STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS203 - ADVANCED SURVEYING

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Canino School of Engineering Technology

Department: Construction and Civil Engineering Technology !

Semester/Year: Spring 2019

A. **TITLE**: Advanced Surveying

B. **COURSE NUMBER:** CONS203

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 4
 # Lecture Hours: 2 **per week**
 # Lab Hours: 6 **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

This course emphasizes fundamentals of field and office procedures used in the construction industry. Major topics covered are: mapping procedures, topographic survey methods, area determinations by coordinates, determination of volumes for earthworks, horizontal and vertical control necessary for mapping and building layout, horizontal (circular) curves and vertical (parabolic) curves. The student uses modern surveying equipment in field sessions, including total stations, automatic levels and lasers, geographic positioning satellite receivers and integrated mapping and surveying software for data analysis and map compilation.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

Elementary Surveying (CONS 101).

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
a. Interpret the meaning of contour lines and generate contour lines based on elevation data using interpolation.	1ab, 2ac		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Demonstrate proficiency in the use of surveying software package such as "Wolfpack" and spreadsheet routines to improve the efficiency (speed, number and accuracy) of making surveying calculations.	1b, 2ac		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c. Measure and record angles and distances between points using total station equipment and use these data to compute the coordinates of control points.	1ab, 2bc		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d. Collect the field data needed to prepare a topographic map by the radiation method using total station equipment.	1ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e. Analyze total station topographic map data using CAD software designed for map preparation and use the analyzed data to draw a final map.	1ab, 2c, 7c		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	PS Subsets Subsets Subsets
f. Calculate staking notes needed to construct a road with horizontal and vertical curves and use the total station and a surveyor's tape to set points for highway centerlines in the field	1ab, 2ac, 3bc, 4a, 6a		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

g. Determine earthwork quantities for highway construction and/or a borrow pit.	1ab, 3		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
h. Demonstrate both team and leadership skills.	5ab		4-Soc Respons ISLO ISLO	T Subsets Subsets Subsets
			ISLO ISLO ISLO	Subsets Subsets Subsets Subsets
			4-Soc Respons ISLO ISLO	T Subsets Subsets Subsets

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Construction Surveying, and Layout, 3rd Edition, Wesley G. Crawford, Creative Construction, 2720 S. River Rd, West Lafayette, IN, 2003. ISBN 0-9647421-1-X.

L. REFERENCES:

AutoCad Civil 3D for surveyors, Schroff Development Corporation

M. EQUIPMENT: None ☐ Needed:

Automatic Level, Total Station, Prism Poles, Geographic Positioning System Receivers, Drafting Software, Metal Detector, Steel Tape, Range Pole, Engineering Rod (Leveling), Miscellaneous Hand Equipment are provided by the department.

The student is expected to provide the following:
A calculator capable of performing addition, subtraction, multiplication, division, trigonometric functions, inverses, exponentiation and roots.
Quadrille ruled Engineering Computation paper for assignments.
A Student Field Book.
A sharp pencil(s) with H or HB lead for computations.
A sharp pencil(s) with 3H or 4H lead for field notes.
A 256 MB (or larger) Flash Memory Drive.
The following drafting equipment:Plastic Ruler, Protractor,

N. GRADING METHOD: A - F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Exams
Problem solving Assignments
Computer drawing assignments
LAb Field Work
Peer Asseement
Mapping Project

P. DETAILED COURSE OUTLINE:

I. Introduction/Review Differential Leveling
A. Review Leveling
B. Techniques of Leveling
C. Peg Test
D. Level Loop Adjustments

II. Review Angles and Direction
A. Total Stations
B. Azimuths
C. Bearings

III. Coordinate Geometry
A. Review
B. Determination of Intersections
C. Resection

IV. Map Projections and Coordinate Systems
A. Need for Map Projections
B. Coordinate Systems
C. State Plane Coordinates

V. Geographic Positioning System
A. Introduction to system components
B. How satellite signals determine positions
C. Sources of error
D. Static survey procedure
E. Kinematic survey procedure

VI. Topographical Surveying
A. General Setup of Survey
B. Radiation survey procedure
C. Map Drafting with Land Desktop
D. Survey Drafting
E. Contours

VII. Construction Control Surveys
A. General Use and Responsibilities
B. Position Accuracies
C. Specifications for Short Lines
D. Coordinate Grid Systems
E. Coordinate Geometry (COGO)
F. Project Control

VIII. Highway Curves
A. Route Surveys
B. Circular Curves
1. Chord Calculations
2. Offset Curves
3. Compound Curves
C. Vertical Curves

1. **Geometric Properties of the Parabola**
2. **Computations of Vertical Curves**

D. Design Considerations

Q. <u>LABORATORY OUTLINE</u>: None ☐ Yes ☒

Field Laboratory Outline

1. **Peg Test of a Level**
2. **Leveling Review**
3. **Trigonometric Leveling**
4. **Traverse Review Survey**
5. **Acquisition of Horizontal Control Using State plane references**
6. **Map Traverse Planimetric Survey : Horizontal and Vertical Control**
7. **Location of Map Traverse Point with GPS (Optional)**
8. **Topographic Map Side Shots Manual**
9. **Topographic Map Side Shots Electronic (4 weeks)**
10. **Field Check of Topographic Map**
11. **Horizontal Curve stakeout**
12. **Trigonometric Leveling of Borrow Pit Elevations (Optional)**
13. **Total Station Dexterity Test (As directed)**
14. **Finalization of Topographic Map (Optional)**
15. **Structure Layout (Optional)**