**SCHOOL OF APPLIED ENGINEERING & TECHNOLOGY**
**SURVEYING ENGINEERING TECHNOLOGY**

SET 200 **Introduction to Geomatics** Fall 2025

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| **COURSE STRUCTURE** | (2-0-2) (lecture hr/wk - lab hr/wk – course credits)<br>**Classroom: CKB 341 (Monday: 6:00 pm – 7:55 pm)** |
| **COURSE DESCRIPTION** | Plane surveying with angle and distance measurements; geospatial data acquisition technologies and, basics of aerial mapping and Global Navigation Satellite System (GNSS) for localization (positioning). Principles of topographic mapping and Geographic Information Systems (GIS) for surveying and mapping applications. Emphasis is on the using computers for solving typical field and office problems. |
| **PREREQUISITE(S)**<br>**CO REQUISITE(S)** | Pre-calculus<br>SET200A–Surveying Laboratory |
| **TEXTBOOK(S)/ RECOMMENDED MATERIAL** | **Elementary Surveying:** *An Introduction to Geomatics*, Latest Edition, by Charles D. Ghilani, Pearson, ISBN-13: 978-0134604657.<br>Calculator (NCEES –recommended), Engineering Computation Pad |
| **SUPPLEMENTARY MATERIALS** | **Surveying with Construction Applications**, 3rd Edition, Prentice Hall 1997. |
| **COMPUTER USAGE** | MS Word, Excel |
| **COURSE LEARNING OUTCOMES** | By the completion of this course, students will be able to:<br>1. Develop an understanding of the survey math and its application to basic surveying<br>2. Develop understanding on surveying measures and associated measurement errors.<br>3. Perform height leveling computations and adjustment<br>4. Develop understanding on remote sensing and photogrammetric principles<br>5. Perform basic computations associated with GNSS measurements and geodetic datums<br>6. Perform topographic mapping and contour interpretations<br>7. Understand and differentiate the difference between vector and raster data and associate GIS operations on these data formats,<br>8. Perform elementary GIS operations |
| **CLASS TOPICS** | Technology for distance and angular measurements and basics of measurement errors, heights and differential leveling, bearings and azimuths, coordinate computations, , earthworks: areas and volumes topographic surveys and mapping, construction surveys, elements of photogrammetry & remote sensing, space-based positioning (i.e., GPS), introduction to Geographic Information Systems (GIS). |
| **STUDENT OUTCOMES** | The Course Learning Outcomes (CLO) support the achievement of the following SET Student Outcomes and TAC of ABET Criterion 9 requirements:<br>**Student Outcome b** - an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that |

require the application of principles and applied procedures or methodologies; **Related CLO – 1 thru 3**

**HYBRID LEARNING INFORMATION**

The instructor will discuss these requirements on the first day of the course and/or post on their Learning Management System (LMS).

Please become familiar with:

- Zoom: https://njit-edu.zoom.us/
- Online Proctoring: https://ist.njit.edu/online-proctoring/
- Back2Classroom: https://back2classroom.njit.edu/getting-started-students

**GRADING POLICY**

Quizzes……20% (due dates indicated on Canvas)
Homework …….. 25% (due dates indicated on Canvas)
Mid Term ……..25% (- Date shown on syllabus)
Final……30% (In Class. See Registrar Webpage)

**Videos:** Videos cover concepts outlined in the recommended text book.

**Quizzes:** Canvas will host all quizzes for this course. Quizzes will cover materials covered in the Lecture and the posted videos. For example, the assignment "Review V1" means that students should access the online quiz for Video 1 by the due date as posted in Canvas (and the syllabus).

**Homework:** Solutions to survey problems that require application of concepts learnt. Problems statements will also require the computational skills using the basic scientific calculation. It is strongly recommended to solve the homework problems (follow the format as shown in lecture videos) using either engineering calculation pad or a ruled workbook to better understand the sequence of computations that lead to the solution. This method will also be helpful during your review for the midterm and final exam. Submittals of your homework assignments are also via Canvas in the form of a quiz.

**Exam:** There will be one midterm and a final exam. The final exam is not comprehensive but will cover materials that were covered since the midterm exam. The general **format** for the midterm exam will be two parts. **Part I** consists of multiple choice and True/False questions in a timed quiz with lockdown browser. **Part II** of an exam comprises problem/solution type questions as a timed quiz with lockdown browser.

**Notes**:
Students cannot pass this course if you have NOT completed more than 80% of the quizzes and the homework assignments. Penalty for late submissions will be at a rate of 10% per day after the posted deadline.
*There will be no makeup exams.*

Student use of artificial intelligence (AI) is permitted in this course for certain assignments and activities. It is not permitted to be used in the homework

assignments as doing so would undermine student learning and achievement of course learning outcomes. Additionally, if and when students use AI in this course, the AI must be cited as is shown within the NJIT Library AI citation page for AI. If you have any questions or concerns about AI technology use in this class, please reach out to your instructor prior to submitting any assignments.
**Due date** for assignments is Sunday 11:59 pm of the week of the assignment

**Final Grade/Score Assignment (out of 100 %)**

D= 50-56
C= 57-62
C+= 63-69
B = 70-76
B+ = 77-84
A > 85

**ACADEMIC INTEGRITY**

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

**DISCUSS VIOLENT CRITICAL INCIDENT**

Class discussion on strategies when class may encounter a Violent Critical Incident: Alert, Evacuate, Counter

**STUDENT BEHAVIOR**

- See NJIT policy at https://www.njit.edu/doss/code-student-conduct-article-11-university-policy-academic-integrity/

**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 a timely manner of any changes to the Course outline.

**PREPARED BY**

Dr. L. V. Potts

**Office Hours**

**221 Fenster Hall: Monday and Wednesday 3:00 – 5:30 pm**
**Or by appointment via email** lpotts@njit.edu

**Course Outline**

| Week | Date: Week of | Assignments online via Canvas | Reading/ Activity | Topics |
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| **1.** | **9/01** | | Ch. 1 | **Introduction** (Video)<br>• Overview of Geomatics<br>• Math Review<br>• Principles of Geospatial Mapping |
| **2.** | **9/08** | Review V1 | Ch. 3:<br>3.1-3.8 | **Measurements** (Video - V1)<br>• Measurement Technologies<br>• Data Types for topographic Mapping |
| **3.** | **9/15** | **HW #1** | Ch. 6<br>Ch. 7 | **Surveying Measurements (cont.)** (Video – V2)<br>• Angles, Azimuth & Bearings<br>• Distance Measurements<br>• Quality of Surveying Data |
| **4.** | **9/22** | Review V2 | Ch.: 6<br>Part II | **Calibration & Measurement Corrections**<br>• Equipment Calibration<br>• Measurement Corrections |
| **5.** | **9/29** | **HW #2** | Ch. 4:<br>(4.1-4.2)<br>Ch.13<br>(13.4.3) | **Geodetic Surfaces, Coordinates & Reductions**<br>• Geodetic Surfaces and Datums<br>• Horizontal (Geodetic) Datums<br>• Vertical Datum (Height) Datums<br>• Projections - State Planar Coordinates<br>• Measurement Reductions (scale factors) |
| **6.** | **10/06** | | Ch. 4<br>Section 4.5 | **Heights** (Video – V3)<br>• Trigonometric leveling<br>• Computations & Adjustments |
| **7.** | **10/13** | Review V3 | Ch. 4<br>Section 4.5<br>Ch. 5<br>(5.5; 5.6; 5.9) | **Concepts on Heights (cont.)**<br>• Differential leveling<br>• Computations and Adjustments |
| **8.** | **10/20** | **HW #3** | Ch. 10<br>(10.4; 10.8) | **Coordinate Geometry** (Video – V4)<br>• Departures and Latitude<br>• Computing Coordinates<br>• Compute Construction Data |
| **9.** | **10/27** | | **Midterm**<br>**(Covers Materials from Weeks 1 - 7)** | |
| **10.** | **11/03** | Review V4 | Ch. 13<br>(13.4; 13.5) | **Space-based Positioning (Localization)** (Video – V5)<br>• GPS (Pseudo Range) Observation<br>• GNSS advantageous & Limitations<br>• Receiver Location (XYZ) & Numerical Examples |

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| **11.** | **11/10** | Review V5 | Ch: 17<br>(27.6-27.7) | **Principles of Aerial Surveying (Video – V6)**<br>• Principles of Remote Sensing with Drones<br>• Principles of Photogrammetry<br>• Creating coordinates from aerial photos |
| **12.** | **11/17** | **HW #4**<br><br>Review V6 | Ch. 18<br>(18.6 – 18.9)<br>Ch. 12 (12.5)<br>Ch. 26 (26.11 | **Mapping (Video – V7)**<br>• Construction of Topographic Maps<br>• Contours and contour interval (Gradient)<br>• Area & Volume Computations |
| **13.** | **11/24** | Review V7 | Ch. 28<br>28.1-28.6 | **Geographic Information System (GIS) (Video – V8)**<br>• GIS Components<br>• GIS data types and limitations |
| **14.** | **12/01** | | Ch. 28<br>Section 28.9 | **GIS (cont.)**<br>• **GIS Operations**<br>• **ArcGIS – Software**<br>• ArcGIS Mapping |
| **15.** | **12/08** | **HW #5**<br><br>Review V8 | | **Construction Surveys**<br>• Layout Computations<br>• Reality Capture<br>**Geospatial Intelligence & Applications**<br>• "The Geoverse"<br>• Point clouds<br>• Building Information Modeling (BIM)<br>• Digital Twins<br>Course Summary & Review |
| | | **Final Exam (see Registrar Homepage for schedule details)** | | |