1. **Course number and name**  
**EML3013C Dynamic Systems I**

2. **Credits and contact hours**  
4 cr, 5.25 contact hours (2 hrs. 30 min. lecture, 2 hrs. 45 min. lab)

3. **Instructor’s or course coordinator’s name**  
Instructor: Dr. Carl A. Moore, Coordinator: Dr. Jonathan Clark

4. **Text book, title, author, and year**  

5. **Specific course information**  
   a. *brief description of the content of the course (catalog description)*  
   This course is the first part of an integrated sequence in dynamics, vibrations, and controls. Material in this first course includes the following: absolute and relative motion of particles and rigid bodies in inertial, translating, and rotating coordinate frames; derivation and computer solution of differential equations of motion; single degree of freedom vibrations and elementary feedback control.
   
   b. *prerequisites or corequisites*  
   Prerequisites: EML 3002 and EML 3004  
   Corequisite: MAP 3305 or MAP 2302
   
   c. *indicate whether a required, elective, or selected elective course in the program*  
   Required course

6. **Specific goals for the course**  
   a. *Course Outcomes*  
   1. Be able to recognize which coordinate system is appropriate for a given problem in dynamic analysis and understand the use of the appropriate formula for that coordinate system [1]
   2. Given a kinetic analysis problem, be able to determine and apply the most efficient method for its analysis [1]
   3. Be able to derive a differential equation model of a dynamic system [2]
   4. Be able to solve for the solutions of simple unforced and forced vibrational systems [2]
   5. Be able to design a proportional feedback control law for a first or second order dynamic system [2]
   6. Be able to analyze the kinematic behavior of four-bar linkages [3]
   7. Be able to perform kinematic analysis using moving reference frames [3]
   8. Complete and provide a report on several dynamic system labs [4, 5]
   9. Be able to write simple Mathcad programs for dynamic analysis [5]
   10. Completion of the assignments in a reading journal based on the course text [6]  
   Numbers refer to Course Objectives below, e.g. for course outcome 8, [4, 5] refers to course objectives 4 and 5.
   
   b. *Course Objectives and Relation to Student Outcomes*  
   1. To teach dynamic analysis based on Newton’s second method, momentum methods and energy methods [1, 5]
   2. To introduce the use of differential equation models for analyzing and designing dynamic systems [1, 3]
   3. To teach the kinematic analysis of systems consisting of interconnected links [1, 5]
4. To teach the application of dynamic concepts to the analysis of laboratory experiments, representing real-world systems [1, 5, 7]
5. To teach the use of Mathcad as an engineering tool for dynamic system analysis [10]
6. To teach students to learn basic engineering principles from reading [9]
Numbers refer to Departmental Student Outcomes, e.g. for course objective 3, [1, 5] refers to student outcomes 1 and 5.
7. Brief list of topics to be covered
   • Kinematics of a Particle
   • Kinetics of a Particle: Newton’s 2nd Law
   • Kinetics of a Particle: Energy Methods
   • Kinetics of a Particle: Momentum Methods
   • Mechanical Vibrations
   • Elementary Feedback Control
   • Rigid Body Kinematics
   • Rigid Body Dynamics: Newton’s 2nd Law
   • Rigid Body Dynamics: Energy Methods
   • Rigid Body Dynamics: Momentum Methods