

2030:480 Advanced Topics in Technical Mathematics

Bulletin Description

2030:480 Advanced Topics in Technical Mathematics

2 credits

Prerequisites: 2030:255 or equivalent with a grade of C– or better, or placement test.

Matrices, introduction to series, partial derivatives, least squares adjustments, and coordinate systems.

Assessment Outcomes

After completing this course the student should have the following competencies:

1. the ability to perform matrix addition, scalar multiplication of matrices, transposing of matrices, and matrix multiplication,
2. the ability to find the solution of a linear system of equations using matrices,
3. an understanding of power series,
4. the ability to find the partial derivative of a function,
5. the ability to recognize and solve technical problems by using partial derivatives,
6. the ability to calculate the least squares adjustment using the observed equation and matrix methods,
7. an understanding of polar, spherical, geocentric and geodetic coordinate systems and position computation.

Course Outline

1. Matrices
 - (a) Basic operations on matrices
 - (b) Multiplication of matrices
 - (c) The inverse of a matrix
 - (d) The transpose of a matrix
 - (e) Solving a system of linear equations using matrices
2. Series
 - (a) Introduction to series
 - (b) Power series
3. Partial Derivatives
 - (a) Power rule
 - (b) Product rule
 - (c) Chain rule
 - (d) Partial derivatives
 - (e) Applications of partial derivatives
4. Least Squares Adjustments
 - (a) Introduction to least squares adjustments

- (b) Conditions for least squares
- (c) Observation equation method
- (d) Matrix methods in least squares adjustments

5. Coordinate Systems

- (a) The polar coordinate system
- (b) The spherical coordinate system
- (c) The geocentric and geodetic coordinate systems
- (d) The local geodetic coordinate system
- (e) Ellipsoidal radii of curvature

Text Coverage

Supplemental material is used for this course.

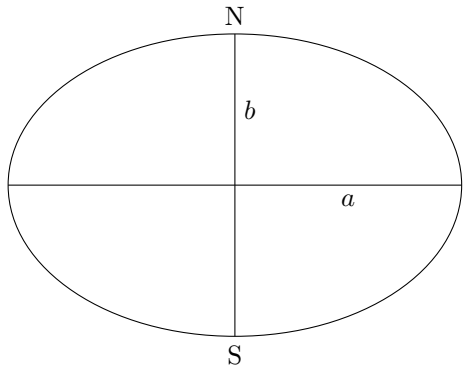
The course 2980:310, Survey Computations and Adjustments has Topics in Advanced Mathematics as a corequisite. In order to ensure that students taking these two courses during a single semester have learned the mathematics they need for Survey Computations and Adjustments, the order of the supplemental material should be followed in Advanced Topics in Technical Mathematics.

Calculator Policy

All students are **required** to have a **graphing** calculator with minimum functionality equivalent to that of the **Texas Instruments TI-83** calculator. Every student is **required** to have possession of their calculator by the end of the first week of classes. No exceptions to this policy will be made by the instructor.

Formula Policy

The formulas that students are required to know by heart at the end of the course are listed below.



a = semi-major axis

b = semi-minor axis

ϕ = latitude

$$f = \frac{a - b}{a}$$

$$e^2 = \frac{a^2 - b^2}{a^2}$$

$$M = \frac{a(1 - e^2)}{(1 - e^2 \sin^2(\phi))^{3/2}}$$

$$N = \frac{a}{\sqrt{1 - e^2 \sin^2(\phi)}}$$

August 1, 2010