The following topics should form the nucleus of what you study for the final exam in Kinematics and dynamics of machinery.

Be able to add and subtract vectors graphically with a ruler and a protractor. Bring a ruler and protractor to the final exam.

Know the basic position and velocity relationships that allow you to analyze the motion of a vehicle, like Prof Owen on his bicycle, as exemplified in Problem 3 of Midterm 1.

Know how to use instantaneous centers to find the velocities of links and points in a mechanism.

Know the kinematics of a rotating wheel very well. Know the relative-velocity/relative-acceleration relationships between points on the rim and the center of the wheel. Know the characteristics of the cycloidal curve generated by a rim point and the path-referenced velocity and acceleration of a point generating that curve as it moves along the curve (e.g., $\vec{a}$ is tangent to the path at the contact point on the ground; $\vec{a}$ is normal to the path at the top of the cycloidal curve).

Know the kinematics of a slider-crank mechanism very well. This includes using instantaneous centers to find angular and linear velocities. It also includes knowing the angular and linear velocities, also the location of instant centers for the four poses (crank at 0°, 90°, 180°, and 270°).

Know the kinematics of a four-bar mechanism very well. What you need to know is similar to that expressed above for the slider-crank.

Know how a four-bar mechanism is part of the drive train of a bicycle.

Know the relative-velocity and relative-acceleration equations. Know how one develops from these equations the velocity and acceleration diagrams to describe the kinematics represented by the relative-motion equations.

Know the five-term acceleration equation and what all the terms mean. Know how to calculate the Coriolis acceleration of a mechanism that involves a component moving within a rotating reference plane (we saw this on the quick-return mechanism, with the slider moving in and out along link 4).

Know something about the quick-return mechanism—how it works, how to identify the end strokes of link 4, what happens to the mechanism when link 4 is vertical (both positions of link 2).

Know what cams are and how they work. Know the basic terminology of cams—base circle, rise, fall, dwell. Be able to generate a cam curve from a description of needed linear motion.

Be able to use the $x/v/a$ curves for a cam or for analyzing the leg motion of a bicycle rider to generate the unknown parts of this motion. The calculation that we've done twice is that one knows the displacement; one also knows that the area under part of the velocity curve is equal to this displacement. From that one can calculate the maximum velocity. From that one can then calculate 1) the acceleration curve and 2) the displacement curve. We did this with cams for the case of constant acceleration. We did it for the bicycle rider's legs for the case of sinusoidal motion.