1. Course number and name
   **EML 4288 Vehicle Design**

2. Credits and contact hours
   3 cr, 2.5 contact hours (2 hrs. 30 min. lecture)

3. Instructor’s or course coordinator’s name
   Instructor: Dr. Patrick Hollis, Coordinator: Dr. Jonathan Clark

4. Text book, title, author, and year
   Automotive Engineering Fundamentals, Stone, R. and Ball, J. K., 2004
   - References, Additional Resources
     - Tires, Suspension and Handling, Dixon, J. C., 1996
     - Electric and Hybrid Vehicles: Design Fundamentals, Husain, I., 2010

5. Specific course information
   a. brief description of the content of the course (catalog description)
      This introductory course in vehicle design emphasizes vehicle dynamics. Content covers the primary performance related features of vehicle design (suspension, steering, chassis, and tires). Using the latest industry-standard software, the course examines various design parameters that influence vehicle performance and handling.
   b. prerequisites or corequisites
      Prerequisites: EML 3014C and EML 3018C
   c. indicate whether a required, elective, or selected elective course in the program
      Selected Technical Elective course

6. Specific goals for the course
   The goal of this course is to produce a student capable of designing and analyzing the handling characteristics of simple vehicles. The student should be able to synthesize a reasonable solution to a given design problem, analyze the proposed solution, and judge its suitability.
   a. Course Outcomes
      1. Explain the various contributing factors to tire forces [1]
      2. Explain and find tire lateral forces given slip angles [1]
      3. Use a bicycle model to analyze neutral steer, understeer and oversteer [2]
      4. Calculate dynamic responses to simple inputs [3]
      5. Find the various instant centers in vehicle suspension systems [4]
      6. Explain the important geometric aspects of major suspension systems [4]
      7. Explain the geometry factors in a steering system [5]
      8. Calculate the loads that act on the wheels due to acceleration, braking and cornering [6]
      9. Use ADAMS to model vehicle behavior [7]
      Numbers refer to Course Objectives below, e.g. for course outcome 1, [1] refers to course objective 1.
   b. Course Objectives and Relation to Student Outcomes
      1. To introduce the important aspects of tires and their effects on vehicle performance [1, 3, 5, 10]
2. To introduce steady state stability and control aspects of vehicle handling [1, 3, 5, 10]
3. To introduce transient stability and control aspects of vehicle handling [1, 3, 5, 10]
4. To introduce suspension geometry and how it influences behavior [1, 3, 5, 10]
5. To introduce steering systems [1, 3, 5, 10]
6. To examine the various effects that affect wheel loads [1, 3, 5, 10]
7. To provide computational tools to assist in the design, modeling, and simulation of vehicle systems [1, 3, 5, 10]

Numbers refer to Departmental Student Outcomes, e.g. for course objective 1, [1, 3, 5, 10] refers to student outcomes 1, 3, 5, 10.

7. Brief list of topics to be covered
   • Acceleration Performance
   • Braking Performance
   • Road Loads
   • Ride
   • Steady State Stability and Control
   • Transient Stability and Control
   • Suspensions
   • Steering
   • Tires
   • Adams Software for Vehicle Design and Simulation