

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



MASTER SYLLABUS

**COURSE NUMBER – COURSE NAME
CONS 203 – Advanced Surveying**

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Canino School of Engineering Technology

Department: Civil and Construction Technologies

Semester/Year: Fall/2021

A. **TITLE:** Advanced Surveying

B. **COURSE NUMBER:** CONS 203

C. **CREDIT HOURS:** 3 credit hour(s) per week for 15 weeks

- One hour (50 minutes) of lecture per week 1
- Two to three hours of lab or clinical per week
- Two hours of recitation per week 2 two hour computer session
- 40 hours of internship

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 office skills associated with surveying for site planning, design and layout for construction projects involving infrastructure and land development. Major topics covered are preparation of site plans and site modeling and design for projects such as roads, commercial and residential projects. The estimation of earthwork and other quantities associated with these projects is also addressed. Students use state of the art software that is used in the government, business and non-profit sectors engaged in this type of work.

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

CONS 101 Elementary Surveying and SOET 116 Introduction to Computer Aided Drafting and Design or SOET 115 Computer Aided Drafting and Design; or permission of instructor

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:

<u>Course Student Learning Outcome</u> <u>[SLO]</u>	<u>Program Student Learning Outcome</u> <u>[PSLO]</u>	<u>GER</u> <i>[If Applicable]</i>	<u>ISLO & SUBSETS</u>	
a. Construct contour lines based on spatial elevation data using manual interpolation and computer software and explain the meaning of contour lines.	1ab, 2ac		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Demonstrate the proficiency to efficiently perform coordinate geometry surveying calculations (COGO) using spreadsheets, computer software such as “Wolfpack” and Civil 3D..	1b, 2ac		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c. Analyze data from surveying equipment to determine the north and east coordinates and elevations of surveyed points and add them to a computer-based site plan.	1ab, 2bc		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d. Create the images of planimetric features on a site plan based on processed survey data.	1ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e. Assemble site plan and plan-profile drawings for construction of infrastructure facilities.	1ab, 2c, 7c		5-Ind, Prof, Disc, Know Skills 2-Crit Think ISLO	Subsets Subsets Subsets Subsets
f. Prepare staking note reports for the layout of a road that includes horizontal and vertical curves including the necessary calculations.	1ab, 2ac, 3bc, 4a, 6a		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

g. Estimate the quantities of cut and fill associated with the construction of infrastructure projects such as roads, land development and water storage.	1ab,3		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
h. Explain the operation of the Global Navigation Satellite System (GNSS) and how it applies to surveying and layout of construction projects. Describe the methods used to overcome natural interference with GNSS measurements.	5ab		5-Ind, Prof, Disc, Know Skills 4-Soc Respons ISLO	T Subsets Subsets Subsets
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KEY	<u>Institutional Student Learning Outcomes [ISLO 1 – 5]</u>
ISLO #	ISLO & Subsets
1	Communication Skills Oral [O], Written [W]
2	Critical Thinking <i>Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS]</i>
3	Foundational Skills <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
4	Social Responsibility <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
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:

ASCENT, 2020, Autodesk Civil 3D 2021 Fundamentals, SDC Publications, PO Box 1334, Mission, KS.
ISBN 978-1-63057-343-0.

L. REFERENCES:

AutoCad Civil 3D for surveyors, Schroff Development Corporation

M. EQUIPMENT: None Needed:

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 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

Quizzes

Projects

P. DETAILED COURSE OUTLINE:

I. Leveling

a. Review of differential leveling

b. Trigonometric Elevations

II. Angles & Line Directions

a. Measurement of angles

b. Bearings

c. Azimuths

III. Coordinate Geometry

a. COGO

b. Inversing

c. Intersection

IV. Map Projections and Coordinate Systems

a. Map Projection Concept

b. Lambert Conformal Conic Projection

c. Transverse Mercator Projection

d. State Plane Coordinate System

e. Universal Transverse Mercator Coordinate System

V. Topographic Surveying Techniques

a. Cross section method

- b. Radial Surveying
- c. Field methods
- VI. Map Drafting Methods
 - a. Data reduction and analysis
 - b. Use of Description Keys
 - c. Point groups and layers
 - d. Contouring surfaces
 - e. Volumetric surfaces
 - f. Use of breaklines
 - g. Document production
- VII. Roadway design and detailing
 - a. Horizontal curves
 - b. Vertical curves
 - c. Alignments
 - d. Corridors and Assemblies
 - e. Plan – Profile drawings
 - f. Cross sections
 - g. Cut and Fill volume estimates
 - h. Slope Staking
- VIII. The Global Navigation Satellite System
 - a. Overview of GPS methodology
 - b. Ground equipment
 - c. Sources of error
 - d. Differential GPS
 - e. Use for survey measurement
 - f. Use for layout
 - g. Machine control

Q. LABORATORY OUTLINE: None Yes

1. Introduction to Civil 3D
2. Points and Point Creation from Survey Data
3. Coordinate Geometry Calculations
4. Site Plan Project Setup
5. Point Processing
6. Creation of Planimetric Features
7. Site Plan Surface Creation
8. Add Breaklines to EG Surface and Document Production
9. Creation of Grading and Volumetric Surfaces
10. Civil 3D Road Project
11. Alignment and Existing Ground Profile Creation
12. Addition of Corridors and Assemblies to Road Project
13. Corridor Earthwork Volumes and Plan-Profile Drawing Production