UNIVERSITY OF CALIFORNIA, SANTA CRUZ
BOARD OF STUDIES IN COMPUTER ENGINEERING

CMPE118(218)/L: INTRODUCTION TO MECHATRONICS

WINTER 2010
T-Th 6:00 – 7:45 PM
CLASS: Jack Baskin Engineering, 165
LAB: Jack Baskin Engineering, 115

DEFINITION

Mechatronics is the synergistic combination of mechanical engineering ("mecha" for mechanisms), electronic engineering ("tronics" for electronics), and software engineering. The purpose of this interdisciplinary engineering field is the study of automata from an engineering perspective and serves the purposes of controlling advanced hybrid-systems such as production systems, synergy-drives, planetary-rovers, automotive subsystems such as anti-block system, spin-assist and every day equipment such as autofocus cameras, video, hard disks, cd-players, washing machines, lego-matics etc.

Mechatronics is centered on mechanics, electronics and computing which, combined, make possible the generation of simpler, more economical, reliable and versatile systems.

The word "*mechatronics*" was first coined by Mr. Tetsuro Moria, a senior engineer of a Japanese company, Yaskawa, in 1969. Mechatronics may alternatively be referred to as "electromechanical systems."

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TEXTBOOKS (ALSO IN THE LIBRARY ON RESERVE):

"Introduction to Mechatronics," by J. Edward Carryer, Thomas Kenny, and Matt Ohline, Pearson/Prentice Hall, 2009. Pre-release in a reader form.

"The Art of Electronics, 2nd Edition," by Paul Horowitz and Winfield Hill, Cambridge University Press, 1989. Available at Baytree Bookstore.

"Mechanical Devices for the Electronics Experimenter," by Britt Rorobaugh, TAB books, 1995. Available at Baytree Bookstore.

"The Cartoon Guide to Computer Science" by Larry Gonick, Barnes and Noble Books, 1983. Available on reserve in the Engineering Library.

READINGS

There is quite a bit of material to cover in this class, and you are expected to have read the assigned reading before coming to class. You will get out of this class what you put into it. Simply put, if you do not do the reading, you will not effectively learn the material. We have gone to quite a bit of trouble in order to find appropriate reading for you, so take the time to read them.

This year, a pre-release version of an upcoming Introduction to Mechatronics book is very generously provided to the class at the cost of printing by the authors. Many of the readings are taken from this book. Any feedback on the readings would be helpful.

GRADING

This course is based on a combination of the lab and class. They go together and are indivisible (they are divided only because that is how things are done here, ideally it would be just one class). If you cannot complete the lab, you cannot complete the course. You will receive the same grade on the course and the lab, and cannot pass one without passing the other. This is essentially a hands-on project class, and the grading reflects this status.

COURSE:	70%	Labs and Projects
	30%	Class
QUIZZES, EXAMS	15%	Midterm, 72 Hour Take Home
	10%	Quizzes (every week on reading)
	5%	Participation
LABS AND PROJECT	8%	Lab 0
	8%	Lab 1
	8%	Lab 2
	8%	Lab 3
	3%	Lab book
	35%	Project

Note: there is a sure fire quick and easy way to fail this class—that is to end the quarter without cleaning up your lab area and returning the microcontroller and daughter boards back to the TA's or the instructor.

NOTE ON ATTENDANCE: CMPE/EE 123A

There will be a quiz at the beginning of class covering the required reading material *at least once a week*. No make-up quizzes will be given, nor will there be an opportunity to take the quiz later in that class. If you must miss a quiz, contact the instructor or TAs *before* the class to make arrangements. The only

accepted excuse after a quiz is from the ER. If you are also taking the capstone design, CMPE/EE 123A/B, your attendance in that class will be reflected on your grade in this class as well.

WWW SITE, VIDEOS, AND WEBFORUM

Website: www.soe.ucsc.edu/classes/cmpe118/Winter09

Check this site often as this is where the homework assignments, lecture notes, labs, homework and test solutions, and lecture videos are posted. You are expected to read the material on the website.

WebForum: TBA, look for it on the class website shortly.

Use the webforum to post questions to the tutors and the TAs about lab and class work. Use it to ask questions of other students. Do not expect quick replies from the instructor, use e-mail for that. Do NOT post code onto the webforum.

COURSE WORK: CMPE 118

Attendance is highly recommended for the lectures as the material builds up quickly. Lecture material will be made available on the website, sometimes before covered in class. Annotated lecture notes will be posted after class in a timely fashion.

There will be weekly quizzes at the beginning of class that are both required and graded. Though they are worth only 10% of your overall grade, they are essential to mastering the material. There will one take-home midterm exam based on design problems covered in the lecture and on the quizzes. The midterm and quiz material will be based on reading and lecture material.

LAB WORK: CMPE 118 L

This class should be a lot of fun. I would add also a lot of work (think: drinking from the firehose). There is a lot to cover, and only 10 weeks to get you familiar with it and using it in an unstructured project. Prepare to spend over 20 hours a week on this class, less at first, much more towards the end. We will make every attempt to help you, and to ensure that you succeed, but you have to put in the work yourselves.

You must be enrolled in CMPE 118L to remain in this class. You must pass CMPE 118 to pass CMPE 118L. You will receive the same grade for both the lab and the class, and thus cannot pass one without passing the other. There is a lab fee of I think $100 per student, which will cover the lab kits and the use of the microcontrollers and daughter-boards (which some of you will manage to damage by the end of the quarter). The lab will be open 24/7; times when the TA's and the Professor are in Lab will be announced later in the quarter, but expect to spend all night there several times during the quarter.

We will be working with a 16 bit microcontroller, the Freescale 68HC9S12C32 (formerly Motorola), and have a number of subsystem modules and daughter boards that will help you through the course. This is a fairly typical microcontroller, inexpensive and powerful enough for the tasks that we will cover. Freescale offers educational starter kits with the same processor, and if you wish you may purchase such a board to allow you to work at home. Additionally, you will be working in teams of three for the project, and should think early about joining up with your team. See the class website for more information on the lab.

This class is based largely on a team project; as such it has a strong collaborative element. This collaboration is understood, and encouraged. However, this is NOT license to copy others' work. Credit for collaboration should be explicitly noted; failure to give credit on collaboration is considered a form of cheating and will be dealt with accordingly.

ACADEMIC HONESTY

Academic honesty is a requirement for the course. All assignments must be your own independent work; this includes quizzes, exams, and labs.

What is cheating? It is presenting work that is not yours as your own. You can, and are encouraged to, discuss and strategize with your colleagues on homework and labs, but your work should be your own. Copying is NEVER acceptable.

On the labs, cheating is sharing code when not explicitly told that it is permitted. If a student is caught cheating in either the class or the lab this will result in an immediate failure in the class and the lab. It will be reported to your college and your department. DO NOT CHEAT; it is not worth it.

ACKNOWLEDGEMENTS

This course is based on a the Smart Product Design sequence (ME218A, B, C), and the one quarter Mechatronics class (ME210/EE118) offered at Stanford by the Smart Product Design Lab, headed by Dr. Ed Carryer.

I would like to acknowledge the tremendous help of Prof. Ed Carryer of Stanford University in bringing this topic to UCSC via Prof. Gabriel Elkaim, who took it from him as a student, for all of his help with the slides, the software libraries, and the electronic hardware, and helping to set this course up. Without his help and inspiration, this class would not be here. I would like to also acknowledge Prof Gabriel Elkaim directly for allowing me the opportunity to teach "his" class and by being generous with all his material and giving me free reign with it.