1. This course builds on concepts in dynamics and system dynamics and controls to study ground vehicle systems.

2. **Vehicle dynamics** in the performance, handling, and ride modes will be reviewed, introducing: a) modeling of power sources and loads, including concepts in power transmission, b) methods for modeling and predicting directional response and stability in small and large disturbance maneuvers, and c) ride phenomena to understand suspension response/design, including response to random road excitation.

3. The influence of **vehicle-environment interaction** will be studied, and static and dynamic properties and performance of 'running gear' (tires, tracks, etc.) on different types of terrains will be presented.

4. **Concepts in vehicle control** will be introduced relating to traction/braking, handling/steering, and suspension in vehicle systems, with mechatronics concepts (electronic controls, sensors and actuators) introduced/reviewed as needed.

5. **Computer-based models and simulation** will be used throughout the course, and an introduction to MSC.ADAMS will be provided.

**Prerequisites**
For undergraduates (ME 379M), admission to Major Sequence, ME 324, and ME 344 (Dynamic Systems and Controls), or consent of instructor. Familiarity with computer-based simulation of dynamic systems is expected.

**Required Textbook**

**References**
Material will be drawn from:


**Lectures & Homework**
1. The [semester schedule](http://www.me.utexas.edu/~longoria/VSDC/index.html) provides outline of course and lecture summaries.
2. [Reading, homework and projects](http://www.me.utexas.edu/~longoria/VSDC/index.html)
3. Some materials will be posted on [BlackBoard](http://www.me.utexas.edu/~longoria/VSDC/index.html)

**Grading**
Homework (40%), 2 Quizzes (20%), Term Project (20%)

**More...**
See [Page 2 of Syllabus](http://www.me.utexas.edu/~longoria/VSDC/index.html)

Last updated January 25, 2010
ME 379M/397: Spring 2008
Vehicle System Dynamics and Controls

Department of Mechanical Engineering
The University of Texas at Austin

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Unique #: 18540 (379M)/18820 (397)

Course Topics

This course will introduce most of the material listed below, in the context of solving practical problems related to projects in vehicle systems dynamics and controls.

<table>
<thead>
<tr>
<th>Vehicle Dynamics</th>
<th>Vehicle-Terrain Modeling</th>
<th>Vehicle Technology</th>
<th>Controls</th>
<th>Computer-Aided Analysis/Simulation</th>
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<tbody>
<tr>
<td>- Rigid body dynamics</td>
<td>- Tire forces on hard surfaces</td>
<td>- Basic source modeling (engines, motors, etc.)</td>
<td>- Sensors</td>
<td>- Using Matlab, MathCAD for basic analysis</td>
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<td>- Vehicle coordinate systems</td>
<td>- Tire-soil interaction</td>
<td>- Simple power transmission concepts</td>
<td>- Actuators</td>
<td>- Simulation with Matlab and Simulink or LabVIEW</td>
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<tr>
<td>- Vehicle models for basic analysis</td>
<td>- Track-terrain modeling</td>
<td>- Basic power generation concepts</td>
<td>- Cruise control</td>
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<tr>
<td>- Performance analysis</td>
<td>- Characterizing typical terrains for mobility analysis</td>
<td>- Traction control</td>
<td>- Anti-lock braking</td>
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<td>- Handling/turning</td>
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<td>- Directional control (steering)</td>
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<tr>
<td>- Ride/vibration</td>
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<td>- Vehicle stability controls</td>
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<td>- Obstacle performance</td>
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<td>- Active suspension</td>
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</table>

Homework, Quizzes, Project and Course Policies

1. **Homework/Projects.** There will be about 5 homework assignments that may include extended computer-based modeling/analysis, and the weighting will be based on content.
2. **Quizzes.** Two quizzes are planned to motivate learning fundamentals.
3. **Project.** There will be one term project involving modeling, control and simulation.
4. **Format requirements/guidelines.** Homework and project work must be completed in a succinct, professional manner and submitted by the due date in hard copy form. Any work on the back sides of pages will not be reviewed. Pages should be stapled on the left side with name clearly marked on each page.
5. **Office Hours.** Office hours are 2-3 pm on Tuesdays and Thursdays. You can also make an appointment by contacting me anytime via e-mail. Please do not visit my office on Tuesday or Thursday before class.
6. **Resource Usage.** It is expected that you will fully utilize the library and/or other resources made available to you by the University, especially computing resources as needed.
7. **University Support.** 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.

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