ROBOTICS AND AUTOMATION  
EET 2430

Class Hours:  2.0
Laboratory Hours:  3.0
Credit Hours:  3.0
Date Revised:  Spring 2011

Catalog Course Description:

Basic robotics and automation principles, including sensor technology, motion principles, and microcontroller technology, are applied. Degrees of freedom, multi-axis motion, gripper technology and other robotic features are covered. Lab includes programming of robots, interfacing sensors, and troubleshooting basic hardware and software problems, as well as analog to digital converter and digital to analog converter applications.

Entry Level Standards:

The student must have an understanding of number systems, basic logic gates, combinational logic circuits, flip-flops, and sequential circuits.

Prerequisites:

EET-1310 or Consent of Instructor

Corequisites:

None

Textbook(s) and Other Course Materials:


I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1-2</td>
<td>Introduction to Industrial Robotics.</td>
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<tr>
<td>3</td>
<td>Robot Classification.</td>
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<tr>
<td>4</td>
<td>Automated Work Cells and CIM Systems</td>
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<tr>
<td>5-6</td>
<td>End-of-Arm Tooling</td>
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<tr>
<td>7-8</td>
<td>Automation Sensors.</td>
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<tr>
<td>9</td>
<td>Work-Cell Support Systems</td>
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<tr>
<td>10</td>
<td>Robot and System Integration</td>
</tr>
<tr>
<td>11-12</td>
<td>Work-cell Programming</td>
</tr>
<tr>
<td>13</td>
<td>Justification and Application of work Cells</td>
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</tbody>
</table>
II. Course Goals*:

The course will

A. Understand the basic applications of Robotic Technology. I, II, III

B. Understand industrial and research applications of robotics and motion control principles. I, II, III

C. Understand sensor technology. I, II, III

D. Understand the instruction set of a Micro-Controller.

E. Understand Analog to Digital Converter principles and interface an ADC to a Micro-Controller. I, II, III

F. Understand servo and stepper motor theory and applications. Interface servo motors to a Micro-Controller. I, II, III

G. Understand basic mechanics as applied to Robotic Systems. I, II, III

H. Interface switches, LEDs, IR sensors, Ultra-sonic and other field sensors to the Micro-Controller. I, II, III

I. Write programs for a Micro-Controller in Robotic applications. I, II, III

J. Understand automation principles, such as feedback control. I, II, III

K. Demonstrate, as an individual and as a team member, library/information skills, time management skills, problem-solving skills, material management skills, and communication skills. I, II, III, IV, V

*Roman numerals after course objectives reference goals of the Engineering Technology program (Career Program Goals and General Education Goals are listed http://www.pstcc.edu/departments/curriculum_and_instruction/syllabi/)  

III. Expected Student Learning Outcomes*:

Students will: be able to:

1. Define the terms used in robotics and motion control applications. A, B

2. Explain open loop and closed loop feedback control. J

3. Construct a block diagram of a robotic system. A

4. Understand basic mechanic principles, such as torque, speed, acceleration, friction, gear ratios, and pulley systems. A, G

5. Identify the purpose of a Micro-Controller. D

6. Explain how a Micro-Controller and other control units are used in robotic and motion control applications. D
7. Interface sensors and motors with a Micro-Controller. C, D, F, H
8. Create simple programs for a Micro-Controller. D, I
9. Learn the basic instruction set for a Micro-Controller. D, I
10. Use a Micro-Controller and sensor assembly to build a robot. D
11. Create application programs to make the robot perform simple tasks. D, I
12. Explain the difference between servo motors and stepper motors. C, F
13. Connect a sensor to an Analog to Digital converter and interface with a Micro-Controller. C, E
14. Apply feedback control principles to automatically control a robotic function. I, J
15. Explore motion control principles. G, F, J
16. Understand the concepts of torque and speed requirements of a robot. G, F
17. Explain how robots are used in industrial applications. A, B
18. Explain the future of robotic systems, motion control systems, and artificial intelligence applications. A, B

* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. Evaluation:

A. Testing Procedures: 80% of grade

The evaluation in the classroom grade will be determined by a combination of tests, homework, and a final exam. Pop quizzes may also be used at the discretion of the instructor. The percentage that each of these factors count and the frequency of quizzes, tests and homework is left to the discretion of the instructor, but the following is offered as a guide:

Tests: 40%
Quizzes 20%
Final Exam: 20%

B. Laboratory Expectations: 20% of grade

The laboratory grade will be determined by a combination of performance (including teamwork) within the lab and the degree of comprehension demonstrated in the lab report. There will be at least ten labs during the semester to go along with the classroom material. The following is offered as a guide for the instructor:

Performance in labs (subjective) 20%
Lab Reports (neatness and content) 50%
Computer Program (or application) 10%
Laboratory Test 20%

Laboratory topics may vary at the discretion of the instructor, but will be related in a timely manner to the course work.
C. Field Work:

None

D. Other Evaluation Methods:

None

E. Grading Scale:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93 - 100</td>
<td>A</td>
</tr>
<tr>
<td>88 - 92</td>
<td>B+</td>
</tr>
<tr>
<td>83 - 87</td>
<td>B</td>
</tr>
<tr>
<td>78 - 82</td>
<td>C+</td>
</tr>
<tr>
<td>70 - 77</td>
<td>C</td>
</tr>
<tr>
<td>60 - 69</td>
<td>D</td>
</tr>
<tr>
<td>Below 60</td>
<td>F</td>
</tr>
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V. Policies

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of the Learning Division, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of the Learning Division.

Class Attendance for Lab: Attendance is required to all lab sessions unless excused by the instructor. Students missing more than four unexcused sessions will receive an "F" and no credit will be received. Students tardy past half an hour will be considered absent.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

• Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
• Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

C. Accommodations for disabilities:
Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at www.pstcc.edu/departments/swd/.

D. Other Policies: