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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
AREA 320 - EXPERIMENTATION & MEASUREMENT I

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Canino School of Engineering Technology !

Department: Mechanical & Energy Technology !

Semester/Year: Fall/2018 !

A. **TITLE**: Experimentation & Measurement I

B. **COURSE NUMBER:** AREA 320

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

 # Credit Hours: 3
 # Lecture Hours: **per week**
 # Lab Hours: (3) 2-hours **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:**

In this laboratory students will learn experimental methods, instrumentation for engineering measurements, statistical estimates of experimental uncertainty, and calibration techniques. Students will perform laboratory experiments that are applicable to energy systems as well as to broader engineering applications. This course serves as the foundation for higher level lab and design courses in this curriculum.

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

Pre-requisites: MECH 241, Fluid Mechanics, ENGS 102, Programming for Engineers, MATH 141, Statistics

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***	
Apply basic experimental methodology, including statistics, error analysis, and uncertainty propagation.	SO #3 An ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes.		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	PS Subsets Subsets Subsets
Describe the principles used to make common physical measurements.	SO #1 An appropriate mastery of the knowledge, techniques, and skills, and modern tools of their disciplines utilizing renewable energy systems and design parameters		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	IA Subsets Subsets Subsets
Create data products (graphs, mathematical models) and analyze experimental data.	SO #3 An ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes		1-Comm Skills 2-Crit Think 5-Ind, Prof, Disc, Know Skills	W CA Subsets Subsets
Write technical reports to convey results of lab experiments.	SO # 7 An ability to communicate effectively through written, oral, and graphic methods related to renewable energy systems.		1-Comm Skills 2-Crit Think 5-Ind, Prof, Disc, Know Skills	W IA Subsets Subsets
Design, build, and present a project in renewable energy field..	SO #5 An ability to function effectively on teams.		4-Soc Respons 1-Comm Skills 2-Crit Think	T O IA 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:

Holman, J.P., Experimental Methods for Engineers (7th edition), McGraw Hill, 2001

L. REFERENCES:

Beckwith, T.G., Marangoni, R.D., and Lienhard V, J.H., Mechanical Measurements (5th edition), Addison-Wesley, 1993
Figliola, R.S. and Beasley, D.E., Theory and Design for Mechanical Measurements (3rd edition), John Wiley & Sons, 2000

M. EQUIPMENT: None ☐ **Needed:** Wind Turbine, Solar panels, geothermal model, fuel cell, biofuel processor

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Grading may include lab notebook, lab reports, homework, quizzes, and exams.

P. DETAILED COURSE OUTLINE:

N/A

Q. LABORATORY OUTLINE: None ☐ **Yes** ☒

1. Basic Measurement Concepts
- **a. Statistical review**
- **b. Statistical analysis of experimental data**

2. Measurements Uncertainty
- **a. Precision, bias, and total uncertainty**
- **b. Error propagation**

3. Linear regression methods and statistics
- **a. Graphical data presentation**
- **b. Time constant and dynamic response**

c. Calibration techniques

4. Electrical measurements
a. Voltage, current, power
b. Using an oscilloscope

5. Temperature measurement
a. Thermometers
b. Thermocouples
c. Resistance thermometers (RTD's and thermistors)
d. Pyrometers

6. Humidity measurement
a. Psychrometrics
b. Humidity transducers

7. Flow measurement
a. Obstruction flow meters
b. Variable-area flow meters
c. Thermal anemometers
d. Flow visualization

8. Pressure measurement
a. Static, dynamic, and total pressure
b. Pressure transducers

9. Computer-aided data acquisition
a. Analog-to-digital conversion
b. Sampling rate and aliasing
c. Range and resolution