SET 401 - 102, Fundamentals of Geodesy

COURSE NUMBER	SET 401
COURSE DESCRIPTION	Geometric Geodesy, Map Projection, Surveying with SPCS, Physical Geodesy
COURSE STRUCTURE	(3-0-3) (lecture hr/wk - lab hr/wk – course credits)

COURSE DESCRIPTION

Topics in **geometric geodesy** include definitions and the geometry of the reference ellipsoid that approximates the real Earth's physical and dynamic characteristics, and computations of geodetic coordinates on a reference ellipsoid and **map projections**. Definitions of the *geodesic* are applied for the solution of the direct and inverse problems (i.e., long distances and geodetic azimuth on the reference ellipsoid), geodetic datums, and coordinate systems and transformations. Concepts on map projections include developable surfaces used in projections, basic properties and characteristics of most common map projections (and distortions). Geodetic field survey data reduction and computation on **State Plane Coordinate Systems**.

Topics in **physical geodesy** include gravity observations and gravity reductions, application of Stokes' integral to describe Earth's global gravity field, application of Bruns' formula to derive geoid undulations for orthometric height estimates from geodetic leveling. Basic concepts of positioning using other advanced space-based technologies satellite laser ranging and satellite altimetry.

PREREQUISITE(S) CE 200 or equivalent, SET 302

CO REQUISITE(S)

TEXTBOOK(S)/ REQUIRED MATERIALS

1. None Required – Instructor provided notes
2. **Surveying: Theory and Practice**, by Anderson et al., 7th Ed. McGraw Hill
3. **Geodesy for Geomatics and GIS Professionals** by Elithorp and Findorff available from http://xanedu.proquest.com/originalworks/elithorp, 1-800-218-5971, ISBN 1-59399-087-1

COMPUTER USAGE Fortran90, MATLAB, Word, Excel

CLASS TOPICS

Definitions and the geometry of the reference ellipsoid and geometric attributes of reference ellipsoids, Properties of the *Geodesi*c and solutions of the direct and inverse geodetic problems, the nature and problems of geodesy and their practical impact on engineering and land surveying projects, various geodetic datums and geometric attributes of reference ellipsoids, and vertical systems. First Fundamental Quantities and map projections, and surveying in State plane Coordinates. Definition of Geoids, Physical and geometric heights, Gravity anomalies and deflection

of the vertical, Stokes' Theorem, Green's Function, and Spherical Harmonic Models of Gravity Potential. Principles of Satellite Altimetry.

COURSE LEARNING OUTCOMES

By the end of the course students should be able to:

1. Demonstrate the proper use of geodetic datums and coordinate transformations.
2. Compute arc lengths of curves on the ellipsoid and be able to solve the Direct and Inverse geodetic problem given geodetic data.
3. Demonstrate understanding on the theory of distortions in map projection.
4. Demonstrate the application of the First Fundamental Quantities for planar, spherical, and ellipsoidal datums as well as their relevance to measured distances and azimuth.
5. Demonstrate the application of survey data corrections and reductions procedures for requisite computations of geodetic quantities relative to the appropriate mathematical surface representing the real earth.
6. Compute various geodetic quantities including geoid undulation, deflection of the vertical, various heights including orthometric heights, and gravity anomalies.
7. Write an effective essays on Geodesy in a professional, concise , and timely manner.
8. Download and upload files with Moodle, as well as utilize other aspects of this learning management application
9. Understand the theoretical principles of satellite altimetry for topography missions and sea level determination.
10. Be able to use web-based geodetic software and tools.

MODIFICATION TO COURSE

The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course Outline.

COURSE COORDINATED BY

Dr. L. Potts