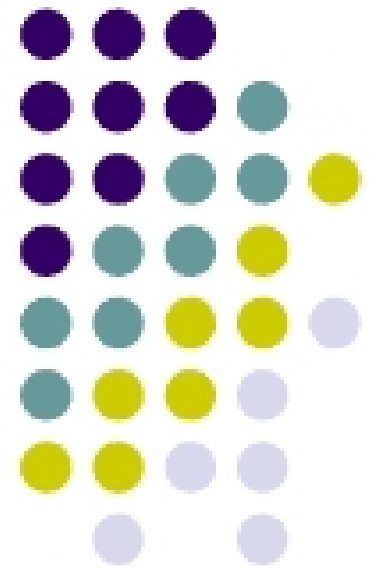


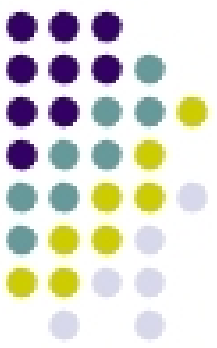
ME451

Kinematics and Dynamics of Machine Systems

Dynamics of Planar Systems: Chapter 6
November 1, 2011



Before we get started...



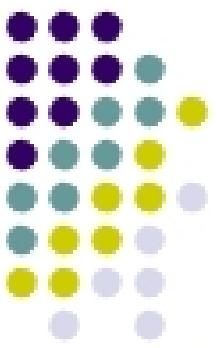
- Last Time
 - Discuss “Singular Configurations of Mechanisms” (Section 3.7)
 - Start the “Dynamics Analysis” part of the course (Chapter 6)

- Today:
 - Virtual displacements
 - Look at all types of forces we might deal with in ME451 and determine the virtual work they lead to
 - Start derivation of EOM of one body (pp. 200 of textbook)

- HW (due on November 3 at 11:59 PM):
 - ADAMS
 - MATLAB

- Quick Remarks:
 - Exam coming up on Nov. 3 during regular class hour
 - Exam Review on Nov. 2, starting at 6PM in room 1153ME

Two Principles



- Principle of Virtual Work
 - Applies to a collection of particles
 - States that a configuration is an equilibrium configuration if and only if the virtual work of the forces acting on the collection of particle is zero

$$\sum_i \delta \mathbf{r}_i^T \cdot \mathbf{F}_i = 0$$

- D'Alembert's Principle
 - For a collection of particles experiencing accelerated motion you can still fall back on the Principle of Virtual Work when you also include in the set of forces acting on each particle its inertia force

$$\sum_i \delta \mathbf{r}_i^T \cdot (\mathbf{F}_i - m_i \ddot{\mathbf{r}}_i) = 0$$

- NOTE: we are talking here about a collection of *particles*
 - Consequently, we'll have to regard each rigid body as a collection of particles