**ME 56500**  
**VEHICLE DYNAMICS**

**Course Outcomes**

1. To mature in application of modeling techniques to predict the *dynamic behavior of highway vehicles.*
2. To develop an understanding of the relationships between *vehicle design variables* and *vehicle dynamic behavior* (acceleration, braking, handling, and ride).

<table>
<thead>
<tr>
<th>Performance (6 wks)</th>
<th>Handling (7 wks)</th>
<th>Ride (2 wks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tire Models</td>
<td>1. Indeterminacy of tire loads</td>
<td>1. Comfort</td>
</tr>
<tr>
<td>2. Aerodynamics</td>
<td>2. Tire models and slip</td>
<td>2. Quarter-car models</td>
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<tr>
<td>4. Vehicle Model</td>
<td>4. Transient steering models and stability</td>
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<tr>
<td>5. Braking Models</td>
<td>5. Steady-State models, understeer/oversteer</td>
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**Typical Simulation Projects**

1. Manual Transmission vehicle full-throttle simulation of 1/4 mile  
2. Lane-change steering simulation  
3. Understeer coefficient variation with lateral acceleration
1. **COURSE NUMBER:** ME 56500 Vehicle Dynamics

2. **CREDITS AND CONTACT HOURS:** 3 credits  
   a. Lecture – 3 days per week at 50 minutes for 16 weeks

3. **COURSE COORDINATOR OR INSTRUCTOR:**  
   J.M. Starkey

4. **TEXTBOOK:**  

5. **SPECIFIC COURSE INFORMATION:**  
   a. **Catalog Description:** Modeling of wheeled vehicles to predict performance, handling, and ride. Effects of vehicle center of mass, tire characteristics, traction and slip, engine characteristics, and gear ratios on performance. Suspension design. Steady state and transient handling models of four-wheeled vehicles and car-trailer systems to determine oversteer and understeer characteristics, critical speeds, and stability. Multi-degree-of-freedom ride models, including tire and suspension compliance. Computer simulations. Current research topics in vehicle vibration isolation. Typically offered in the spring.

   b. **Prerequisites:**  
      ME 35200 – Machine Design I  
      ME 37500 – System Modeling and Analysis

   c. **Status:**  
      Elective

6. **SPECIFIC GOALS FOR THE COURSE:**  
   a. **Course Outcomes:**  
      1. To mature in *application* of modeling techniques to predict the dynamic behavior of highway vehicles.  
      2. To develop an *understanding* of the relationships between vehicle design variables and vehicle dynamic behavior (acceleration, braking, handling, and ride).

   b. **Related ME Program Outcomes:**  
      A1. Engineering Fundamentals;  
      A2. Analytical Skills;  
      A3. Experimental Skills;  
      A4. Modern Engr Tools;  
      A5. Design Skills;  
      A6. Impact of Engr Solns;  
      B1. Communication Skills;  
      B2. Teamwork Skills  
      B3. Prof/Ethical Responsibility;  
      B4. Contemporary Issues;  
      B5. Life-Long Learning;  
      C1. Leadership;  
      C2. Global Engineering Skills;  
      C3. Innovation;  
      C4. Entrepreneurship

7. **LIST OF TOPICS:** See following page.

**PREPARED BY:** J.M. Starkey  
**REVISION DATE:** June 18, 2013