

ME 360/390 Vehicle System Dynamics and Controls Unique No. 18215/18545 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 2020 Phone: (512) 471-0530 E-mail: r.longoria@mail.utexas.edu
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1. Course rationale: This is an elective course that reviews and applies concepts in dynamics, systems, and controls to ground vehicle systems. Typical models used to analyze and predict handling, performance, and ride are introduced, including models for how tires interact with surfaces.

2. Course goals / objectives:

1. Review and reinforce 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. Learn how to assess vehicle stability in various modes of operation
5. Gain familiarity with vehicle control methods used in traction/braking, handling/steering, and suspension for vehicle systems, including mechatronics concepts (electronic controls, sensors and actuators) as time permits
6. Develop and/or enhance skill in formulating and using computer-based models and simulations using Matlab

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

4. Course Schedule and Topics: 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. Tentative course topics will likely follow in this order: basic vehicle dynamics & control, ground vehicle concepts, lateral dynamics & stability, longitudinal dynamics & performance, vehicle control systems, vehicle ride dynamics, and human v. machine control.

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

6. Course Readings/Materials: No textbook is required. Content will be provided through lecture slides and/or handouts via Canvas. 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. It is expected that you have experience with Matlab and/or can find resources to help you solve problems assigned using this platform.

6. Grading Policy: Homework (30%), Quizzes (30%), Projects (10, 10, 20%)

7. Expectations:

- (a) **This is an elective.** If you enroll in this course it is expected you will attend lectures, participate in classroom discussions, and keep up with readings and assignments.
- (b) **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.
- (c) **Preparation and submission of assignments:** All submitted work should be prepared neatly and organized. If hand-written, writing must be neat and legible. Unacceptable assignments will not be graded.

- (d) **Quizzes:** Quizzes will be short and in-class, aiming to evaluate how well you are keeping up with material covered in lectures and assignments.
- (e) **Late policy:** Late homework will not be accepted.
- (f) **Final exam:** The last project replaces the final exam.

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.