MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MKTX 310 – Instrumentation and Controls

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:** Instrumentation and Controls

B. **COURSE NUMBER:** MKTX 310

C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)
   
   # Credit Hours: 3  
   # Lecture Hours: 3 per week  
   # Lab 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:**

   This course will introduce instrumentation systems, process measurements, and process control. Specifically, the course will discuss measurement terminology, differentiating between analog and digital, describe the instrumentation used for electronic testing and develop the principles of operation of transducers used for process measurement and control.

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

   ENGS 263/264 Electric Circuit/Laboratory

   **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:

<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>Understand the fundamentals of system monitoring and measurement via system elements (sensors)</td>
<td>a, b, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>Subsets Subsets</td>
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<td></td>
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<td></td>
<td>CA IA Subsets</td>
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<tr>
<td>Understand the presentation and real-time/post-process analysis of data sets obtained via system sensors</td>
<td>a, b, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<td></td>
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<td>3-Found Skills ISLO</td>
<td>Subsets Subsets</td>
</tr>
<tr>
<td>Understand the fundamentals of control theory and the types of control systems.</td>
<td>a</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Subsets Subsets</td>
</tr>
<tr>
<td>Understand the transfer function and block-diagram models used in the creation of a control loop.</td>
<td>a, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<tr>
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<td></td>
<td></td>
<td>Subsets Subsets</td>
</tr>
<tr>
<td>Understand and investigate system response, frequency response, and system stability.</td>
<td>a, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<td>5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS Subsets</td>
</tr>
<tr>
<td>Design controllers using Ziegler-Nichols tuning, Root-Locus method, and other conventional techniques.</td>
<td>a, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<td></td>
<td>5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS Subsets</td>
</tr>
<tr>
<td>Generate and analyze Nyquist diagrams and Bode plots.</td>
<td>a, c, k</td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA IA Subsets</td>
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<tr>
<td></td>
<td></td>
<td>5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS 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 [O], Written [W]</td>
</tr>
<tr>
<td>2</td>
<td>Critical Thinking [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</td>
</tr>
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<td>3</td>
<td>Foundational Skills [IM], Quantitative Lit./Reasoning [QTR]</td>
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<td>4</td>
<td>Social Responsibility [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</td>
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<tr>
<td>5</td>
<td>Industry, Professional, Discipline Specific Knowledge and Skills [PS]</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:


L. REFERENCES:

N/A

M. EQUIPMENT: None ☐ Needed: Computers with MatLab and Simulink

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- Homework
- Tests, Quizzes
- Projects

P. DETAILED COURSE OUTLINE:

Measurement Systems
  Instrumentation System Elements (sensors)
  Data Presentation Elements
  Control Systems

Process Controllers
  Correction Elements
  Programmable Logic Control Systems
  System Models
  Transfer Function
  State Space Models
  System Response
  Frequency Response
  Nyquist Diagrams
  Bode Plots
  Ziegler-Nichols Tuning
  Root Locus Method
Q. LABORATORY OUTLINE: None ☒ Yes ☐