MA 111 Contemporary Mathematics

MA 111 Course Competencies

General Education Competencies

A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.

B. Intellectual and practical skills, including

- inquiry and analysis
- critical and creative thinking
- written and oral communication
- quantitative literacy
- information literacy
- teamwork and problem solving

C. Personal and social responsibility, including

- civic knowledge and engagement (local and global)
- intercultural knowledge and competence
- ethical reasoning and action
- foundations and skills for lifelong learning

D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

MA 111 Course Objectives

Upon completion of this course, the student can:

1. Interpret information presented in mathematical and/or statistical forms by:
   - reading pictorial representations and charts to solve fair division problems and/or voting method problems
   - interpreting apportionment information given in charts

2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically by:
   - organizing information in preference schedules for use in discussing various voting methods and apportionment problems
   - creating graphs to illustrate graph theory problems and/or geometric concepts

3. Determine when computations are needed and execute the appropriate computations by:
   - finding appropriate modified divisors for different apportionment methods
   - solving equations involving consumer finance formulas

4. Apply an appropriate model to the problem to be solved by:
   - selecting the appropriate formula to use when solving problems involving consumer finance
   - using circuits and paths to model situations involving graph theory
   - comparing advantages and disadvantages of different voting methods and different apportionment methods

5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis by:
   - estimating the relative error using an approximate algorithm to solve graph theory problems
   - comparing results of consumer finance problems and evaluating assumptions applicable to different formulas

MA 111 Course Outline

Include parts I, II, III, and IV, plus at least one section from part V.

I. Voting Methods
   A. Methods
      1. Plurality
      2. Elimination
      3. Borda's
      4. Pairwise Comparison
   B. Fairness Criteria

II. Fair Division
   A. Equal Division
      1. Fair Shares
      2. Divider Chooser Method
      3. Sealed Bids
   B. Proportional Division
      1. Quota Methods
         a) Hamilton
         b) Lowndes'
      2. Divisor Methods
         a) Jefferson
         b) Adams
         c) Webster
         d) Huntington-Hill

III. Graph Theory
   A. Euler Paths and Circuits
      1. Euler's Theorems
      2. Graph Modelling
      3. Eulerization
   B. Hamilton Paths and Circuits
      1. Travelling Salesman Problem
      2. Approximate Algorithms
         a) Nearest Neighbor
         b) Cheapest Link

IV. Financial Math
   A. Percent Increase/Decrease
   B. Simple Interest
   C. Compound Interest
   D. Systematic Savings Plans
   E. Amortized Loans

V. Additional Topics
   A. Growth Modelling
   B. Geometry
   C. Scheduling
   D. Logic
   E. Number Theory
   F. Statistics