MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MKTX 370 – Mechatronics Laboratory II

Created by: Rashid Aidun, Ph.D.
Updated by: J. Miles Canino, Ph.D.

Canino School of Engineering Technology
Department: Mechatronics Engineering Technology
Semester/Year: Fall/2018
A. **TITLE:** Mechatronics Laboratory II

B. **COURSE NUMBER:** MKTX 370

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

- # Credit Hours: 1
- # Lecture Hours: per week
- # Lab Hours: 3 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 mechatronics laboratory emphasizes the applications of analog electronics, digital electronics, sensors and transducers, actuators, and microcontrollers. Laboratory experiments are designed to give the student hands-on experience with components and measurement equipment used in the design of mechatronic products. Design and construction of mechatronics systems are emphasized.

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

MKTX 320

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

MKTX 325
I. STUDENT LEARNING OUTCOMES: (see key below)

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

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th>GER [If Applicable]</th>
<th>ISLO &amp; SUBSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguish the basic elements underlying analog and digital electronics</td>
<td>a, b, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets Subsets</td>
</tr>
<tr>
<td>Use sensors, actuators, microcontrollers, and embedded software in mechatronics applications</td>
<td>a, b, c, k</td>
<td>2-Crit Think 3-Found Skills ISLO</td>
<td>CA IA IM Subsets</td>
</tr>
<tr>
<td>Design and develop system models for mechatronic systems.</td>
<td>a, b, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets Subsets</td>
</tr>
<tr>
<td>Design and develop control architectures for mechatronic systems</td>
<td>a, b, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets Subsets</td>
</tr>
<tr>
<td>Tune, modify, and implement control systems in mechatronics projects</td>
<td>a, b, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets Subsets</td>
</tr>
<tr>
<td>Demonstrate effective team-work and collaborative skills</td>
<td>d</td>
<td>4-Soc Respons ISLO ISLO</td>
<td>T Subsets Subsets Subsets</td>
</tr>
<tr>
<td>Demonstrate comfortability with giving oral and written presentations</td>
<td>g1</td>
<td>1-Comm Skills ISLO ISLO</td>
<td>O Subsets Subsets Subsets</td>
</tr>
</tbody>
</table>

**KEY**

<table>
<thead>
<tr>
<th>ISLO #</th>
<th>Institutional Student Learning Outcomes [ISLO 1 – 5]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Communication Skills&lt;br&gt;Oral [O], Written [W]</td>
</tr>
<tr>
<td>2</td>
<td>Critical Thinking&lt;br&gt;Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</td>
</tr>
<tr>
<td>3</td>
<td>Foundational Skills&lt;br&gt;Information Management [IM], Quantitative Lit./Reasoning [QTR]</td>
</tr>
<tr>
<td>4</td>
<td>Social Responsibility&lt;br&gt;Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</td>
</tr>
<tr>
<td>5</td>
<td>Industry, Professional, Discipline Specific Knowledge and Skills</td>
</tr>
</tbody>
</table>
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:**

Faculty-Created Lab Manual

L. **REFERENCES:**

The Next Step in Training in Mechatronics Technologies, Lab-Volt Systems Inc., Farmingdale, NJ

M. **EQUIPMENT:** None ☐  Needed: Computers with MatLab, Simulink, and Data Acquisition capabilities

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- Lab practical
- Lab-reports
- Projects
- Participation & Team Work

P. **DETAILED COURSE OUTLINE:**

See laboratory outline.

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

I. Fluid Power Circuit
II. Electro-Pneumatic System
III. Speed control in AC and DC drives
IV. Servo controller interfacing with DC motors
V. Proportional Integral Derivative (PID) controller design and development.
VI. Stepper motor microcontroller system
VII. Modeling and digital simulation of electrical, hydraulic, and pneumatic systems using MatLab and Simulink
VIII. Data logging, archiving, and mining
IX. Independent Component Analysis
X. Principle Component Analysis
XI. Fundamentals of Machine Learning I
XII. Fundamental of Machine Learning II
XIII. Implementing Machine Learning and Decision Systems