**Course**

ECE 478 – Robotics and Automation

**Type of Course**

Elective for EE and CmpE Programs

**Catalog Description**

Introduction to robotics; motion actuators, sensors, Homogenous transformations, Forward and inverse kinematics for rigid-link robots, electric ladder diagrams, and Programmable Logic Controllers (PLCs).

**Credits**

3

**Contact Hours**

3

**Prerequisite Courses**

ECE 36200, ME 253, MA 363

**Corequisite Courses**

None

**Prerequisites by Topics**

Programming experience in C/C++. Have a good understanding of linear algebra and differential equations.

**Textbook**

TBD

**Course Objectives**

This course provides an introduction to mechatronics, industrial automation, and robotics. The material covered in this course provides the students a broad knowledge of fundamental topics in electrical and mechanical engineering disciplines including motion actuators and sensors, homogenous transformations, forward and inverse kinematics for rigid-link robots, PLCs and electric ladder diagrams.

**Course Outcomes**

Students who successfully complete this course will have demonstrated:

1. Familiarity with motion actuators. (a, k)
2. Familiarity with sensors. (a, k)
3. Derive the forward and inverse kinematics for an arbitrary rigid-link robot. (a, c, e)
4. An understanding of electric ladder diagrams and their design methods. (c, k)
5. An understanding of programmable logic controllers. (a, k)

**Lecture Topics**

1. Introduction
2. Motion actuators
3. Mechanism for motion transmission
4. Sensors  
5. Rigid motions and homogeneous transformations  
6. Forward and inverse kinematics for rigid-link robots  
7. Programmable logic controllers (PLCs)  
8. Electric ladder diagrams and program for PLCs

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<thead>
<tr>
<th>Computer Usage</th>
<th>High</th>
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<tbody>
<tr>
<td>Laboratory Experience</td>
<td>None</td>
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<tr>
<td>Design Experience</td>
<td>Medium</td>
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<tr>
<td>Coordinator</td>
<td>Yanfei Liu, Ph.D.</td>
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