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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MKTX 410 – Robotics Analysis and Synthesis

Created by: Lucas Craig, Ph.D.

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Department: Mechatronics Engineering Technology

Semester/Year: Fall/2018

A. **TITLE**: Robotics Analysis and Synthesis

B. **COURSE NUMBER:** MKTX 410

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

 # Credit Hours: 3
 # Lecture Hours: 2 **per week**
 # Lab Hours: **per week**
Other: 2 hours recitation **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 teaches the fundamentals of robotics through implementation of control theory and high level system dynamics and modeling. Students write computer code, implement system controllers, use sensory equipment, collect and analyze data, and design and develop robotic systems.

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

MKTX 310: Instrumentation and Controls

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***	
Understand the dynamics of open and closed chain systems	a, e		2-Crit Think ISLO ISLO	CA IA PS Subsets
Demonstrate an understanding of trajectory generation through system design	a, e		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA IA PS Subsets
Understand motion planning and motion optimization schemas	a, e		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	Subsets Subsets Subsets Subsets
Implement sensor-based feedback control into robotic systems.	a, b, d, e		1-Comm Skills 2-Crit Think 5-Ind, Prof, Disc, Know Skills	W CA IA PS
Understand contact kinematics and apply them to robotic manipulators	a, b, e		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	IA PS CA Subsets
Apply understanding of robotic systems to mobile and paired robotic systems	a, b, d, e		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA PS PS Subsets
Apply essential techniques, skills, and modern engineering tools to overcome common issues observed in industry	d, e		4-Soc Respons 5-Ind, Prof, Disc, Know Skills 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**

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:

Lynch and Park. "Modern Robotics: Mechanics, Planning, and Control", 1st edition, Cambridge University Press, 2017

L. REFERENCES:

Corke, Peter. "Robotics, Vision and Control: Fundamental Algorithms in MatLab", 2nd edition, Springer Press, 2017

M. EQUIPMENT: None ☐ **Needed:** Computers with MatLab, Robotic Workstattions

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Exams**
- **Quizzes**
- **Homework**
- **Projects**

P. DETAILED COURSE OUTLINE:

I. Configuration Space
II. Rigid-Body Motion Review
III. Forward Kinematics
IV. Velocity/Kinematics/Statics Review
V. Inverse Kinematics
VI. Closed Chain Kinematics
VII. Open Chain Dynamics
VIII. Trajectory Generation
IX. Motion Planning
X. Robot Control
XI. Grasping and Manipulation
XII. System Mobility

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