

DEPARTMENT: MECHANICAL ENGINEERING	
COURSE #: EML 4804 3 credits Course Web Delivery System	COURSE TITLE: Mechatronics II
TYPE COURSE: Technical Elective	TERMS OFFERED: Fall / Spring
CATALOG DESCRIPTION: This course is a senior level follow-on to Mechatronics I. This class focuses on developing greater competence in the application of electro-mechanical components to solve engineering problems and build 'smart' systems. The focus is on the design interplay between electrical and mechanical systems. Microprocessors, circuits, sensors, and actuators will be used in both labs and projects to develop multi-purpose electro-mechanical devices. The class provides instruction and practical exercises in: programming, electronics, signal conditioning, communication protocols, mechanical design, prototyping techniques, and system integration.	PREREQUISITES: EML 3811, Mechatronics I
AREA COORDINATOR: Dr. Jonathan Clark RESPONSIBLE FACULTY: Dr. Jonathan Clark INSTRUCTOR OF RECORD: Dr. Jonathan Clark Building, Office room number: AME 208 (850) 645-0132 clarkj@eng.fsu.edu Office Hours: after class or by appointment DATE OF PREPARATION: 11/03/2017 (JC)	CLASS SCHEDULE: Class: Two times weekly for 1 hr. and 15 min. Lab: 2 hrs. 30 min. lab
TEXTBOOKS/REQUIRED MATERIAL: 1. Introduction to Mechatronic Design, Carrier, J. E., Kenny, T., and Ohline, M., 2010 References, Additional Resources: <ul style="list-style-type: none"> • Developer board used in the lab: http://www.evbplus.com/dragon12_hc12_68hc12_9s12_hcs12.html • The Art of Electronics, Horowitz, P. and Hill, W., 2015 • Learning by Example using C: Programming the DRAGON 12-Plus Using Code Warrior, Haskell R. E. and Hanna D. M., 2008 	SCIENCE/DESIGN (%): 50% / 50% CONTRIBUTION TO MEETING THE PROFESSIONAL COMPONENT: 50% engineering science 50% engineering design
COURSE TOPICS: The topics to be covered includes (not necessarily in the order shown) <ol style="list-style-type: none"> 1. Basic circuits 2. Mechanical Prototyping 3. Circuit Analysis 4. Op-amps, Comparators 5. Sensors 6. Digital I/O, Embedded Programming 7. PWM 8. Interrupts, Timers 9. Gears, Couplings, and Mechanisms 	ASSESSMENT TOOLS: <ol style="list-style-type: none"> 1. Labs (30%) 2. Exams and Quizzes (30%) 3. Projects (40%)

10. Event Driving Programming 11. A/D & D/A 12. Datasheet Reading 13. Power/Batteries 14. Noise 15. Feedback control 16. Communication 17. H-bridges 18. Encoders/Decoders.	
Student Learning Objectives for FSU Curriculum File Syllabus	At the end of the course the student should be able to 1. To design an electro-mechanical system to meet project objectives. 2. To analyze and build passive and active circuits to meet technical requirements. 3. To program microcontrollers and use modern software tools to design mechatronic systems. 4. To demonstrate documentation and presentation skills as an individual and as a group
Justification for addition or change	Course is needed in order that students to learn the basics of designing and analyzing electro-mechanical system.
Level of computer usage: Modes of Instruction: Core Curriculum Course: Availability to other Majors:	None <input type="checkbox"/> Elementary <input type="checkbox"/> Intermediate <input type="checkbox"/> Advanced <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> DIS <input type="checkbox"/> Discussion <input checked="" type="checkbox"/> Other <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
ME COURSE OBJECTIVES* [related to ABET Student Outcomes]	(Numbers shown in brackets refer to department Student Outcomes – http://www.eng.fsu.edu/me/about_us/accred-info.html) 1. To teach how to identify the correct method (electrical, mechanical, or via a software algorithm) to meet project objectives. [5b] 2. To teach how to design an electro-mechanical system to meet project objectives [3a] 3. To analyze and build passive and active circuits to meet technical requirements. [1b] 4. To teach programming and the use of software tools to design mechatronic systems. [10b] 5. To teach professional documentation and presentation skills as an individual and as a group [4a, 7a,b] 6. To teach how to identify the correct method (electrical, mechanical, or via a software algorithm) to meet project objectives. [5b] Numbers refer to the Departmental Student Outcomes, e.g. for course objective 3, [1, 5] refers to student outcomes 1 and 5.
ME COURSE OUTCOMES* [related to ME Course Objective] = FSU Student Learning	*(Numbers shown in brackets are links to Course Objectives above) By the end of the course, a student should be able to: 1. Be able develop software to synthesize sensor inputs and control actuators [3] 2. Be able to develop a complete signal condition system using a combination of hardware, electronic, and software filtering [5] 3. Be able to document technical findings as a team in a professional manner. [4] 4. Be able to execute a project plan to build a mechatronic system with multiple sensor inputs and actuator outputs [1,2] 5. Be able to give professional quality presentations [4] Numbers refer to Course Objectives above, e.g. for course outcome 1, [1] refers to course objective 1.

ASSESSMENT TOOL DETAILS

GRADING/ EVALUATION:

Grades will be based on the following breakdown of graded work:

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| <ol style="list-style-type: none">1. Labs (30%)2. Exams & Quizzes (30%)3. Projects (40%) |
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Letter grades will be assigned equivalent to the following:

Undergraduate Grading Scale	
Numerical Score	Letter Grade
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
0 - 59	F

Departmental policy is that a grade of C or better is required to pass this course.

College of Engineering Undergraduate Policy:

1. It is the policy of the College not to assign “plus and minus (+/-)” grades for undergraduate engineering courses. <http://www.eng.fsu.edu/current/undergraduate/guide.html>, see Grading Policies.
2. Students are required to be familiar with Academic Policies and Requirements as outlined in the COE Student Handbook <http://www.eng.fsu.edu/current/undergraduate/guide.html> page 11

ASSIGNMENTS/RESPONSIBILITIES:

Student Responsibilities

- Participation Attendance
- Homework
- Other Daily Responsibilities
- Projects, including information on group processes
- Tests/Exams

Assessment Tools:

1. In-class problems
2. Group project reports
3. Group presentation
4. Homework
5. Quizzes (Quizzes will not be announced ahead of time)
6. Lab Reports
7. Exam(s)

Examinations:

The date of all exams will be announced at least one (1) week in advance.

Instructional Method(s)

The primary instructional method is a traditional in-class lecture. There will also be extensive use of the Course Web Delivery System for distribution of course assignments and other materials. Course materials available from the textbook publisher may also be used.

COURSE POLICIES:

Attendance Policy:

First day attendance is mandatory for FSU students, and first week attendance is mandatory for FAMU students. Students not in class during the first day (FSU) or first week (FAMU) are to be dropped from the course.

Excused Absences: Excused absences include documented illness, deaths in the immediate family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

Please note that the College of Engineering has a restrictive interpretation of what is considered a valid excuse for an absence. See: <http://www.eng.fsu.edu/current/undergraduate/guide.html> p. 5. If an absence is to be excused, make sure you check beforehand. In case of excused absence, the instructor will work with you to help you make up for missed time and catch up.

Unexcused Absences: A student having more than four unexcused absences will be dropped from the course and assigned the grade F. No exceptions. Tests and exams missed because of unexcused absence receive the grade 0. No exceptions.

Other projects and activities missed completely receive the grade 0 for those projects or activities. No exceptions.

Other Regulations

Note that the penalties for copying work may result in a failing grade for the course. If you are uncertain, please check with the instructor who assigned the work. Working together is encouraged in this course, but blatant copying is not.

Departmental Policy:

A student may continue in the B.S. in ME degree program unless one or more of the following conditions arise;

- a. A grade below C in the second attempt of the same engineering course
http://www.eng.fsu.edu/me/resources/pdf/ME_Prerequisite_Policy.pdf
- b. More than three (3) repeat attempts in engineering courses.
http://www.eng.fsu.edu/me/resources/pdf/ME_Excessive_Repeat_Policy.pdf
- c. Violation of academic honor code as defined in university bulletin or catalog
- d. Use of grade forgiveness (currently available for FAMU students only) in more than two (2) courses.

Make-up Assignments

A make-up examination may be granted to students with a valid excused absence. However, you **must** notify me in advance if your absence involves a planned event or observance of a religious holy day. If an emergency prevents you from attending a scheduled examination, you must notify me at your earliest opportunity. You must obtain a valid excused absence for the emergency to be eligible for a make-up examination. Students with a valid excused absence will not be arbitrarily penalized for missing an assignment.

Students without a valid excused absence are not entitled to a make-up examination. However, certain class assignments may be accepted late, with penalty, without a valid excused absence.

Instructional Method(s)

The primary instructional method is a traditional in-class lecture. There will also be extensive use of the Course Web Delivery System for distribution of course assignments and other materials. Course materials available from the textbook publisher may also be used. The use of online instructional techniques will be introduced.

COURSE SCHEDULE

Week	Topics to be covered (not necessarily in the order shown)
1	Basic Circuits & Circuit analysis
2	Theoretical OpAmps and Comparators
3	Limitations on OpAmps and Comparators
4	Design Methods
5	Switches and Semi-Conductors
6	Diodes and Transistors
7	Sensors Overview
8	Passive Filtering - Midterm project Due
9	Noise and Noise Coupling - Exam
10	Digital Logic and the 555chips
11	Digital IO, Timer and Interrupts
12	PWM and Motor Drivers
13	Control Overview
14	Micro-controller options and debugging
15	Power and Batteries - Final Project Due

DEPARTMENTAL STUDENT OUTCOMES

The department's student outcomes can be found at

http://www.eng.fsu.edu/about/accreditation/program_outcome.html?ID=215&agency=ABET

Program Outcomes/Student Learning Outcomes

Student learning outcomes for students majoring in engineering may be found at

<http://www.eng.fsu.edu/outcomes>

Location of Academic Learning Compacts (ALC)

COE: http://www.eng.fsu.edu/about/accreditation/program_outcome.html?ID=217&agency=ALC

FAMU: <http://www.famu.edu/index.cfm?Assessment&CurrentALCs#engineering>

FSU: <http://learningforlife.capd.fsu.edu/smalcs/learningCompact.cfm?smalcId=62534>

ACADEMIC HONOR POLICY

Students are expected to uphold the University Student Code of Conduct and/or University Academic Honor Code

The Florida A&M University is committed to academic honesty and its core values which include scholarship, excellence, accountability, integrity, fairness, respect, and ethics. These core values are integrated into its academic honesty policy. Being unaware of the Academic Honesty Policy is not a defense to violations of academic honesty. Academic Honesty Policy violations shall be reported and appropriate actions taken by the Department Chair and Associate Dean for Student Affairs and curriculum. The complete Florida A&M Student Code of Conduct - Regulation 2.012 (8a) can be found on (p. 5)

http://www.famu.edu/judicialAffairs/Regulation%202_012%20Student%20Code%20of%20Conduct.pdf and in the Student Handbook "The Fang" p. 61

<http://www.famu.edu/Students/STUDENT%20HANDBOOK%20%28FANG%29%202012-2014.Updated%208.22.13.pdf> p 61

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State

University.” (Florida State University Academic Honor Policy, found at <http://fda.fsu.edu/Academics/Academic-Honor-Policy>.)

AMERICANS WITH DISABILITIES ACT

During the first week of class students with disabilities needing academic accommodation should:

- 1) register with and provide documentation to the FAMU **LDEC** or FSU **SDRC**; and
- 2) bring a letter to the instructor indicating the need for accommodation and what type.

Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from the Student Disability Resource Center has been provided.

For more information about services available to FAMU students with disabilities, contact **The Learning Development and Evaluation Center (LDEC)**

677 Ardelia Court Florida A&M University Tallahassee, FL 32310 Nathaniel Holmes, Director Donna Shell, Asst. Director	599-3180 (phone) 561-2512 (fax) 561-2783 (TDD) http://www.famu.edu/index.cfm?a=EOP&p=ADA
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For more information about services available to FSU students with disabilities, contact the:
Student Disability Resource Center (SDRC)

874 Traditions Way 108 Student Services Building Florida State University Tallahassee, FL 32306-4167	(850) 644-9566 (voice) (850) 644-8504 (TDD) sdrc@admin.fsu.edu http://www.disabilitycenter.fsu.edu/
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This syllabus and other class materials are available in alternative format upon request.

UNIVERSITY’S NON-DISCRIMINATION POLICY STATEMENT

FAMU: <http://www.famu.edu/index.cfm?EOP&NON-DISCRIMINATIONPOLICYSTATEMENT>

FSU: http://www.hr.fsu.edu/PDF/Publications/diversity/EEO_Statement.pdf

SYLLABUS CHANGE POLICY:

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advanced notice.