The statement of need for the Engr 374 design project is to design a front suspension for a design competition vehicle.

**Design Approach.** The project should be attacked using the design process outlined in Chapter 1 of the text. (Following this approach carefully will help prepare the student for the capstone senior design project.) This means that you will need to do background research, define goal statements and task specifications as well as follow through the rest of the process. In order to guide your design process, consider the following (these are not necessarily task specifications!).

1. Consider using a dimensionless performance index function to evaluate potential designs. An example would be

   \[ I = A(\alpha - 3\gamma)^2 + B(\gamma + 3\alpha)^2 + C(-R_c) + D(s^2) \]

   in which \( \alpha = \) camber in jounce, \( \gamma = \) camber in rebound, \( R_c \) is roll center height, and \( s \) is scrub. You would choose weighting factors \( A, B, C, \) and \( D \) to assign relative importance to each of the terms in this function.

2. You should try several design iterations. For each, compute the performance index; try to minimize it.

**Report.** The project must be documented in a design report (maximum of six pages excluding appendices). It should follow the general outline of Chapter 1 in the text. The report should include, among others, the following critical elements:

1. Identification of need, background research, goal statement, and task specifications (draft due May 10).
2. Explanation of your approach to solving the problem (this is not the solution, but your method of attaining it). Include the results of several iterations if necessary.
3. The computer or graphical analysis used to arrive at the final solution (appendix), along with computer-formatted samples of equations used (body of report).
4. A scaled layout showing the shape (and numerical length) of each link as assembled, along with the wheel (appendix).
5. A diagram of the final design (body of report) showing the links in each precision position along with measurements of performance criteria.
6. A graph showing the variation of the wheel’s instant center of velocity throughout its motion. You must use your own graphical or computer analysis to create this graph.
7. A working prototype built to scale. This may be built all in one plane.

**Collaboration.** You may freely discuss the following information with your study group.

1. Background research, goal statements, task specifications
2. General approaches and linkage types
3. General methods of synthesis or analysis

You may not discuss the following information.

1. Mechanism dimensions which work well.
2. Computer code or electronic files for analysis
3. Precise wording or paraphrasing of reports

**Due Date:** Thursday, May 24, 4:30pm in Dr. Thompson’s office. Late work not accepted!