Math 1007-11: Mathematics and Politics

Fall 2026

Lectures:	MW 12:45 – 2:00 PM	1957 E St B12	
Textbook:	The Mathematics of Politics, Second Edition by E. Arthur Robinson and Daniel H. Ullman		
ISBN:	9781498798907		
Course Webpage:	`https://jaydaigle.net/politics/`	**Discord:**	`https://discord.gg/23E9v5QuY`
Instructor:	Jay Daigle	**Office:**	Phillips 720E
Email:	`jaydaigle@gwu.edu`	**Office hours:**	TR 12:00–2:00 PM

Course content

You probably associate math with numbers—addition, multiplication, equations, solving for x. And all that stuff is math; but math isn't just that stuff. At its most general, math is about identifying the assumptions we are making and describing them completely and explicitly. It's about testing those assumptions, and studying what would change if they were different. And it's about choosing new and better assumptions to let us use all the information we care about, as simply as we can.

In this course we'll learn about some specific concrete mathematical ideas that explain how political systems work. How does the way we tabulate votes affect who wins elections? Is there a fair way to allocate political power? What sort of negotiation strategies are more likely to be successful? And yes, there will be some numbers here.

But we'll also take a step back and see how thinking like a mathematician can help you understand how, and why, people do politics. We'll learn to identify the hidden assumptions that underlie political arguments and beliefs. We'll practice articulating the assumptions we're making, and understanding what we really care about. And we'll see how flexibility with those assumptions can help us better understand the world and our fellow citizens.

Prerequisites

There are no prerequisites for this course but you will have to do some high school-level algebra.

Textbook

The official textbook for Math 1007 is *The Mathematics of Politics, Second Edition* by E. Arthur Robinson and Daniel H. Ullman. It should be available free online through the library website, and you can buy a hard copy for under $50 if you wish. I will be assigning problems out of this book, so you should make sure you have regular access to it.

Office Hours

I will hold regular, weekly office hours. These are times I are waiting and available to help you with the course material. Any time during office hours you are free to come by and ask whatever questions you want, or discuss whatever would be helpful to you.

This is one of the most valuable resources you have; we are able to assist you with thinking through material and shoring up your weaknesses in a direct, personalized way you can't easily get elsewhere.

Office hours also have less obvious benefits beyond help with the course. For instance, in office hours, we can make you aware of campus resources you might not have known about. Office hours are also helpful for building relationships with faculty. Many students need letters of recommendation for jobs, internships, etc., and we cannot write useful or effective letters for students we do not know. Attending office hours helps make sure your professors know you and are able to provide you with recommendations or other forms of assistance or advice you may need in the future.

Communication

You may email me at any time with course questions. I will try to get back to you promptly, but at some points during the term this will be more prompt than others.

I have set up a Discord server at `https://discord.gg/23E9v5QuY` to facilitate low-key discussions of class material. This is totally optional, but you can go there to talk about the class with each other or with me; I'll be keeping an eye on it most of the time and it's usually the easiest and fastest way to get in touch with me.

AI Chatbots

AI systems like ChatGPT are capable of answering many of the problems that will be assigned in this course. These tools might be helpful if used carefully, but more typically they get in the way and make it actually harder for you to learn, often without you even noticing until you find yourself completely lost on a test.

Homework is assigned to help you practice skills and prepare for exams and future courses. If you get the answer to a problem from an AI system (or a friend, or solution manual) you will not be engaging with the problem in a way that gives you effective practice and helps you prepare for exams. It may feel like you are learning when you read an answer from AI, but it generally does not help you very much. You will get much more out of struggling with the problem and working it out on your own.

Sometimes you do need help, but even then, being merely told the answer generally is not very helpful. That is why in office hours our answers are often in the form of a sequence of questions or prompts that aim to help you see the answer for yourself, and to foster in you the habit of asking smaller questions that will ultimately allow you to resolve your own problems (as you need to do on exams!). If you use AI, you want to mimic that; try to ask it to give you the smallest possible hint, or show it your work and ask it where you might be making a mistake. If it just tells you how to do the problem, you will not learn much, but a small hint, or a diagnosis of an error, can help.

Technology in the Classroom

I strongly encourage you to avoid all use of laptops and cell phones during class time. This includes using technology to engage with class, like taking notes and looking up course content. Frequently these uses of technology can feel like they are helping you learn, but they actually make you less focused and engaged with the actual material.

I will not be enforcing a ban on tech use but I suspect most of you will learn more and perform better in the course if you come in with a notebook, a pencil, and a determination to be mentally present for the duration of class.

Lecture schedule

The list below gives a tentative outline of what is planned and when. The course is divided into three main topics. The placement of specific ideas within these topics may shift around as the course progresses.

	Voting			
1	August 24	Mathematical Reasoning	August 26	Voting Systems
2	August 31	Two-Candidate Elections	September 2	Criteria for Voting Systems, **Quiz**
3	~~September 7~~	*No Class for Labor Day*	September 9	Multi-Candidate Criteria
4	September 14	Theorems on Voting System Criteria	September 16	Evaluating Voting Systems I
5	September 21	Evaluating Voting Systems II, **Quiz**	September 23	Arrow's Impossibility Theorem
6	September 28	**Midterm 1**		
	Apportionment			
			September 30	The Problem of Apportionment
7	October 5	Hamilton's Method	October 7	Jefferson's Method
8	~~October 12~~	*No Class for Fall Break*	October 14	Divisor Methods, **Quiz**
9	October 19	More on Divisor Methods	October 21	Evaluating Apportionment Methods
10	October 26	Criteria and Impossibility, **Quiz**	October 28	The Best Apportionment Methods
11	November 2	**Midterm 2**		
	Conflict and Game Theory			
			November 4	Zero-Sum Games
12	November 9	Strategies and Saddle Points	November 11	Probability and Randomness
13	November 16	Mixed Strategies, **Quiz**	November 18	Nash Equilibria
	~~November 23~~	*No Class; Thanskgiving Break*	~~November 25~~	*No Class; Thanskgiving Break*
14	November 30	Solving 2×2 games	December 2	Conflict and Cooperation
15	December 7	Important Games, **Quiz**	December 9	Class Choice: Gerrymandering or the Electoral College

Expected amount of work

There are 2.5 hours of class time each week. In addition, we expect a typical students to spend a minimum of 6 hours each week on independent work (primarily, homework assignments). Of course, you should spend as much time as you need to succeed in 1007, and this may be more than 6 hours per week.

Assessments

Assessments in this course will include weekly written homework, six quizzes, two tests, and a final exam. No extra credit will be available under any circumstances. Your final grade will be computed via the following weighting:

- Homework: 20% (drop two lowest)
- Quizzes: 25% (drop lowest, 5% each)
- Tests: 30% (15% each)
- Final Exam: 25%

Written Homework

Weekly writtne homework will give you practice at thinking about the political structures we're studying so that you can follow our reasoning about them, and also at making solid mathematical arguments.

Homework will generally be due Tuesday night, with a grace period until the beginning of Wednesday's class. **We will not accept homework submitted after class has begun** without prior arrangement or a serious medical excuse. Please make sure your homework is fully and completely submitted through Blackboard on time.

Doing the homework in a timely manner is very important, because the course continually builds on previous skills and knowledge, and if you have not practiced earlier skills you will struggle to understand later ones. While homework is due on Tuesdays, you should make a serious attempt to finish it before Monday's class.

If you have a need for an extension please clear it with me **before the assignment is due**. But doing the work when assigned is important to learning the material and staying on pace with the course, so you will probably not benefit from taking unnecessary extensions.

Your two worst homework scores will be dropped from your final average.

Quizzes

There will be six quizzes in class. These will be short (15-20 minute) quizzes to make sure you're caught up with the basic ideas of each unit. The lowest of your six scores will be dropped.

Quizzes missed due to an excused absence can be made up in my regularly scheduled office hours within one week of the quiz date.

Tests and Final

There will be tests on September 28 and November 2, and a comprehensive final as scheduled by the registrar (tentatively Monday, December 14 from 12:40–2:40 PM).

Midterms missed due to an excused absence can be made up in my regularly scheduled office hours within one week of the quiz date. If you miss a midterm for an acceptable medical or family reason, and are unable to make it up during regular office hours, your final exam will replace the missed midterm and be worth 40% of your course grade.

Note Use During Tests

For all in-class assignments, I will allow you to bring a cheat sheet you have made. You must physically write on the sheet of paper you bring in; no printouts will be allowed. For quizzes and midterms I will allow a one-sided cheat sheet, and for the final I will allow a two-sided cheat sheet.

Grading Policies

This course is primarily focused on providing clear justifications for our conclusions. Consequently, you will primarily be evaluated on your arguments and justifications; little credit will be given for correct answers without justification.

No Technology During Quizzes and Tests

Cell phones, laptops, smart glasses, headphones, ear buds/air pods, and other devices that may store, send, or receive information or connect to the internet are strictly banned during quizzes and tests. All such devices in your possession must be in your book bag, which must be zipped shut. If I see your cell phone or any other device under any circumstances, you will get a zero on the assignment and I will file academic integrity charges for having banned devices out during a quiz or exam. If due to a medical reason you need regular access to your phone, please discuss this with me and DSS as soon as possible.

University Policies

Academic Integrity Code

Academic integrity is an essential part of the educational process, and all members of the GW community take these matters very seriously. As the instructor of record for this course, my role is to provide clear expectations and uphold them in all assessments. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, and otherwise violate the Code of Academic Integrity. If you have any questions about whether particular academic practices or resources are permitted, you should ask me for clarification. If you are reported for an academic integrity violation, you should contact Conflict Education and Student Accountability (CESA) to learn more about your rights and options in the process. Consequences can range from failure of assignment to expulsion from the University and may include a transcript notation. For more information, refer to the CESA website at students.gwu.edu/code-academic-integrity or contact CESA by email cesa@gwu.edu or phone 202-994-6757.

University policy on observance of religious holidays

Students must notify faculty during the first week of the semester in which they are enrolled in the course, or as early as possible, but no later than three weeks prior to the absence, of their intention to be absent from class on their day(s) of religious observance. If the holiday falls within the first three weeks of class, the student must inform faculty in the first week of the semester. For details and policy, see `provost.gwu.edu/policies-procedures-and-guidelines`.

Use of Electronic Course Materials and Class Recordings

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for non-course related purposes unless express permission has been granted by the instructor. Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct. Contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions. Contact Disability Support Services at disabilitysupport.gwu.edu if you have questions or need assistance in accessing electronic course materials.

Academic Support

Academic Commons

Academic Commons is the central location for academic support resources for GW students. To schedule a peer tutoring session for a variety of courses visit go.gwu.edu/tutoring. Visit academiccommons.gwu.edu for study skills tips, finding help with research, and connecting with other campus resources. For questions email academiccommons@gwu.edu.

GW Writing Center

GW Writing Center cultivates confident writers in the University community by facilitating collaborative, critical, and inclusive conversations at all stages of the writing process. Working alongside peer mentors, writers develop strategies to write independently in academic and public settings. Appointments can be booked online at gwu.mywconline.

Support for students in and outside the classroom

Disability Support Services (DSS) 202-994-8250

Any student who may need an accommodation based on the potential impact of a disability should contact Disability Support Services at disabilitysupport.gwu.edu to establish eligibility and to coordinate reasonable accommodations.

Student Health Center 202-994-5300, 24/7

The Student Health Center (SHC) offers medical, counseling/psychological, and psychiatric services to GW students. More information about the SHC is available at healthcenter.gwu.edu. Students experiencing a medical or mental health emergency on campus should contact GW Emergency Services at 202-994-6111, or off campus at 911.

GW Campus Emergency Information

GW Emergency Services: 202-994-6111

For situation-specific instructions, refer to GW's Emergency Procedures guide.

GW Alert

GW Alert is an emergency notification system that sends alerts to the GW community. GW requests students, faculty, and staff maintain current contact information by logging on to alert.gwu.edu. Alerts are sent via email, text, social media, and other means, including the Guardian app. The Guardian app is a safety app that allows you to communicate quickly with GW Emergency Services, 911, and other resources. Learn more at safety.gwu.edu.

Protective Actions

GW prescribes four protective actions that can be issued by university officials depending on the type of emergency. All GW community members are expected to follow directions according to the specified protective action. The protective actions are Shelter, Evacuate, Secure, and Lockdown (details below). Learn more at safety.gwu.edu/gw-standard-emergency-statuses.

Shelter

- Protection from a specific hazard
- The hazard could be a tornado, earthquake, hazardous material spill, or other environmental emergency.
- Specific safety guidance will be shared on a case-by-case basis.

  Action:

  - Follow safety guidance for the hazard.

Evacuate

- Need to move people from one location to another.
- Students and staff should be prepared to follow specific instructions given by first responders and University officials.

  Action:

- Evacuate to a designated location.
- Leave belongings behind.
- Follow additional instructions from first responders.

Secure

- Threat or hazard outside of buildings or around campus.
- Increased security, secured building perimeter, increased situational awareness, and restricted access to entry doors.

  Action:

  - Go inside and stay inside.
  - Activities inside may continue.

Lockdown

- Threat or hazard with the potential to impact individuals inside buildings.
- Room-based protocol that requires locking interior doors, turning off lights, and staying out of sight of corridor window.

  Action:

  - Locks, lights, out of sight
  - Consider Run, Hide, Fight
- Classroom emergency lockdown buttons All classrooms have been equipped with classroom emergency lockdown buttons. If the button is pushed, GWorld Card access to the room will be disabled, and GW Dispatch will be alerted. The door must be manually closed if it is not closed when the button is pushed. Anyone in the classroom will be able to exit, but no one will be able to get in.