

640:103: Introduction to Mathematics for the Liberal Arts

Textbook: Excursions in Modern Mathematics, 10th Edition, Tannenbaum

Prerequisites:None

Credits:3

Course Outline:

This course introduces students to a broad variety of real world applications of mathematics and statistics in the social sciences, art, and other areas of study. It is intended for students in programs which do not require any further courses in mathematics. The course along with 640:106 can be taken in any order to fulfill both 640 and LQR general education requirements. Topics covered include: elections, voting, fair-division, apportionment, graph theory, and traveling salesman problems.

Sections Covered:

- 1.1: The Basic Elements of an Election
- 1.2: The Plurality Method
- 1.3: The Borda Count Method
- 1.4: The Plurality-with-Elimination Method
- 1.5: The Method of Pairwise Comparisons
- 1.6: Fairness Criteria and Arrow's Impossibility Theorem
- 2.1: An Introduction to Weighted Voting
- 2.2: Banzhaf Power
- 2.3: Sharpley-Shubik Power
- 2.4: Subsets and Permutations
- 3.1: Fair-Division Games
- 3.2: The Divider-Chooser Method
- 3.3: The Lone-Divider Method
- 3.4: The Lone-Chooser Method
- 3.5: The Method of Sealed Bids
- 3.6: The Method of Markers
- 4.1: Apportionment Problems and Apportionment Methods
- 4.2: Hamilton's Method
- 4.3: Jefferson's Method
- 4.4: Adams's and Webster's Methods
- 4.5: The Huntington-Hill Method
- 4.6: The Quota Rule and Apportionment Paradoxes
- 5.1: Street-Routing Problems
- 5.2: An Introduction to Graphs

- 5.3: Euler's Theorem's and Fleury's Algorithm
- 5.4: Eulerizing and Semi-Eulerizing Graphs
- 6.1: What is a Traveling Salesman Problem?
- 6.2: Hamilton Paths and Circuits
- 6.3: The Brute-Force Algorithm
- 6.4: The Nearest-Neighbor and Repetitive Nearest-Neighbor Algorithms
- 6.5 The Cheapest-Link Algorithm