DEPARTMENT OF THE AIR FORCE

THE DEPARTMENT OF MATHEMATICAL SCIENCES

USAF ACADEMY, COLORADO

05 January 2026

MEMORANDUM FOR STUDENTS ENROLLED IN MATH 300Z/356Z, SPRING 2026

SUBJECT: Math 300Z/356Z Course Letter

1. **Introduction.** Welcome to Math 300Z/356Z, *Data-Driven Statistics with AI*. This course is designed to provide you with statistical, mathematical and computational tools to answer questions from data by providing a solid foundation in probability and a strong introduction to statistical and descriptive modeling. This is the third iteration of this course, which will become the new core statistics and data science course for all cadets at USAFA starting in Fall 2026.

   Course Identity: You are now, just by being here, a statistician and a data-driven decision maker. This course will help us frame out exactly what it means to be a statistician and what it means to make data-driven decisions. We will also work to understand what statistics and probability are and the limitations of data and AI.

2. **Learning Goals.** The learning goals for this course are to use computational and mathematical statistical/probabilistic concepts, with assistance from generative AI, to:

   a. Articulate the fundamentals of probability models, including discussions about data provenance and the downstream issues that arise due to choices concerning data,

   b. Create data visualizations and numerical summaries to communicate about data for a variety of audiences,

   c. Compare and contrast what typical and unusual means using a variety of definitions for centrality and spread,

   d. Design and execute inferential tasks and precisely communicate the results for a variety of audiences, and

   e. Detail the basics of the machine learning pipeline, specifically how it relates to linear regression.

   Math 300 and Math 356 are contributors to the development and assessment of USAFA's Critical Thinking institutional outcome.

3. **Updated Course.** This course in data science and statistics is replacing the current four courses in the core fulfilling the statistical reasoning requirement. This course aims to provide a common experience for cadets while meeting The Department of the Air Force's articulated several priorities for Airmen and Guardians regarding data acumen. As such, this course will meet all graduation requirements for your major and is designed with your future as officers keenly in mind.

   You were randomly selected to join this course based on your eligibility for Math 300 or Math 356. This is not a "harder" version of Math 300 nor is it an "easier" version of Math 356. This course is designed so that success in learning the material and earning a high score is not predetermined based on one's major nor based on their prior experience with statistics and data science. However, this is still a relatively new course, and we will be actively seeking your feedback throughout the semester to ensure that we meet our goals for this course.

4. **Course Materials.** We will make extensive use of computational methods which depend heavily on software. We will be using free software called R through a web-based platform called Posit Cloud. Grades and some assignments will be available in Gradescope. Course materials and course communications will be in Microsoft Teams. We prefer Teams as the primary method of communication to instructors.

   In addition to assigned course readings and activities, we will utilize Generative AI tools such as NotebookLM and ChatGPT to help us understand concepts, generate and understand code, and interpret models and their output throughout the semester. To do so effectively, we must learn to write and iterate prompts and to validate responses from GenAI tools. These tools will be authorized resources for in-class work and projects, unless otherwise stated. We will not be using GenAI tools for GRs because you need to have a foundation in the course concepts, coding and communicating data analysis.

   a. **Course Text**. The readings for this course will come from four digitally available textbooks:

      i. **David Diez, Mine Cetinkaya-Rundel, and Christopher D. Barr.** OpenIntro Statistics, 4th Edition. Free PDF available at https://openintro.org/book/os/.

      ii. **Mine Cetinkaya-Rundel and Johanna Hardin**. *Introduction to Modern Statistics*, 2nd Edition. Free web-native version available at https://www.openintro-ims.netlify.app (may not work on MissionNet).

      iii. **Chester Ismay, Albert Y. Kim, and Arturo Valdivia**. *Modern Dive (v2).* Free e-book available at https://moderndive.com/v2/.

      iv. **Bradley Warner, Brianna Hitt, and Ken Horton**. *Computational Probability and Statistics*. Free e-book available at https://ds-usafa.github.io/Quarto-Book/.

      v. Additional readings provided by the instructor.

   b. **Optional Course materials.** Please consider investing in a standard 52-card deck and a set of gamer dice that includes at least 4 different types of die (e.g., 6-, 8-, 12-, and 20-sided), something like this set. We will provide class sets of these materials early in the semester.

   c. **Install/Setup.** Prior to the start of class, please complete the following:

      i. Join the "Math Z – Spr26" workspace on Posit Cloud using this link. Create a paid **Cloud Plus** account using your @afacademy.af.edu email address. The cost is $5/month to gain access to unlimited project hours/workspaces.

      ii. Log in to Gradescope and verify that you can see our course: "Math 300Z/356Z: Data-Driven Statistics with AI".

      iii. Create an account for accessing NotebookLM via https://notebooklm.google.com/ (you should only need a free Google account). Create a free account for ChatGPT via https://openai.com. **You MUST have an account for NotebookLM and any other GenAI tools you decide to use in this course, as you will be required to provide transcript links as part of your documentation of GenAI usage.**

      Other options include Google Gemini and Claude.ai. You also have free access to GPT-4 through Microsoft Copilot using your @afacademy.af.edu email address and to GenAI.mil using your CAC. Paid versions of some GenAI tools are available for around $20/month and provide improved access and additional tools. You will ***not need*** anything beyond a free account for NotebookLM and ChatGPT for this course.

5. **EI.** The instructors for this course are

    - Dr. Brianna Hitt (Office 6D-140)
    - Dr. Beth Schaubroeck (6D-112)
    - Col Scott Williams (6D-100)
    - Lt Col Harris Butler (6D-104)
    - Lt Col Rob Newton (6D-218)
    - Lt Col Will Adorno (6D-242)
    - Capt Alex Contarino (6D-106)

    You can schedule in-person or virtual EI with any instructor via Teams.

6. **Graded Events.** This course uses standards-based grading. Your final grade in this course will be based on how well you achieve 30 standards, which fall into one of three categories: 1) Core Competencies, 2) Application, and 3) Professional Development. The following are brief descriptions of the categories and associated graded events. More specific details will be provided at the time these assessments are administered.

    a. **Core Competencies.** There are 12 standards that every student leaving this course should have proficiency with. Students will have at least 2 opportunities to demonstrate their understanding of each standard during Graded Reviews (GRs). There are four GRs and a final exam. Each standard is assessed independently using a standards-based grading approach.

    For each GR, cadets will have the opportunity to demonstrate their understanding of any standards that have been covered in class so far. Once a cadet is satisfied with their proficiency level for a particular standard, they do not have to reattempt questions related to that standard again. Cadets will have the opportunity to attempt each standard at least twice. The fourth GR and final exam will have all 12 standards available.

    b. **Application.** There are three components in the application category: i) specialty concepts, ii) semester-long group project, and iii) homework assignments. The application category has 10 standards.

        i. *Specialty Concepts (2 Standards).* In the first half of the semester, you will be asked to select one statistical specialty: communication and visualization, mathematical foundations, computational methods, or statistical extensions. Each of these four specialties have two standards associated with them. You will complete a reading guide and assignment for each standard in your chosen specialty.

        ii. *Semester-Long Group Project (4 Standards).* Over the course of the semester, you will work in a small group to explore a data set. The project will involve individual tasks as well as group tasks, and it will leverage a range of skills from the different statistical specialties. One standard is associated with the draft data proposal. The final submission corresponds to two standards. The fourth standard will be assessed based on the quality of the feedback you offer your group members.

        iii. *Individual Homework Assignments (4 Standards)*. There will be 8 homework assignments throughout the semester, with two assigned during each block of the course. The four standards correspond to the homework for each of the four blocks. Homework questions will come from the daily practice problems provided in the course notetakers.

    c. **Professional Development.** There are three components in this category: i) professional skills, ii) course participation, and iii) reflection. The professional development category has 8 standards.

        i. *Professional Skills (4 Standards).* Throughout the semester, you will develop professional skills that relate to your future, both as a military officer and as a life-long learner. Those skills are technical reading and productive group learning. Technical reading will be

assessed through daily reading guides. Productive group learning will be assessed through daily group problem sets (GPsets), completed in groups of 2-4 cadets. There are two standards for technical reading and two standards for group work. One of each will be assessed at Prog and at the end of the semester. All daily work will be submitted via Gradescope. Completing 90% of reading guides or 90% of GPsets will result in a Q1 score for the respective standards.

ii. *Course Participation (3 Standards).* Just before Prog and at the end of the semester, you will have the opportunity to assess your own engagement in the course. Your self-assessments in combination with the instructor's assessment will be used to assess two of these standards. The third participation standard will be assessed based on feedback you give to other cadets in the course on two structured feedback activities (peer feedback on Lesson 27 and peer feedback at the end of the semester).

iii. *Reflection (1 Standard).* There are four reflection assignments throughout the semester. The associated standard is assessed based on the number you complete in good faith.

d. **Final Exam.** There is a final written exam that covers all course material. There are no final exemptions for this course. However, a student may choose to complete as many (or as few) of the final exam questions as they wish.

7. **Daily Course Rhythm.** Each lesson of this course will have a pre-class reading assignment with an interactive reading guide. We expect you to be conversant with the assigned readings prior to each class. The assigned readings and the associated reading guides are important learning assets, so use them to prepare for class. This course requires regular and active participation from every student.

   Bring your computer to every class. For class time to be beneficial, you must be prepared and participate in each lesson. In class, after a short (10-15 minute) mini-lecture, we will be working with the ideas from the readings in small groups to complete the GPsets. If time permits, we will transition to practice problems in the daily notetaker. After class, in addition to reviewing your own notes from the day, we recommend that you work on the practice problems in the notetakers and come to EI to ask questions. Remember that the homework questions are a selection of the practice problems in the notetakers, and it is strongly recommended that you complete the practice problems as close to their associated lesson as possible.

8. **Proficiency Levels.** This course uses a contract grading system designed to reward mastery and professional growth. Your grade will be determined based on performance in 30 total standards across the three key areas. Each standard is evaluated on a four-level proficiency scale, where higher levels reflect deeper integration, judgment and communication – not just correctness.

   - **Exceptionally Qualified (EQ)** – The student understands the material deeply enough to teach it to others. This represents a different level of mastery – the ability to explain, critique, and guide others.
   - **Q1** – The student understands the material deeply enough to apply and interpret the concepts independently and correctly, with only minor or infrequent communication errors.
   - **Q2** – The student understands the material well enough to apply and interpret the concepts independently most of the time, with occasional minor justification errors.
   - **Q3** – The student demonstrates partial understanding of the material; conceptual gaps, reasoning errors, or major misconceptions are present and must be addressed before the material can be applied reliably.
   - **Cannot Be Assessed** – The student has provided incoherent or incomplete evidence of understanding.

For grading contract purposes, the Exceptionally Qualified proficiency level is treated the same as Q1. Students who are Exceptionally Qualified on a minimum number of standards may receive a small positive GPA adjustment, provided they already meet a base requirement. Students are never required to earn Exceptionally Qualified on standards to meet any contract threshold.

Each area contributes to an adjusted GPA score, which determines your guaranteed minimum final grade in the course. The Core Competencies form the foundation of your score, while Application and Professional Development standards serve as refinements.

The following table shows the guaranteed minimum final grade corresponding to GPA points (without rounding):

GPA points	4.0	3.0	2.0	1.0
Guaranteed Minimum Grade	A	B	C	D

Core Competency (12 standards total) – Determines your base GPA score

GPA	Requirement
4.0	8 Q1, remainder Q2, no more than 1 Q3
3.0	6 Q1, remainder Q2, no more than 3 Q3
2.0	6 Q1 or Q2, no more than 6 Q3
1.0	4 Q1 or Q2, remainder Q3, no more than 2 Cannot be Assessed

GPA Adjustment	EQ Core Competencies	Application (10 standards total)	Professional Development (8 standards total)
+0.50	7 or more EQ		
+0.33	5 or more EQ	7 Q1, no more than 2 Q3	
+0.16	3 or more EQ	5 Q1, 8/10 Q3 or higher	7 Q1, remainder Q2
0.00		3 Q1, 6/10 Q3 or higher	5 Q1, remainder Q3 or higher
-0.16		5/10 Q3 or higher	3 Q1, 6/8 Q3 or higher
-0.33			4/8 Q3 or higher

For example, suppose a cadet earns the following:

- Core Competency standards: 7 Q1, 3 Q2 (and the rest Q3) → 3.0
- Application standards: 7/10 Q1 (and the rest Q2) → +0.33
- Professional Development standards: 4/8 Q1 (and the rest Q3) → –0.16
- The cadet's final GPA score is $3.0 + 0.33 - 0.16 = 3.17$, guaranteeing a B in the course.

You are encouraged to track your progress and use feedback to aim for the learning outcomes, not just the grade!

9. **<u>Use of Artificial Intelligence/Large Language Model Tools.</u>** We will be using Generative AI (GenAI) tools such as NotebookLM and ChatGPT to assist in our learning throughout this course. The responsible way to use these models is as an augmentation tool for coding, learning, and communication. We must learn to write and iterate prompts and to question and check responses.

   Unless otherwise stated, your authorized GenAI resources for all Math 300Z/356Z assignments completed outside of class are Level 4: Use of GenAI to co-create and/or revise work per the Dean's Guidance for Academically-related GenAI at USAFA. Remember, never copy verbatim the work of another (including GenAI) and submit it as your own, even if you document it as such. The authorized resources for all Math 300Z/356Z GRs will be Level 0: No use of GenAI because you need to have a foundation in the course concepts, coding and communicating data analysis.

a. Use of AI tools to learn content is encouraged at any time. (for example, "Explain the bootstrap to an undergraduate Biology major.")

b. Use of AI for editing your work is equivalent to asking your friend for editorial feedback on your work and should be documented as such. (for example, “Help me to make my confidence interval interpretation clearer and more concise.”)

c. Use of AI to solve a problem or complete an analysis is equivalent to asking your friend to do your homework for you, which is not permitted under the honor code. (for example, “Answer the following question: <INSERT HOMEWORK PROBLEM HERE>.”)

d. You will be asked to provide an explanation and reflection on how LLMs were used on various assignments in this course. Be certain to document this tool just as you would any other additional resource, and NEVER attempt to pass off someone or something else’s work as your own. **When utilizing GenAI tools, your documentation statement MUST include the following five parts:**

   i. The name of the GenAI tool (and version, when possible)

   ii. What you provided the GenAI tool (a summary of your prompts),

   iii. What the GenAI tool provided you (a summary of the output)

   iv. How you altered the GenAI tool’s output (e.g., how you iterated on prompts or how you edited the response before using it) to be in line with Level 4: Use of GenAI to co-create and/or revise work

   v. A full transcript (link or pdf file) of your interaction with GenAI tools

   Example: I used ChatGPT to help write code for a scatterplot with a regression line. I asked: “How can I plot a scatterplot of height vs weight in R using ggplot2 and add a regression line?” ChatGPT gave me a full ggplot() code snippet. I edited the code to use my dataset name (cadet_data) and customized axis labels and colors. https://chatgpt.com/share/6942d3ea-f350-8013-b0a5-55aac51ba119

e. If your instructor suspects you utilized GenAI tools without co-creating or with insufficient documentation, they will meet with you to discuss, and you will be asked to redo any graded work as deemed appropriate by your instructor and/or the course director. Recurrent issues related to GenAI usage or documentation may result in initiation of the honor process and/or an academic penalty.

10. **Violations of Academics Standards:** In accordance with the Dean’s Policy on Academic Integrity and Documentation and USAFA Instruction 36-3534, *Violations of Academic Standards*, violations of academic standards will result in an academic penalty. Academic penalties are independent of the Cadet Honor System. The default penalty will be no credit for the graded event. Penalties that deviate from this default may be considered on an individual basis.

11. **Absent/Late Events.** To receive credit for graded events, you must turn them in by the provided deadline. **No credit will be provided for late submissions without prior coordination.** Absences or late arrivals for GRs must be coordinated with your instructor prior to the in-class graded event. Unexcused absences from GRs will result in a mandatory 25% penalty per FOI 36-173.

12. **Dignity and Respect.** You are a valuable member of our Academy and deserve to be treated with dignity and respect. Likewise, you are expected to treat your classmates and instructors with dignity and respect. Our goal is to create an environment where everyone is valued and has an equal opportunity to be heard and contribute. Be thoughtful, considerate, aware, forgiving, kind, and

willing to admit mistakes. Your instructors will do the same. If you have any concerns talk with your instructor, or go directly to the Department Head, Col Scott Williams, or his Deputy, Lt Col Chris McGrath. There are also Ombuds in DF outside of the Mathematical Sciences Department that will address your concerns. Whatever avenue you choose, please know that Col Williams is committed to dignity and respect for all cadets and faculty.

13. **Acknowledgements.** Material for this course will come from a variety of sources, including courses here at USAFA and at other colleges. We will acknowledge our sources when possible (noting that at times acknowledgements may have to come after an assignment is completed) and be transparent about our motivations for using materials generated by other teacher-scholars. For example, many of the course materials were designed by Dr. Katherine Kinnaird of Smith College.

14. **Final Comments.** We are confident in your ability to succeed in this course, but we expect you to have a positive attitude, put in the work and take responsibility for your own learning. Stay engaged, make suggestions for improvement, ask questions, and maintain professionalism. It is up to you what you get from the course. If you have any questions or concerns, please don't hesitate to ask for help. We're looking forward to learning and working with you this semester!

//signed/BDH/05 January 2026//
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Math Z Course Schedule

Lesson	Topic	Graded Events	Project
Block 1: Probability Models			
1	Introduction to Math Z and Generative AI		
2	Introduction to Probability		
3	Conditional Probability and Bayes' Rule	Strengths Activity #1	
		Pre-course AI questionnaire	
4	Discrete Random Variables	HW 1	Group Project Form
5	Continuous Random Variables		
6	Named Distributions		Individual Task #1
7	Normal Distribution	HW 2	
Block 2: Data Wrangling & Visualization			
8	Data Basics		
9	NO REGULAR CLASS - M9/T9 Comp Day	Common GR1 (M9): Core Medals 1-2	
10	Data Collection and Studies		
11	Tidy Data		Group Task #1
12	Data Wrangling	HW 3	
13	Numerical Summaries		
14	Data Visualization in 2D		
15	Data Visualization in 1D / Centrality and Spread		Individual Task #2
16	Centrality and Spread	HW 4	
17	Data Provenance/History of Statistics		
18	NO REGULAR CLASS - M18/T18 Comp Day	Common GR2 (T18): Core Medals 1-5	
Block 3: Hypothesis Testing			
19	Sampling Framework	Course Participation Form	
20	Bootstrap and Resampling		
21	Confidence Intervals		Group Task #2
22	Interpreting Confidence Intervals	HW 5	
23	Null and Alternative Hypotheses, p-values		
24	Hypothesis Testing (difference of proportions)		
25	Hypothesis Testing (single mean and proportion)		
26	Type I & II errors, Significance	HW 6	
27	Project - Mentor and Peer Feedback Day		
28	NO REGULAR CLASS - M28/T28 Comp Day	Common GR3 (M28): Core Medals 1-9	
Block 4: Linear Regression			
29	Linear Regression and Correlation		Individual Task #3
30	R-squared, Outliers, and Residuals		
31	Diagnostics and the Train-Test Paradigm		
32	Multiple Regression (parallel slopes)	HW 7	
33	Multiple Regression (interaction), Simpson's Paradox		
34	Interpretation of Regression Tables		Group Task #3
35	Multiple testing, p-hacking		
36	Central Limit Theorem	HW 8	
37	t-tests		
38	NO REGULAR CLASS - M38/T38 Comp Day	Common GR4 (T38): Core Medals 1-12	
39	ANOVA	Course Participation Form	Group Task #4 - Final Submission
		Strengths Activity #2	Group Project Feedback
40	Chi-squared tests	Feedback to Fellow Statisticians	
		Post-course AI Questionnaire	

SPRING 2026 SEMESTER CALENDAR (Approved: 21 Mar 2025)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JANUARY						
				1 HOLIDAY NEW YEAR'S DAY	2 CADET WING RETURNS 1900	3 TRANSITION
4	5 TRANSITION	M1 6	T1 7	M2 8	T2 9	10
11	M3 12	T3 13	M4 14	T4 15 HW #1	M5 16	17
18	HOLIDAY 19 MARTIN LUTHER KING NO CLASSES	T5 20	M6 21	T6 22 Project IT#1	M7 23	24
25	T7 26 HW #2	M8 27	T8 28	M9 29 Block 1 GR	T9 30	31
FEBRUARY						
1	M10 2	T10 3	M11 4	T11 5 Project GT#1	M12 6	7
8	T12 9 HW #3	M13 10	T13 11	M14 12	T14 13	14
15	HOLIDAY 16 PRESIDENTS' DAY NO CLASSES	M15 17	T15 18 Project IT#2	M16 19 NCLS	T16 20 NCLS	21 NCLS
22	M17 23 HW #4	T17 24	M18 25	T18 26 Block 2 GR	M19 27	28
MARCH						
1	T19 2	M20 3	T20 4	M21 5	T21 6 Project GT#2	7
8	M22 9	T22 10 HW #5	M23 11	T23 12	M24 13	14
15	T24 16	M25 17	T25 18	M26 19	T26 20 SPRING BREAK BEGINS LMD ---------- HW #6	21
22 ----------	23 ----------	24 S P R I N G --------	25 ----------	26 ---------- B R E A K	27 ----------	28 ----------
29 CADET WING RETURNS 1900	M27 30 Project Feedback Day	T27 31				
APRIL						
			M28 1 Block 3 GR	T28 2	M29 3	4
5	T29 6 Project IT#3	M30 7	T30 8	M31 9 DSAT	T31 10 DSAT	11
12	M32 13 DSAT	T32 14 DSAT HW #7	M33 15 CRUCIBLE BEGINS AFTER CLASSES	16 CRUCIBLE NO CLASSES	17 CRUCIBLE NO CLASSES	18 CRUCIBLE
19	T33 20	M34 21	T34 22 Project GT#3	M35 23	T35 24	25
26	M36 27	T36 28 HW #8	M37 29	T37 30		
MAY						
					M38 1	2
3	T38 4 Block 4 GR	M39 5	T39 6 Project GT#4	M40 7	T40 8	9 DEAN'S WEEKEND
10 DEAN'S WEEKEND	11 FINALS 1 & 2 & 3	12 FINALS 4 & 5 & 6	13 FINALS 7 & 8 & 9	14 FINALS 10 & 11 & 12	15 FINALS 13 & 14	16 SUMMER PREP WEEK BEGINS
17 ----------	18 S U M M E R ----------	19 ----------	20 ---------- P R E P ----------	21 ----------	22 ---------- W E E K	23 ----------
24	25 HOLIDAY MEMORIAL DAY	26 GRAD WEEK----------	27 GRAD WEEK----------	28 GRADUATION	29 TRANSITION	30 1ST SUMMER PERIOD BEGINS
31						