Syllabus for Math 89s:
Game Theory and Democracy

Instructor Information:

Hubert Bray, Professor of Mathematics and Physics, Duke University
bray@math.duke.edu, (919)757-8428, Physics 189, www.professorbray.net

Course Information:

Class meets 7:00 – 8:15 p.m., Fall Semester 2021.

Office Hours:

After class, upon request. You may also schedule a meeting by email.

Course Objectives:

What is democracy? For example, given a finite number of choices, how does a group of equals choose the option which "best" reflects the will of the group? When there are more than two options, this is an open question in the sense that philosophical notions of "best" are not universally agreed upon. In this seminar, we will use mathematics and game theory to aid us in our discussion on the meaning of democracy and to examine the pros and cons of different approaches to this question. We will discuss preferential ballot elections (where each voter ranks all of the choices) and cover some of the most common vote counting methods used to determine a winner in a preferential ballot election. We will see how some of the most "obvious" vote counting methods, such as Instant Runoff Voting (used on many college campuses), have some significant theoretical defects. The seminar will also include an introduction to game theory, both for its own sake, as well as an essential tool for predicting how intelligent people with agendas behave given carefully defined rules.

Quizzes:

Many classes will begin or end with a quiz over material already covered in class as well as videos assigned to watch outside of class. See the course web site for the list of videos.

Homework:

Students will conduct and analyze surveys and elections. Problems will also be assigned in class.

Papers:

Each student will write 4 papers (5-10 pages) on the topics of their choice which make connections to game theory and democracy.

Grading:

30% Quizzes and Homework
60% Four papers. Each student will present their paper in 5 minutes.
Officially, however, the grade is based on just the paper, not the presentation.
10% Class Participation