

24-261 Statics, Fall 2001  
Laboratory #4  
Due: 1:30 PM, October 11, 2001

## GOALS

The purposes of this laboratory are to (1) acquaint you with a commonly used mechanism; (2) give you experience analyzing the kinematics (geometry) and statics of this mechanism.

The mechanism is depicted on the following page. You will apply a force to a cord, measure the force and motions of the members of the mechanism. The spring constant is 5 lb/in (McMaster part 9657K221).

## PROCEDURE

- ~~✍~~ Apply a force to the cord, maintaining the cord horizontal.
- ~~✍~~ Record the orientation of the upper link using the protractor. When the upper link is vertical, its angle is defined as 90°. Initially, the angle is less than 90°.
- ~~✍~~ Record the length of the spring using the ruler.
- ~~✍~~ Record the force applied to the cord using the spring scale.
- ~~✍~~ Carry out the above measurements for approximately 2° increments in the upper link orientation, starting from the initial orientation and continuing to as close to 90° as possible. Carry out the measurements at least twice and average the results. Record and present all of the results.

## RESULTS

- (i) Present all the raw data in a spreadsheet, with columns labeled, along with averages.
- (ii) Using averages, plot the length of the spring as a function of the link angle.
- (iii) Given the lengths of the members, their initial orientations and the initial length of the spring, use geometry to predict the length of the spring as a function of the link angle. **Clearly derive the necessary equations, defining variables and showing all your steps.** Plot this prediction on the same plot as (i).
- (iv) Using averages, plot the force applied to the cord as a function of the link angle.
- (v) Given the lengths of the members, their initial orientations and the spring constant, use geometry and statics to predict the force applied to the string as a function of the link angle. **Show calculations steps clearly.** Plot this prediction on the same plot as (iv).

## Experimental Set Up for Laboratory 4

