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SET 401-452: Fundamentals of Geodesy

Laramie Potts

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SET 401 - 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, computations of geodetic coordinates on a reference ellipsoid, application of the *geodesic* 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 basic properties and characteristics of common map projections (and distortions) with stronger emphasis on the projections used in **State Plane Coordinate Systems** (SPCS) such as Lambert conformal, transverse Mercator and UTM. Examples of applications of Geodesy include large boundary surveys, precise engineering/defortmation surveys and tunnel surveying and mapping

PREREQUISITE(S) CO REQUISITE(S)	CE 200 or equivalent, SET 302
TEXTBOOK(S)/ REQUIRED MATERIALS	**A.** Text: Instructor provided materials **B.** **Surveying: Theory and Practice**, by Anderson et al., 7th Ed. McGraw Hill **C.** **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	Geometric Geodesy, Definintions of various Geodetic Datums, Radii of Curvature of Reference Ellipsoid, Normal Section Azimuth, Coordinate Transformations, Geodetic Datums, Map projections and surveying with State Plane Coordinates. Gravimetric Geodesy, Geoid, and deflection of the vertical, Applications

GRADING POLICY		
	Homework/Computer	20 %
	Reviews (Video/Text)	15 %
	Quizzes	15 %
	Midterms (2 x 10%)	20 %
	Final Exam	30 %

Note: Cannot pass course if you are having failing grades on Midterms and final exam
Also, if you achieve an A for all homeworks, Quizzes and the Midterms, you will not be excused from the final. There will be no makeup exams.

STUDENT BEHAVIOR	NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For more information on the honor code, go to http://www.njit.edu/academics/honorcode.php
STUDENT BEHAVIOR	• Online protocol
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 outline.
PREPARED BY	Dr. L. V. Potts
COURSE COORDINATED BY	Dr. L. V. Potts

COURSE OUTLINE 2020

Week	Week of	Assignment Due	Reading/Activity	Topics
1.	**20-Jan**	**Video Review Week 1**	**A: 1** **B: Chapter 1** **B: Appendix A** **B: Appendix C** **C: Chapter 3**	**Introduction:** History of Geodesy Geodesy and Other Sciences, Geodesy for Surveyors Math Review (Parametric Equation of Surfaces)
2.	**27-Jan**	**Review Video Week 2** **HW#1**	**A: 2** **B: Appendic C** **C: Chapter 5** **Moodle**	**Curvature of Reference Surfaces** Fundamental Surfaces in Geodesy Types of Latitudes Radius of Curvature of Reference ellipsoid Compute Arc Lengths on the Datum Surfaces
3.	**3-Feb**	**Review Video Week 3**	**C: Chapter 5**	**Geodetic Computations:** Latitudinal and Meridional Arc Length Areas of Quadrangles
4.	**10-Feb**	**Review Video Week 4** **HW#2**	**A: 3** **Chapter 7**	**Geodetic Computations (cont)** The Geodesic Directions & Distances on the Ellipsoid Geodetic Direct Problem Geodetic Inverse Problem
5.	**17-Feb**	**Review Video Week 5** *Quiz I*	**A: 4, 7** **B: Chapter 14.1 - 14.3** **C: Chapter 5, 8**	**Geodetic Datums**: NAD27, NAD83 NGS Software - NADCON
6.	**24-Feb**	**HW#3** **Review Video Week 6**	**A: 5** **B: Chapter 11**	**Map Projections:** Concepts of Map Projections Defintion and Uses
7.	**2-Mar**		**Midterm I** (covers Weeks 1-4)	**Map Projections (cont):** Conformal Map Projections Map Projections in Surveying
8.	**9-Mar**	**HW#4** **Review SPCS Notes (Part 1)**	**B: Chapter 9.11** **C: Chapter 8**	**Positioning on SPCS** State Plane Coordinate Systems (SPCS) EDM (topocentric) distances vs GPS baselines Geodetic Azimuth vs Grid Azimuth
9.	15-22 Mar		**SPRING RECESS**	
10.	**23-Mar**	**HW#5** **Review SPCS Notes (Part 2)**	**B: Chapter 11** **C: Chapter 4, 10** **A: 8 & 9**	**Positioing on SPCS (cont.)** Total Station Traverse computation with SPCS GPS traverse adjustment
11.	**30-Mar**	**Review Video Week 11** *Quiz 2*	**B: Chapter 4 (Adv)**	**Geodetic Surveying & Applications** Geodetic Survey Data Corrections & Reductions Geodesy Application for Large Boundary Surveys **Physical Geodesy** Basic Concepts of Physical Geodesy Gravitation, Gravity Potential, gravity anomlies

#	Date			
12.	**6-Apr**	**HW#6** **Review Video Week 12**	**Midterm II** (covers Weeks 5-11a)	**Heights** Heights Height: Physical vs Geometric Geoid vs Mean Sea Level Orthometric Height & Leveling
13.	**13-Apr**	**HW#7** **Review Video Week 13**	**A: Moodle** **B: Chapter 5 (Adv)**	**Height Datums** Vertical Datums: NGVD27 & NAVD88, Great Lakes Datums, Datums of Local and State Government Agencies Local Tidal Datum
14.	**20-Apr**	**Review Video Week 14** *Quiz 3*		**Geodesy for Surveyors** National Spatial Reference System (NSRS) Purpose & Components of NSRS Surveying on the NSRS Coordinate (Datum) Transformations
15.	**27 Apr**	**HW#8** **Review Video Week 15**		**Geodesy Outlook:** Geodesy in the 22st Century Modern Development in Geodesy **Final Review**
16.			**Final Exam** (online exam: Covers Weeks 11b -15) (see Registrar Homepage for schedule details)	

CLASS HOURS

Asynchrounous Online

OFFICE HOURS (GITC 2510)

Mondays   4:00 pm – 5:30 pm

Or by appointment: **(973) 596-8191 or lpotts@njit.edu**

HOMEWORK - IMPORTANT

SOFTWARE ASSIGNMENTS

You will be required to submit a printout of the code (e.g., Matlab, or Excel worksheet) . Submission will include a legible printout of the code and a description (use a flowchart) of how the algorithm was implemented. The first (few) page(s) should show a flowchart with sufficient details to explain how the algorithm(s) are implemented. Be liberal with the comment statement in the computer code. I will go over this in more detail when a programming assignment is given. Each assignment is to be done individually.

Additional Information:

1. ***Materials Required*** -- Calculator.

2.   ***Student work and assignmnents*** The course will be administered online via course Learning Management System (LMS). CANVAS is the preferred LMS for NJIT. <u>All assignments</u> such as homeworks, quizzes, and video reviews will be in the form of online quizzes. Assignments on programming will require uploads of the programs file (Matlab, Exel etc). Any assignments (HW, Quiz, Reviews or coding) that are submitted past the due date will be subject to penalties ie., -10% per day past due). Homework will be in the form of a quiz – submit your responses via Canvas. Only one chance per homework quiz. It is recommended that you complete your entire homework problems on a separate computation pad and then enter your responses via the Canvas quiz environement. Be sure to detail all calculations and steps in case you wish to resolve conflicts with the solutions from Canvas.

All assignments are **due on the date as posted in Canvas.**

3.   ***Reviews of Weekly Learning Objects (Videos)*** is due the Sunday at midnoight of that week. View the learning object in your web browser (e.g., Internet Explorer) automatically. Your review will be a graded quiz administered via Canvas

4.   Unexcused ***omissions*** of more than three weeks of submissions (videos and HW's) will result in a grade of F.

5.   The NJIT ***Honor Code*** will be upheld, any violations will be brought to the immediate attention of the Dean of Students.

6.   Students will be informed of any ***changes to syllabus*** at least one week in advance.

7.   To schedule consultation ***outside office hours***, send request via email

9. **Grading**
   Score Assignment
   D =   51-57
   C =   57.1 - 63.0
   C+ = 63.1 - 70.0
   B =   70.1 - 77.0
   B+ = 77.1 - 85.0
   A > 85