

**MA 189 - ZN – Data Dive Into Birmingham**  
UAB Department of Mathematics - Fall 2025

**Instructor:** Dr. Tricia Phillips (she/her)

**Email:** tphilli2@uab.edu

**Class Time:** Lecture MW 10:10-11am (UH 3010); Lab F 10:10-11am (HHB 221)

**Office Hours:** MW 11:10-12:15, R 9:30-10:30, or by appointment

**Office:** University Hall 4053

**Phone:** 205-934-2154

**Course TA:** Celine Li

**TA Office Hours:** Math Learning Lab (HHB 202), W 11-12

**Required Course Materials:** None – students will use the computers in HHB 221 for lab days.

**Course Description:** (3 semester hours). This course provides an introduction to statistical methods for data analysis and places an emphasis on real-life applications more so than traditional mathematics courses. Featured in this course are a variety of applications from companies and businesses, as well as governmental organizations, in the city of Birmingham and the surrounding area. Alumni, local industry researchers, and faculty in other departments/colleges at UAB will be invited to present an illustration of how statistics and mathematics are used in their particular jobs and fields. The presentation form will either be in person, online, or via a pre-recorded video. Students will be asked to replicate the analysis procedures of example cases on real datasets concerning the city of Birmingham and the region using R. The focus will be on learning new techniques and discussing the details from the practical local cases. This course will cover critical concepts, techniques, and tools in statistics and applied mathematics, as well as ethical discussions and privacy and security topics related to data. This course is a part of the Blazer Core City as Classroom curriculum with flags in Collaborative Assignments and Projects, as well as Service Learning/Community-Based Learning. *Prerequisite:* Minimum grade of C in MA 102 or MPL 46.

**Learning Outcomes:** Upon successful completion of this course, a student will be able to:

- articulate the usefulness of statistical data analysis in the city of Birmingham and in a variety of careers;
- define and explain key concepts related to introductory data and statistical analysis;
- be familiar with common data analysis tools such as JupyterLab, R, RStudio, and GitHub;
- identify and articulate some basic ethical and policy-based frameworks related to data;
- effectively apply strategies for ethically conducting research in the city, including strategies for ethical reciprocity and representation; and
- demonstrate processes of collaboration and responsibility that create mutually beneficial relationships with community members and partners who are part of students' research or service.

*Note: In addition to developing technical skills and gaining knowledge, these learning outcomes promote students' development of critical & analytical thinking, excellent communication skills, and ethical behavior surrounding data and research which are all important to learn before entering the workforce. All assignments in the course (homework and projects) are designed to help meet these learning outcomes.*

## Course Content:

- Introductory mathematical tools for analyzing local data;
- Procedures of data analysis including modeling, deployment, and communication of results;
- Be familiar with common data analysis tools such as JupyterLab, R, RStudio, and GitHub;
- Statistical thinking, methods, algorithms, and inferences, including: Descriptive Statistics; Probability; Distributions; Estimation; Hypothesis Testing; Linear Regression; Model Assessment; Classification, etc.;
- Common statistics and applied mathematics tools including JupyterLab, R, RStudio, and GitHub; and
- Ethics, biases, and consequences.

## Content Covered:

- **Chapter 1– Birmingham’s Data Landscape and Statistical Thinking:**
  - Introduction of course focus on Birmingham’s data landscape
  - Data types and data sources from local organizations and in general
  - Overview of statistical thinking and the scientific method
  - Introduction to statistical/data analysis software
- **Chapter 2 – Ethical Considerations in Data Analysis**
  - Discussion on ethical implications of utilizing data in Birmingham and in general
  - Discussion on privacy concerns and considerations when working with local data
- **Chapter 3 – Basic Mathematical Tools for Data:**
  - Section I: Descriptive Statistics*
    - Measures of central tendency and variability
    - Data visualization techniques (e.g., histograms, scatter plots, box plots)
    - Data cleaning and preprocessing
  - Section II: Probability*
    - Basic probability concepts
    - Discrete and continuous probability distributions
    - Using software to simulate random variables
- **Chapter 4 – Estimation:**
  - Point estimation and confidence intervals
  - Sample size determination
- **Chapter 5 – Hypothesis Testing:**
  - Hypothesis testing framework
  - Common parametric and non-parametric tests (e.g., t-test, chi-square test)
  - Multiple comparisons and p-value adjustments
- **Chapter 6 – Linear Regression:**
  - Simple and multiple linear regression
  - Assumptions and diagnostics

- Model interpretation and prediction
- **Chapter 7A – Communicating Results Effectively:**
- Use of data visualization
- Communicating results effectively
- Common Issues
- **Chapter 7B – Data Visualization:**
- Advanced data visualization techniques
- **Chapter 8 – Beyond Linear:**
- Expansion and transformations
- Logistic regression for binary outcomes
- Introduction to machine learning
- **Term Projects:**
- Provide students with opportunities to work on real-world problems faced by the local community

### Course Collaborators:

- Alabama Power Company - Molly Edwards (Environment)
- World Rugby Shop - Brad Kilpatrick (Sports E-commerce)
- Protective Life Insurance - Emma Keenum (Data Science)
- DragonFly Health - Pete VanZandt (Ecology)
- UAB Department of History - Jonathan Wiesen (History)
- *Upcoming: Cahaba Riverkeeper - David Butler & Nicole Tran (Environment)*
- *Upcoming: Naval Meteorology & Oceanography Command - Joseph Kuhner (Government)*

### Grades

**Grade Components:** All grades will be posted on Canvas.

Assignment	Percent
Attendance/Participation	5
Homeworks	35
Chapter Projects	30
Final Project Report	20
Final Project Presentation	10

**Final Grades:** The final grade for this course will be assigned using the following scale:

Total Points	90-100	80-89	70-79	60-69	0-60
Letter Grade	A	B	C	D	F

## Assignment Descriptions

Assessing students will be in the form of attendance and group discussions, homework, and projects. Students will utilize JupyterLab, R, RStudio, and GitHub to complete these assignments. More specifically:

### Attendance/Participation:

Attendance will be taken sporadically ten times throughout the semester to encourage students to be in class consistently and actively participate.

### Homeworks:

Most chapters will have one homework, which emphasizes the main concepts and prepares students with the relevant knowledge and skills for the chapter project, if applicable. Homework problems will involve solving theoretical problems in statistics and performing computer-based analysis of real-world data sets, including local ones, with guidance from the instructor.

### Chapter Projects:

Chapter projects will consist of data sets, some of which will concern the local area, in which students will have the opportunity to discuss with classmates during lab days and continue their data analysis work outside of the classroom.

### Final Project:

The final project requires students to work with a small group of classmates to extend a chapter project based on their specific interests or needs from local collaborators for our course in order to write a report and present to the entire class.

## Class Policies & Student Expectations

### Class Preparation & Collaboration:

Students are expected to attend every class meeting according to the class schedule. I expect you to show respect to the instructor and classmates by putting away distracting items such as cell phones and coursework not related to our class. I ask that you have a positive and productive disposition toward yourself, your classmates, and mathematics and are respectful of fellow classmates and the instructor as you share ideas. During group work, I expect everyone to contribute to the discussion (if you don't know how to answer the question, then *ask* a question). You may collaborate on assignments and I hope you will learn from one another and benefit from working together. However, it is imperative that you understand any work you submit and that it is your own work.

### Make-up Policy:

*Late Work:* There are no make-ups for assignments and no late submissions are accepted – all deadlines are in Central Time. It is recommended that students work far in advance of deadlines to ensure they finish assignments on time.

*Absences:* For absences from class, it is still the student's responsibility to turn in assignments due that day *prior* to class time in order to receive credit. In addition, students should obtain a copy of the work done in class from a classmate in order to stay caught up in the course. In the case of an excused absence (e.g. DSS accommodations, illness, unsafe commute due to weather safety recommendations, military duty, jury duty, official UAB activities), the student must inform the instructor *prior* to their absence and must send the instructor a copy of the missed classwork via email from the day of their absence in order to receive participation

credit that day, after discussing with a classmate what was missed that day. *Note:* Students with an unexcused absence are still expected to stay caught up with work but do not receive participation credit for their absence.

If a student has an unplanned or emergency circumstance that temporarily prevents them from participating in the class for an extended period of time (e.g. documented hospitalization, mandated isolation for COVID-19, jury duty), then the instructor should be contacted to discuss.

#### Inclement Weather:

Class will be canceled for weather only if UAB cancels classes as communicated through the university's official emergency notification system. Otherwise, class will be held as scheduled.

#### Instructor Support - Emails & Office Hours:

I will respond to your emails as promptly as possible (usually within 24 hours, except on weekends). If you email me after 5pm, expect a response the next day unless it is over the weekend in which case I will respond the beginning of the following week. Please check your email and Canvas course regularly for announcements and updated class documents. Students are expected to check their UAB email daily and respond within 24 hours to instructor emails (with the exception of weekends). All students are required to obtain and use the UAB email address that is automatically assigned to them as UAB students, as official correspondence will be sent **ONLY** to your @UAB.edu email address.

During office hours, you may drop by without making an appointment to receive assistance on any assignment.

#### AI Tools:

The use of AI tools is allowed in **SOME** cases in this course. You may use AI to better understand course material, ask for guidance on code syntax, and/or to debug your code. If you use AI, you **MUST** clearly document on the assignment how you used it for that assignment (for example, writing a statement about what you specifically used it for and that you checked its accuracy so that you are meeting standards of attribution and validation). All other uses of AI are prohibited, including: having AI write your code for you, uploading data from our course collaborators, or using AI and not disclosing doing so.

*Principles of AI:* AI that can produce content is now widely available to produce text, images, and other media. I will allow the use of such AI resources to inform yourself about the field, to understand the contributions that AI can make, and to help your learning. However, keep the following principles in mind:

- AI will not be allowed to pass this course. To pass this course, it is necessary to ensure you are competent in your knowledge base to surpass generative AI in the future – whether in academia, research, the workplace, or other domains of society – as well as be knowledgeable in your own work to be able to confidently and coherently present to an audience. If this cannot be achieved, you are limiting your future opportunities and success.
- AI contributions must be attributed and edited for accuracy. You must be fact-based about AI-generated materials: ideas must be attributed to AI and content submitted must be accurate. By keeping track of your AI use and sharing your experiences, we all

gain understanding, identify potential issues in this rapidly changing field, and discover better ways to use the resources for our objectives.

*Academic Misconduct:* Academic misconduct is present in an academic work wherever AI assistance has been used when unauthorized, or when authorized, has not been disclosed as required. Such behavior is considered deceit and a violation of UAB's shared commitment to truth and academic integrity. Deceit constitutes academic misconduct and is subject to review according to UAB's Academic Integrity Code.

*Subject to change:* The developments around generative AI are in flux and the rules that are expressed in this syllabus may need to change on short notice. This may affect the contents of assignments, as well as their evaluation.

**Intellectual Property:** My materials in this course are for your use only and may not be reproduced or distributed without my explicit written consent.

### **UAB Policies & Resources:**

#### **Math Learning Lab (MLL):**

Located in Heritage Hall 202, the MLL offers in-person tutoring (no appointment needed, open Monday through Friday from first to last day of classes except holidays, breaks, and Final Exam week). No food or drink is allowed except bottled water.

#### **University Academic Success Center (UASC):**

The UASC provides students with a host of free services and resources that include Tutoring and Supplemental Instruction. For more information, [click here](#).

#### **Academic Misconduct:**

UAB expects all members of its academic community to function according to the highest ethical and professional standards. This is outlined in the University's Academic Integrity Code found [here](#).

#### **Disability Support Services (DSS) Accessibility Statement:**

UAB is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services (call 205-934-4205, visit their website, or visit their office located in Hill Student Center Suite 409) for information on accommodations, registration, and procedures. Requests for reasonable accommodations involve an interactive process and consist of a collaborative effort among the student, DSS, faculty, and staff. If you are already registered with DSS, please contact them to discuss accommodations that may be necessary in this course.

#### **Title IX Statement:**

In accordance with Title IX, UAB does not discriminate on the basis of gender in any of its programs or services. The University is committed to providing an environment free from discrimination based on gender and expects individuals who live, work, teach, and study within this community to contribute positively to the environment and to refrain from behaviors that threaten the freedom or respect that every member of our community deserves. For more information about Title IX, policy, reporting, protections, resources, and supports, please visit

the UAB Title IX webpage.

#### Student Counseling Services:

Student Counseling Services supports students in achieving personal, academic, and lifelong goals by providing individual and group mental health services, prevention and outreach programming, crisis and emergency support, and consultation services. Student Counseling Services advocates for safe and inclusive learning environments in the university community. Counseling is free and confidential. You can make an appointment by calling the Student Health and Wellness Center at 205-934-5816. Their office is open Monday-Friday, 8am-5pm and is located at 1714 9th Avenue South.

#### Divisive Concepts:

All University faculty, instructors and teaching staff have the academic freedom to explore, discuss, and provide instruction on a wide range of topics in an academic setting. This class may present difficult, objectionable, or controversial topics for consideration, but will do so through an objective, scholarly lens designed to encourage critical thinking. Though students may be asked to share their personal views in the academic setting, no student will ever be required to assent or agree with any concept considered “divisive” under Alabama law, nor penalized for refusing to support or endorse such a concept. All students are strongly encouraged to think independently and analytically about all material presented in class and may express their views in a time, place, and manner, consistent with class organization and structure, and in accordance with the University’s commitment to free and open thought, inquiry, and expressions.

#### Shared Values Statement:

Collaboration, integrity, respect, and excellence are core values of our institution and affirm what it means to be a UAB community member. A key foundation of UAB is diversity. At UAB, everybody counts every day. UAB is committed to fostering a respectful, accessible and open campus environment. We value every member of our campus and the richly different perspectives, characteristics and life experiences that contribute to UAB’s unique environment. UAB values and cultivates access, engagement and opportunity in our research, learning, clinical, and work environments. Our university aims to create an open and welcoming environment and to support the success of all UAB community members.



## Tentative Schedule

Class #	Date	In-Class	Assignment Due
1	M: Aug 25	Chapter 1	
2	W: Aug 27	Chapter 2	
3	F: Aug 29	Lab 1 (Chapter 1 & 2)	
-	M: Sep 1	<i>Labor Day Holiday - No Classes</i>	
4	W: Sep 3	Chapter 3	Lab 1 Homework
5	F: Sep 5	Lab 2 (Chapter 3)	
6	M: Sep 8	Chapter 3	
7	W: Sep 10	Chapter 3	
8	F: Sep 12	Labs 2, 3 (Chapter 3)	
9	M: Sep 15	Chapter 3	
10	W: Sep 17	Chapter 3	
11	F: Sep 19	Lab 3 (Chapter 3)	
12	M: Sep 22	Chapter 4	Lab 2 and 3 Homework
13	W: Sep 24	Chapter 4	Chapter 3 Project
14	F: Sep 26	Lab 4 (Chapter 4)	
15	M: Sep 29	Chapter 5	Lab 4 Homework
16	W: Oct 1	Chapter 5	
17	F: Oct 3	Lab 5 (Chapter 5)	
18	M: Oct 6	Chapter 5	
19	W: Oct 8	Chapter 5	
20	F: Oct 10	Lab 5 (Chapter 5)	
21	M: Oct 13	Chapter 6	Lab 5 Homework
22	W: Oct 15	Chapter 6	Chapter 5 Project
23	F: Oct 17	Lab 6 (Chapter 6)	
24	M: Oct 20	Chapter 6	
25	W: Oct 22	Chapter 6	
26	F: Oct 24	Lab 6 (Chapter 6)	
27	M: Oct 27	Chapter 6	Lab 6 Homework
28	W: Oct 29	Chapter 7A	Chapter 6 Project
29	F: Oct 31	Chapter 7B Lab	
30	M: Nov 3	Guest Speaker Day	
31	W: Nov 5	Chapter 8	
32	F: Nov 7	Final Project Lab ( <i>initialize</i> )	
33	M: Nov 10	Chapter 8	
34	W: Nov 12	Chapter 8	
35	F: Nov 14	Chapter 8 Lab	
36	M: Nov 17	Chapter 8	
37	W: Nov 20	Final Project Discussion	
38	F: Nov 22	Final Project Lab ( <i>finalize</i> )	
-	Nov 24 - 28	<i>Thanksgiving Break - No Classes</i>	
39	M: Dec 1	Final Project Presentations	Final Project Report & Presentation
40	W: Dec 3	Final Project Presentations	
41	F: Dec 5	Final Project Presentations	

Note: The course syllabus and schedule serve as a contract by which the student must comply. The syllabus and schedule are subject to changes through announcements made in class and/or email.