Mathematics and your Political World: Voting, Power, and How You Count

(Introduction to Modern Mathematics and its Applications)

PBIS 188	Quest I: Civic Engagement	Explore Nature (XM)	
Fall 2017	Instructor: Dr. Stephen Szydlik	MWF 10:20-11:20	Swart 13

It's easy to feel insignificant in our big world. How can a single, ordinary person make a difference? In this class, we'll work on answering that question, but from a perspective that you probably haven't considered before: the mathematical one. We'll talk about what it means to make a difference mathematically, and how that lends itself naturally to questions of power and fairness, especially in political systems. Along the way, we will experience the discipline of mathematics as mathematicians do, by exploring data, discovering patterns, making conjectures and constructing careful arguments.

Contact Information

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Office Hours: *See https://www.uwosh.edu/faculty_staff/szydliks/schedule.shtml.*

Peer Mentor:	**Email**:
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Course Materials

Text: *Excursions in Modern Mathematics*, by Peter Tannenbaum (and Robert Arnold). **Any** of the 3rd through 8th editions is fine. Note that the text can be purchased from online booksellers for greatly reduced prices! See the links on D2L for more information.

Course Packet: The PBIS 188 Supplementary Materials Packet can be purchased inexpensively from the bookstore or downloaded and printed. Bring this packet to class every day.

Calculator: A scientific calculator is required. It does not need to be fancy!

D2L: I will use the Desire2Learn content management system to provide information on class materials and activities: news updates, assignments, brief descriptions of class activities, handouts, and study guides. You can find links to course policies and other administrative information (especially the syllabus) on D2L as well.

USP Quest Course Overview

Liberal Education is an approach to learning that empowers individuals and prepares them to deal with complexity, diversity, and change. It provides students with broad knowledge of the wider world (e.g. science, culture, and society) as well as in-depth study in a specific area of interest. A liberal education helps students develop a sense of social responsibility, as well as strong and transferable intellectual and practical skills such as communication, analytical and problem-solving skills, and a demonstrated ability to apply knowledge and skills in real-world settings.

The University Studies Program (USP) is your gateway to a 21st century college education at the University of Wisconsin Oshkosh. This section of PBIS 188 is a Quest I course, which emphasizes a first-year experience. This is the first in a series of courses you will take to introduce you to the campus and all it has to offer, the vibrant Oshkosh community, and the challenges and opportunities of academic life as you pursue a liberal education. In Quest I and your other Quest courses, you'll be exposed to three "Signature Questions" that are central to a UW Oshkosh education:

- How do people understand and engage in community life?
- How do people understand and create a more sustainable world?
- How do people understand and bridge cultural differences?

The Quest classes are designed to provide a solid foundation for the rest of your education here, no matter which major you choose. Your USP courses will also provide the opportunity for you to Explore and Connect as you begin your college education. For further information about the unique general education program at UW Oshkosh, visit the University Studies Program website at *https://usp.uwosh.edu/*.

Our Signature Question: *How do people understand and engage in community life?*

Civic knowledge consists of an awareness and understanding of the various political and social processes that impact the nature and quality of life in local, state, national, or global communities. It also encompasses the cultivation of skills which may be useful in public life, like effective communication and ethical reasoning. Civic engagement means having an appreciation for and applying the values gained from civic knowledge in real world settings, directed at improving the quality of life in the communities of which one is a part. Civic knowledge and civic engagement emphasize learning, reflection, and action in order to create better communities.

PBIS 188 is an "Explore Math" course within the Nature category of USP. It is designed to bring the excitement of contemporary mathematical ideas to the nonspecialist and to help develop the ability to problem solve and to reason mathematically. It is a general education course intended for students whose major program does not require algebra or calculus.

PBIS 188 is also a Problem-Based Inquiry Seminar. This means that it will be an active, problem-solving class. Some class time will be spent on lecture over necessary background material, but a substantial amount of class time will be spent on actual problem-solving, both individually and in groups, and in presenting solutions to problems.

PBIS 188 will broaden your understanding of the world and equip you with transferable skills, like problem-solving. We will investigate a range of mathematical topics, including voting systems, apportionment, and especially the idea of fairness. Many of these topics may be completely new to you. In fact, some of it has only been discovered within the last 20 years! evertheless, the course material will be accessible to anyone with an active curiosity, a willingness to work hard, and a decent background in basic algebra. Interesting and deep mathematics often occurs in places where you might least expect it!

Course Topics

It might seem that mathematics is a subject that's focused on algebra, formulas, and equations. While those are definitely pieces of the discipline (and useful ones at that), mathematics is so much more! We'll spend the first part of the course looking at mathematics as mathematicians do, by solving problems: we'll collect data, look for patterns, make conjectures, and construct careful arguments. This process may seem a bit abstract, but will provide us with experience in mathematical thinking, and it will introduce us to several concepts that will recur throughout the semester.

Then we will apply some of our experiences to a serious examination of our political systems. We'll see how mathematicians talk about voting, and we'll explore different voting systems, with a careful analysis of their strengths and weaknesses. We'll consider the concept of political power, and what it means to have power in a voting system. We will explore ideas related to congressional apportionment and redistricting, focusing on what a ``fair'' division of seats means. If time allows, we'll finish the course by considering networking problems and efficiency. Throughout the course, though, we'll face the challenge of how to engage meaningfully with an increasingly complex and quantitative world.

What will you get from this course?

PBIS 188 is a mathematics course, and you can expect that you will be exposed to many new mathematical ideas this semester. When you finish the course, I expect you to understand this mathematical content. However, from a broader perspective, I also expect you to gain a better understanding of what mathematics is *about* and how we actually go about *doing mathematics*. USP Explore courses such as this one are intended to provide you with a broad understanding of the human experience, especially to examine nature and the culture of mathematics in different ways.

With this in mind, course objectives for PBIS 188 include:

- Understanding how mathematics can be used to help understand the world, especially within the realm of political science.
- Cultivating your expertise in critical thinking, abstract reasoning, problem solving and creativity.
- Deepening your understanding of what it means to “think mathematically,” and becoming more effective at it.
- Gaining a better understanding of what makes a sound mathematical argument, and strengthening your ability to make such an argument.
- Developing skills associated with the scientific method, including rational inquiry, data collection, analysis, theory formulation, and hypothesis testing.
- Continuing to develop effective written and oral communication skills.

As a Quest I course, PBIS 188 also has course objectives related to our signature question on Civic Learning. There are many ways to approach this signature question; we will focus on the social construct of knowledge. With that in mind, course objectives related to Civic Learning include the following:

- Recognition that knowledge is dynamic, changing, and consistently re- evaluated.
- Understanding that knowledge is socially constructed and implicated with power.
- Familiarity with key historical struggles, campaigns, and social movements to achieve the full promise of democracy.

Note that most of our course objectives involve developing intellectual resources that form the heart of a liberal arts education. None of these objectives will be easily met, and in fact, some require a lifetime to master. Nevertheless, I expect you to make great strides this semester towards achieving them!

Assignments and Grading

Exams: There will be 4 exams in the course, two during class time, and two larger evening exams, on the following dates:

- Monday, October 2 and Thursday, November 16, in class (each worth 11% of your total course grade)
- Monday, October 23 and Thursday, December 14, evening exams, (each worth 11% of your total course grade).

Arrangements for conflicts due to **University sponsored activities** must be made at least one week in advance.

Attendance: Attendance in this course is required, and will compose 5\% of your grade. You will be allowed 2 absences without penalty. For each subsequent absence, you will lose one-half of a percentage point from your attendance grade. Note: arriving late to class or leaving early counts as one-half of a miss. You are expected to be active participants in class every day.

Quizzes: There will be weekly quizzes on the course material. Missed quizzes cannot be made up, though the lowest quiz/homework grade will be dropped at the end of the semester.

Homework: Extensive homework will be assigned, and I will collect some, but not all, of it. I will post solutions to selected problems by my office door (220 Swart).

Other Coursework: Over the course of the semester, we'll have other interesting activities and assignments. On many days, we'll work in groups solving problems, and I'll sometimes have you hand in the results.

Quest I Requirements: Since PBIS 188 is a Quest I course, there are a few additional activities that you will take part in as part of your First Year Experience. Students in all of the Quest I courses this semester complete these activities, which will be factored into your final course grade:

- By September 29 you will meet individually, face-to-face with me, your professor, by dropping in during my office hours or by appointment. We can talk about anything you'd like during the meeting (your thoughts on the course, your background, your college experience, or the Green Bay Packers). It doesn't need to be a long meeting, but it will be an opportunity for us to get to know each other a little bit.
- At some point throughout the semester, you will attend your choice of two different on-campus activities that deal in some way with the big ideas that arise in our class. I will provide you with list of potential activities early in the semester and your Peer Mentor will help with this. You can always e-mail me if you hear about an on campus activity that sounds interesting to you. You will write a 1-2 page summary and reflection on what it was like to attend your chosen event.
- You will complete a Student Engagement Survey on topics such as academics, campus culture, financial aid, and housing. The results will be used to improve the student experience at UW Oshkosh.

Course Grades

Grade Weights

2 in-class exams (11% each)	22%
2 evening exams (22% each)	44%
Quizzes, homework, and other class assignments	29%
Attendance	5%
Total	**100%**

Grading Scale

	Grade-	Grade	Grade+
A	90%	93%	
B	80%	83%	88%
C	70%	73%	78%
D	60%	63%	68%
F	0%		

Please contact Steve if you have any questions about your current grade in the course.

Resources for Success

Peer Mentor: One of your best resources on this campus is your peers, especially those who have been there, done that. In this class we are fortunate to have someone who is specially trained and willing to help you become familiar with academic life at UW Oshkosh. The peer mentor will attend campus events with the class, answer your questions about the campus, and refer you to various resources. You should not hesitate to get to know our mentor as she is an important part of the Quest I experience.

Office Hours: My current schedule of office hours can be found at *https://www.uwosh.edu/faculty_staff/szydliks/schedule.shtml*. I am available at other times as well. Just ask!

Tutor Lab: Free tutoring is available to all students in room 113 of Swart Hall. A current schedule is posted outside of the tutoring room and on the math department web page.

Early Alert: Your development through the class is important to me, and I will provide you with regular feedback through homework, quizzes, and classroom discussions. Early Alert is a program that provides you with an early report on your performance in the class. Early Alert will indicate if you have academic performance or attendance issues and specific steps you can take and resources available to help you improve. It is common for students to be unaware of or over-estimate their academic performance in classes so this will help you be aware early on of your progress and provide strategies for success in the classroom. You will receive an email during the 5th week of classes. It is important to read the entire email carefully.

Writing Center: The Writing Center helps students of all ability levels improve their writing. Trained peer consultants help writers understand an assignment, envision possibilities for a draft, and improve their writing process. They even help writers learn to identify their own proofreading errors. Students can make a free appointment or stop by to see whether a consultant is available. For more information, view their website (*https://www.uwosh.edu/wcenter*), call 920-424-1152, email *wcenter@uwosh.edu*, or visit them in Suite 102 of the Student Success Center.

Polk Library: The campus library offers many professional librarians who can help you find library resources for your research. Specifically, Ted Mulvey, the Information Literacy Librarian, is available to assist you as you access, evaluate, and use information in University Studies Program classes. Phone: 920-424-7329; email: mulveyt@uwosh.edu. You may also set up a research advisory session with a librarian at: rap@uwosh.edu.

CAR: The Center for Academic Resources (CAR) provides free, confidential tutoring for students in most undergraduate classes on campus. CAR is located in the Student Success Center, Suite 102. Check the Tutor List page on CAR's website (www.uwosh.edu/car) for a list of tutors. If your course is not listed, click on a link to request one, stop by SSC 102 or call 424-2290. To schedule a tutoring session, simply email the tutor, let him/her know what class you are seeking assistance in, and schedule a time to meet.

Other Course Policies

Collaboration: You and your colleagues in PBIS 188 are a *learning community*. You should support each other's intellectual development by forming study groups, by meeting with each other outside of class, and by solving problems together. I encourage collaboration! Copying, however, is not acceptable. Unless otherwise indicated on an assignment, you should feel free to discuss any of the problems in the class with any other student within this learning community. Talk about the ideas, ask questions, explain your thinking processes, and challenge each other. However (unless otherwise instructed) you should write up any problem solutions on your own. They should ultimately be your work and your solution to the problems, not someone else's.

Other Course Policies (cont.)

Academic Integrity: From the University of Wisconsin System disciplinary code (Section 14.01):

Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors.

Examples of academic misconduct include submitting others' work as your own, copying on an exam, using unapproved resources on assignments, and intentionally assisting another student in any of these activities.

You can always ask questions about academic dishonesty and how to avoid it; you may not commit it. Plagiarism and other forms of cheating may lead to failing grades on assignments assignment or the entire course. Details on university academic dishonesty policies can be found at *https://www.uwosh.edu/deanofstudents/university-policies-procedures/academic-misconduct*.

Cell Phones: Though they are very useful tools, cell phones can also be a distraction in the classroom. If you find it necessary to use the phone for non course-related activities (e.g. sending or receiving texts or calls), you are asked to leave the classroom, so as to minimize disruption to the classroom environment. Out of respect for your colleagues, do not make phone calls, listen to music, watch videos, or text within the classroom environment.

Drop Deadline: The last day to drop the course is Friday, October 20, 2017. Late withdrawals are typically approved only when there are extenuating circumstances beyond your control which occur after the drop date. If at any point you are concerned about your progress in the class, please contact me.

On Class Participation

PBIS 188 is a Problem Based Inquiry Seminar. Much of the course will be spent on processes rather than skills or answers and our approach will be intuitive and investigative. Throughout the course, I expect you to be intensely involved in the process of mathematical enquiry, including investigation, questioning, conjecturing, reasoning, and making mathematical arguments. Speaking or asking questions during discussions can be nerve-racking, and fear of making a foolish comment might sometimes make you feel inhibited to the point of nonparticipation. Please do not feel that you have to speak in order to gain my approval or to show me that you are a diligent student. It is acceptable to say nothing in a class session and there will be no presumption of failure on your part in such situations. *I do not equate silence with mental inertia.* When you have an insight on a topic, a question, a clarification, or even the germ of an idea, I want you to offer your contributions to the class, but I don't want you to do this just for the sake of appearances. In some cases, we might have prolonged periods of silence that might or might not be broken, and we should feel comfortable with that. When you feel like saying something, just speak up.