% each)

Final = 25%

Class Participation will be considered in borderline cases.

Grades will be calculated as below, round as usual:

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percent	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	<63

Fourth Hour:

In this class, the deep learning outcomes associated with TCNJ's 4th hour are accomplished by a series of rigorous educational assignments and projects that extend beyond the typical scheduled class time. These include learning to use statistical analysis tools in Excel and group work on projects during the semester. In addition, it is expected that many students will require additional time with tutors during the semester to develop the skills needed to apply the statistical concepts learned. The course is expected to meet for the full time each class period and to the end of the semester.

Attendance:

All students are expected to attend all classes and are responsible for all information provided. A student who is absent for a test will not be permitted to make up the test unless prior arrangements with the instructor have been made. Approval for missing a test will only be permitted in exceptional circumstances. In the case of illness, a doctor's note will be required. Please view TCNJ's attendance policy at

[Read the attendance policy](#)

Academic Honesty:

Please make sure you are familiar with TCNJ's academic integrity policy. Any suspected violation of this policy will be confronted in the strict accordance with the policy: [Read academic integrity policy](#)

Americans with Disability Act Policy:

[Read the ADA policy](#)

Final Exam-Evaluation-Reading Days Policy:

Exams in the last week of class are limited to 15% of the total grade and the graded exams must be returned to the students by the first day of reading period to allow students to learn from any mistakes. The final exam must take place during the exam period, and students must be permitted to use the full 170 minutes of allotted exam time. The final exam should count for no more than 35% of the final grade. [Read the final exam policy](#).

Commitment to Diversity, Equity, Inclusion, Access, and Belonging:

The TCNJ community is composed of people with diverse backgrounds, perspectives, and experiences, and the college is committed to diversity, equity, inclusion, access and belonging. The college's Campus Diversity Statement can be viewed here: [Read diversity statement](#)

Classroom Environment and Commitment to Student Success, Safety, and Well-Being:

The TCNJ community is dedicated to the success, safety and well-being of each student. TCNJ strictly follows key policies that govern all TCNJ community members rights and responsibilities in and out of the classroom. In addition, TCNJ has established several student support offices that can provide the support and resources to help students achieve their personal and professional goals and to promote health and well-being. You can find more information about these policies and resources at the "TCNJ Student Support Resources and Classroom Policies" webpage here: [view resources](#). Students who anticipate and/or experience barriers in this course are encouraged to contact the instructor as early in the semester as possible. The Accessibility Resource Center (ARC) is available to facilitate the removal of barriers and to ensure reasonable accommodations. For more information about ARC, please visit: <https://arc.tcnj.edu/>