SYLLABUS (Tentative 7/3/08)

Dates,Time, and Place:

Tue & Thu, 9:00 – 10:30 am, Room 1010 H.H. Dow

Instructors:

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Office Hours:
Tue 10:45am - noon
Wed 4 – 5 pm
or by appointment

Textbook:

There is no textbook. Course notes and recommended readings will be available through the CTOOLS web page for ME568 for Fall 2007. (see http://ctools.umich.edu). On reserve for ME568 at the engineering library are several books: (1) Gillespie, T., 1992, *Fundamentals of Vehicle Dynamics*, Society of Automotive Engineers, (2) Wong, J.Y., 1993, *Theory of Ground Vehicles*, 2nd edition, Wiley, New York., (3) Kiencke, U. and L. Nielsen, 2000, *Automotive Control Systems*, Springer-Verlag, Berlin, 2000, (4) Rajamani, R., *Vehicle Dynamics and Control*, Springer, 2006., and (5) Bosch, 2000, *Automotive Handbook*, 5th Ed.

Background:

Students should have some background in dynamics, automatic control, and automotive engineering (all at the introductory undergraduate level). An introductory course in Automatic Control, such as ME461 or equivalent, is an essential prerequisite. Familiarity with Matlab/Simulink is needed, as these are used extensively in the class notes and homework. An excellent on-line tutorial is available at http://www.engin.umich.edu/class/ctms/ (or for those not on the UM network, please see http://www.engin.umich.edu/group/ctm/).

Objectives:

An overview of vehicle control systems. e.g. cruise control, engine and transmission control, anti-lock brakes, traction control and active suspensions, human factors and the role of the driver in the control loops. Advanced vehicle control systems for Intelligent Transportation Systems (ITS) will also be covered, including collision detection and avoidance, lateral and longitudinal control and platooning. Students will be introduced to the basic concepts and terminology, the state-of-the-art, and basic methodologies. They will, upon completion of the course, be able to read the literature on this subject, and to do independent design, research and development.

Grading:

Five Homework Sets	50%
Take-home final exam	50%

Homework:

Due dates for the five homework sets are given in the course outline. Homework must be turned in by the start of class on Thursdays on these due dates. Assignments are handed out at least two weeks in advance. Homework solutions are provided, so late homework will not be accepted.

TENTATIVE COURSE OUTLINE (7/3/08)

Session No	DATE	TOPICS	DUE DATES
1	Tu 9/2	Introduction to course and motivation	
2	Th 9/4	Background on Modeling and Control	
3	Tu 9/9	Matlab/Simulink review	
4	Th 9/11	Engine modeling	
5	Tu 9/16	Vehicle dynamics - longitudinal	
6	Th 9/18	Vehicle dynamics - lateral	
7	Tu 9/23	Vehicle dynamics – vertical and ride	
8	Th 9/25	Human factors	HW #1
9	Tu 9/30	Driver Modeling	
10	Th 10/2	Automotive control - overview	
11	Tu 10/7	Powertrain controls – A/F ratio and spark control	
12	Th 10/9	Powertrain controls – idle speed control, transmissions	
13	Tu 10/14	Background on computer controlled systems	
14	Th 10/16	Fuel cell and hybrid vehicles	HW #2
15	Tu 10/21	FALL STUDY DAY – NO CLASS	
16	Th 10/23	Fuel cell and hybrid vehicles	
17	Tu 10/28	Vehicle controls – cruise control	
18	Th 10/30	Vehicle controls – active suspensions	HW #3
19	Tu 11/4	Vehicle controls – active suspensions	
20	Th 11/6	Vehicle controls – antilock braking	
21	Tu 11/11	Vehicle controls – traction control	
22	Th 11/13	Vehicle controls – vehicle stability & rollover	HW#4
23	Tu 11/18	Vehicle controls – four wheel steering	
24	Th 11/20	ITS - overview	
25	Tu 11/25	ITS – active safety	
26	Th 11/27	THANKSGIVING RECESS	
27	Tu 12/2	ITS – AHS and platooning	
28	Th 12/4	ITS – Automated steering	HW#5
29	Tu 12/9	Course review	
	Fr 12/12		Take-home final exam