

MATH 588, Advanced Data Analysis

Spring 2021

Tuesday and Thursday; Time: 10:40-11:55

Instructor: Dr. Anwar Hossain

E-mail: anwar.hossain@nmt.edu

Office Hours via Zoom: Monday 11:00am-12:00 Tuesday and Thursday 2:00-3:00

Or by Appointment

Text Book: The Statistical sleuth: A Course in Methods of Data Analysis by Ramsey and Schafer, third edition, Brooks/Cole Cengage Learning.

Catalog description:

Topics include linear regression, inferential tools for regression, model checking and refinement, experimental design, repeated measures and other multivariate responses, comparisons of proportions or odds, logistic regressions and power analysis. Principal components and factor analysis are also introduced.

Prerequisite: MATH 483 or consent of instructor and advisor; passed with a C– or better

About the Course:

The purpose of this course is to familiarize you with commonly used data analytic techniques. This course is designed for those in Mathematics or other fields who need to use statistical methods to analyze data from experiments and observational studies and who need to communicate the results to others. It is intended as a course for students who are preparing to design, implement, analyze, and report their research. You will improve your understanding of statistical reasoning, measures of uncertainty, the general tools, and the spirit of statistical data analysis, which will be useful for a wide range of problems.

Software:

- We require the **R** Statistical Software, which is **powerful** and **free**. R can be downloaded at the link below: <http://www.cran.r-project.org/>
- **Rstudio** is a free platform for both writing and running R, available at www.rstudio.org. Some students find it friendlier than basic R (especially in windows OS).
- The learning curve is very steep. Students can become proficient in a few weeks. Some manuals are very helpful to learn R, e.g., <http://cran.r-project.org/manuals.html>

Mode of Instruction: This course is entirely online and it will be delivery synchronically (in real time) via Zoom. Lectures will also be recorded and uploaded to canvas.

Place in Curriculum: This course serves as a mathematics elective for math majors and as a preparation course for a preliminary exam in Probability and Statistics for math PhD students.

Program Learning Outcomes: The Department of Mathematics program learning outcomes are available at <https://nmt.edu/academics/math/about.php#slo>

Learning Objectives:

By the end of this course, students will be able to:

1. Gather sufficient relevant data, conduct data analytics using scientific methods, and make appropriate and powerful connections between quantitative analysis and real-world problems.
2. Demonstrate a sophisticated understanding of the concepts and methods; know the exact scopes and possible limitations of each method; and show capability of using data analytics skills to provide constructive guidance in decision making.
3. Use advanced techniques to conduct thorough and insightful analysis, and interpret the results correctly with detailed and useful information.
4. Show substantial understanding of the real problems; conduct deep data analytics using correct methods; and draw reasonable conclusions with sufficient explanation and elaboration.
5. Write an insightful and well-organized report for a real-world case study, including thoughtful and convincing details.
6. Make better decisions by using advanced techniques in data analytics.

Methods of Assessing: Learning Outcomes Assessment will be achieved through exams and regularly collected homework assignments.

COURSE POLICY:

You are encouraged to seek help from the instructor. Your course grade will be determined on the basis of combined scores from Homework and Exams. In order to make up any assignment, a valid excuse should be documented. The instructor decides if an excuse is a valid one.

Homework:

Homework problems for each chapter will be assigned on canvas and will be due at the beginning of class. **Late homework will be accepted at the discretion of the instructor. Late homework will be penalized with a 10% reduction for every class period it is late.** Homework must be submitted as an **uploaded pdf file into Canvas.**

Exams:

There will be a midterm exam during midterm week and a cumulative final exam during final exam week. No make-up exams will be permitted unless official documentation for absences is provided. All documented absences due to religious observances and officially approved trips will be guaranteed as a make-up opportunity. Absences due to other unavoidable reasons (e.g., death in the family, illness) will be considered on a case-by-case basis, with appropriate documentation being required. Except in the case of an emergency, the student must always seek instructor consent prior to the absence. The instructor decides if an excuse is valid.

Exam Proctoring: Exams will be monitored by proctors via Zoom and as such, students are required to enable video feed. Students must print and complete the exam on your own paper. You can print your exam and then join the zoom meeting with a webcam or the camera on your phone. The completed exam must be uploaded as a pdf file into Canvas. If while taking the exam, you see that your internet connection has been interrupted, you are required to rejoin the class. If you cannot get back online, send an email message as soon as possible. If you are having trouble uploading your document, please send an email explaining the situation as soon as possible. Any tardiness with communication will be met with a deduction in your score.

Grading is based on the percentage of total points earned (the individual tests, homework etc. are not assigned a letter grade).

Distribution of points:	Homework	30%
	Midterm	35%
	Final Exam	35%
	Total	100%

Grading Scale (tentative): A: 90-100%; B: 80-89; C: 70-79; D: 60-69; F: < 60

Cheating & Plagiarism:

Students are expected to submit their original work on papers, homework, and examinations. Any use (in part or in full) of someone else's work must be acknowledged with proper citations. Please familiarize yourself with NMT's academic honesty policies, which can be found in the student handbook.

Academic Honesty:

New Mexico Tech's Academic Honesty Policy for undergraduate and graduate students is found in the student handbook, which can be found at:

<http://www.nmt.edu/student-handbook>

You are responsible for knowing, understanding, and following this policy.

Reasonable Accommodations:

New Mexico Tech is committed to protecting the rights of individuals with disabilities. Qualified individuals who require reasonable accommodations are invited to make their needs known to the Office of Counseling and Disability Services (OCDS) as soon as possible. To schedule an appointment, please call 575-835-6619.

Counseling Services:

New Mexico Tech offers mental health and substance abuse counseling through the Office of Counseling and Disability Services. These confidential services are provided free of charge by licensed professionals. To schedule an appointment, please call 575-835-6619.

Respect Statement:

New Mexico Tech supports freedom of expression within the parameters of a respectful learning environment. As stated in the New Mexico Tech Guide to Conduct and Citizenship: New Mexico Techs primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community.

Title IX Reporting:

Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered Responsible Employees and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Techs Title IX Coordinator (Dr. Peter Phaiah, 20D Brown Hall, 575-835-5187, titleixcoordinator@nmt.edu.) Please visit Tech's Title IX Website (<http://www.nmt.edu/titleix>) for additional information and resources.

Course Outline (tentative):

- I. Review Chapters 1-6
- II. Chapters 7, 9 -13
- III. Chapters 16-18
- IV. Chapters 18, 20-22

The instructor reserves the right to change any part of this syllabus as he sees fit.

MATH 588 HOMEWORK PROBLEMS FOR SPRING 2021

- HW# 1:** *Text book problems: 2.13, 2.19, 2.21, 3.24, 3.26*
- HW#2:** *Text book problems: 4.16, 4.17, 7.15, 7.17, 8.18*
- HW#3:** *Text book problems: 9.14, 9.15, 9.16, 10.13, 10.14*
- HW#4:** *Text book problems: 11.11, 11.12, 11.15, 11.20, 12.14*
- HW#5:** *Text book problems: 12.15,13.19, 16.10, 16.12, 17.9*
- HW#6:** *Text book problems: 17.10, 18.9, 18.12, 18.13, 19.12*
- HW#7:** *Text book problems: 20.10, 20.11, 20.12, 21.10, 21.13*
- HW#8:** *Text book problems: 21.15, 21.16, 22.15, 22.16, 22.22*