

ME 360/390 Vehicle System Dynamics and Controls Unique No. 17510/17850 TTh 1230-2 pm, ETC 4.150 Raul G. Longoria Office ETC 5.134B, Hrs: 2-3 pm (TTH)	Department of Mechanical Engineering The University of Texas at Austin Spring 2018 Phone: (512) 471-0530 E-mail: r.longoria@mail.utexas.edu
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1. Course rationale: This course reviews and introduces concepts in dynamics, systems, and control as applied to ground vehicles, including models for handling, performance, and ride modes, in order to build familiarity with principles and methods useful in design and development of manned and unmanned vehicle systems.

2. Course aims / objectives:

1. Review and strengthen understanding of dynamics, system dynamics, and controls.
2. Establish familiarity with key modeling approaches to analyze and design for performance, handling, and ride behavior in ground vehicles.
3. Gain familiarity for static and dynamic properties and performance of tires, possibly on different terrain types.
4. Review basic vehicle control methods used in traction/braking, handling/steering, and suspension for vehicle systems, including mechatronics concepts (electronic controls, sensors and actuators) as needed.
5. Develop and/or enhance skill in formulating and using computer-based models and simulations, primarily using Matlab.

3. Format and procedures: A *course log* ('clog') on the Canvas course home page conveys class progress with links to reference materials and assignments. Canvas is used for all assignment submissions.

4. Course Schedule: This syllabus describes initial plans and objectives for the semester. Adjustments may be made based on how the courses progresses and based on class interests. Table 1 lists tentative course topics.

Table 1: Tentative schedule of topics and assignments

Week(s)	Topics(s)	HW / Q / P
1	Introduction / motivation	
1-3	Basic vehicle dyn & control	
3	Ground vehicle concepts	
3-4	Lateral dynamics & stability	
5-6	Longitudinal dynamics & performance	
6-7	Vehicle control systems	
8-10	Vehicle ride dynamics	
-	Human v. Machine control	
-	Vehicle multibody modeling	

5. Prerequisites: For undergraduates (ME 360), upper-division standing is preferred, admission to an appropriate major sequence in engineering, and ME 344 with a grade of at least C-; for others, upper-division standing and written consent of instructor. Familiarity with Matlab programming will be expected.

6. Course Requirements and Policies:

Course progress and participation policy:

- (a) **Progress:** Attending class is essential to progress in the course. If you need to miss, you are responsible for timely review of material covered and submission of assignments.
- (b) **Participation:** There is a participation grade that will be based on your conduct and effectiveness during any in-class discussion and work.
- (c) **Behavior:** You are expected to show respect and civility in all discourse with fellow students, administrators, and the course instructor.

Course Readings/Materials:

- (a) **Textbook:** No textbook is required. Content will be provided through lecture slides and/or handouts via Canvas.
- (b) **Supplemental references:** Examples of useful supplemental texts include: a) J.Y. Wong, Theory of Ground Vehicles, any edition, John Wiley and Sons, b) D. Karnopp, Vehicle Dynamics, Stability, and Control,

CRC Press, as well as any other reference that emphasizes model development and simulation usage, especially using Matlab. You may also find texts from past dynamics, system dynamics, and introductory controls courses useful.

(e) **Matlab Usage and Access:** It is expected that you have experience with Matlab and/or can find resources to help you solve problems assigned using this platform.

Assignments, Assessment, and Evaluation:

(a) **Assignments and Submissions:** All assignments are made on Canvas with specified due dates and submission requirements. Unless otherwise indicated, these should be submitted as PDF documents via Canvas.

(e) **Preparation and submission of assignments:** All submitted work should be prepared neatly and organized so it is easy to evaluate. If hand-written, writing must be neat and legible. Unacceptable assignments will not be graded.

(f) **Participation:** This is an elective, so if you enroll in this course it is expected you will attend lectures. Your participation through attendance, demonstrations, and classroom discussions will be graded.

(g) **Late policy:** Late homework will not be accepted.

(i) **Grading style:** All grading will be completed on Canvas, with feedback indicated directly on the submitted PDF documents.

(j) **Quizzes:** Quizzes will be short and in-class, meant to evaluate how well you are following fundamental concepts covered in the course.

(k) **Final exam:** There is no final exam.

7. Grading Policy: Homework (30%), Quizzes (15%), Participation (10%), 3 Projects (10, 15, 20%)

8. Course Outcomes: This course addresses the following program outcomes of the ABET Engineering Curriculum 2000: 4, 5, 6, 7. In particular, attention by the student should be given to Outcome 4, "Ability to set up and conduct experiments, and to present the results in a professional manner."

9. Academic Integrity: University of Texas Honor Code - The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Each student in this course is expected to abide by the University of Texas Honor Code. Any work submitted by a student in this course for academic credit will be the student's own work. For this course, collaboration is allowed when specified in the assignment.

10. Other University Notices and Policies: Be familiar with the University's official e-mail student notification policy. It is your responsibility to keep the University informed of changes in e-mail address. Students are expected to check Canvas and e-mail on a frequent and regular basis in order to stay current with University-related communications, recognizing that certain communications may be time-critical. (see <http://www.utexas.edu/its/help/utmail/1564>).

Documented Disability Statement. The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4241 TDD. Notify the course instructor or TA as quickly as possible if the material being presented in class is not accessible (e.g., instructional videos need captioning, course slides are not readable, etc.).

Behavior Concerns Advice Line (BCAL). If you are worried about someone's behavior, use the Behavior Concerns Advice Line to discuss your concerns. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The University of Texas Police Department (UTPD). Call 512-232-5050 or visit <http://www.utexas.edu/safety/bcal>.

Religious Holy Days: University policy requires students to notify their instructors as far in advance of the absence as possible so that arrangements can be made. You will be given an opportunity to complete missed work within a reasonable time after the absence.

Drop Policy. Contact the ME department Undergraduate Office about drop policy.