

**Southern Polytechnic State University**  
**MTRE 3710: Mechatronics Engineering Fundamentals**  
Course Syllabus – Fall 2012

**Course Description**

This course will provide basic knowledge, tools and backgrounds for mechatronics design. In particular, it will cover the following topics: MATLAB programming (Variable, Expressions, Matrix and its Operations, MATLAB Scripts, Selection Statements, Looping, File Input/Output, 2-D and 3-D Plots, Sound and Image Processing); Pneumatic and Hydraulic Systems; Electrical and Mechanical Actuation Systems; Design of Mechatronics Systems (Mobile Robots): Kinematics, Sensors, Communication, C++ Programming, Position and Velocity Control, Obstacle Avoidance.

**Instructor:**

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**Textbooks:**

1. Robotics, Vision and Control: Fundamental Algorithms in MATLAB, by Peter Corke, Springer, 2011, ISBN: 978-3-642-20143-1 (**Strongly Recommended**).
2. Mechatronics: A Multidisciplinary Approach, 4th Edition, by W. Bolton, Prentice Hall, 2009, ISBN-13: 978-0132407632 (**Recommended**)
3. MATLAB: A Practical Introduction to Programming and Problem Solving, by Stormy Attaway, Elsevier, Inc., 2009, ISBN-13: 978-0750687621 (**Recommended**).

**Course website on GeorgiaVIEW Vista 8**

<https://spsu.view.usg.edu>

**Prerequisite:**

CSE1302E  
ENGR 2710 or a linear algebra course (Strongly Recommended)

**Learning Outcomes:**

Upon completion of the course, the students should be able to:

- 1- Analyze and interpret data, and operate matrices with MATLAB.
- 2- Code basic MATLAB scripts with various programming elements (expressions, statements, loop and condition selection, functions, file input/output).

- 3- Plot 2-D and 3-D curves with MATLAB.
- 4- Understand the principles of pneumatic and hydraulic systems.
- 5- Analyze mechanical and electrical actuation systems.
- 6- Analyze and design a mechatronics system (mobile robot): kinematics, sensors, actuators, programming, position and velocity control, obstacle avoidance.

**Course Outcome Measures and Assessment:**

Measures and assessment of the outcomes will be made by:

- 1- Periodic homework assignments and quizzes.
- 2- Two one hour tests during the semester.
- 3- Final course project.
- 4- Labs and the corresponding lab reports.
- 5- Course and instructor evaluation at the end of the semester to provide student feedback on the quality of the course and effectiveness of the instructor.

**Topics Covered**

- 1) Introduction to mechatronics system.
- 2) MATLAB: variable, expression, vectors and matrices.
- 3) MATLAB: scripts, input/output, file input/output, functions.
- 4) MATLAB: selection statements, looping, advanced file input/output
- 5) MATLAB: 2-D and 3-D plots, solving linear algebraic equations.
- 6) MATLAB: basic sound and image processing.

**Test 1**

- 7) Pneumatic actuation systems.
- 8) Hydraulic actuation systems.
- 9) Mechanical actuation systems.
- 10) Electrical actuation systems.

**Test 2**

- 11) Mechatronics design: kinematics of a mobile robot
- 12) Mechatronics design: sensors
- 13) Mechatronics design: C++ review, communication and programming
- 14) Mechatronics design: position and velocity control
- 15) Mechatronics design: obstacle avoidance.

**Final Course Project**

**Grading:**

1. Two Tests	40.0 %
2. Homework and Quiz	20.0 %
3. Attendance (Lectures and Labs)	10.0 %
4. Lab reports	10.0 %
5. Course project	20.0 %

**Homework / Lab Reports Preparation Guideline:**

- Only **hard-copy** homework/reports will be accepted. **No email submission.**
- Printed homework is preferred but not necessary.
- Lab reports must be printed. A lab report must include lab objectives, procedures, programs (if applicable), experimental results and conclusions.
- Submit your homework/reports directly to the instructor or insert them into the door of Q342.
- **Late homework and reports will NOT be accepted for credit.**
- Homework/reports must be bounded or stapled
- Show all your procedures for full credit! Write your name on every page. Present your work neatly!

**Class/Lab Attendance Policy:**

“ ... The instructor may reduce the course grade of any student who fails to meet the attendance requirements as set forth in the instructor’s attendance policy. Students should understand they are responsible for all course material covered and that they are responsible for the academic consequences of their absences.” (SPSU Student’s handbook)

Class attendance policy

# of Absence	0 - 3	More than 3
Point Deduction	0	1.5 points per absence

**Disruptive Behavior and Academic Dishonesty**

SPSU has an Honor Code and a new procedure relating to when academic misconduct is alleged. All students should be aware of them. Information about the Honor Code and the misconduct procedure may be found at <http://spsu.edu/honorcode/>.

A faculty member reserves the right to remove any student from his or her course if the student’s behavior is of a disruptive nature or where there is evidence of academic dishonesty. In instances of disruptive behavior and/or academic dishonesty, the faculty member will discuss the circumstances with the student(s) before taking final action. In the event the student cannot be reached, he/she will be given the grade of "Incomplete" until such time as he/she can be reached. The student shall have the right of appeal of the faculty member’s decision first to the faculty member’s department head and then to the appropriate college or school dean and, if necessary, to the Vice President for Academic Affairs. Removal of a student from a course under this provision will result in the faculty member’s issuing a grade of "F". A grade of "F" issued under these circumstances shall not be superseded by a voluntary withdrawal and will be included in the student’s cumulative grade point average calculated for graduation purposes. (SPSU Student’s Handbook)