1. Course number and name
   **EML 3014C Dynamic Systems II**

2. Credits and contact hours
   3 cr, 2.5 contact hours (2 hrs. 30 min. lecture)

3. Instructor’s or course coordinator’s name
   Instructor: Dr. Jonathan Clark, Coordinator: Dr. Jonathan Clark

4. Text book, title, author, and year
   - custom set of lecture notes as a required text
   - Mechanical Vibration, Palm, W., 2006 (recommended)

5. Specific course information
   a. *brief description of the content of the course (catalog description)*
      This course is the second part of an integrated sequence in dynamics, vibrations, and controls. Material in this second course includes the development of the equations of motion for translational and rotational mechanical systems, electrical systems, and electromechanical systems; system response using standard differential equation solution techniques and Laplace transforms; frequency response and impedances; linearization of nonlinear system models; and block diagrams and feedback control strategies.
   b. *prerequisites or corequisites*
      Prerequisite: EML3013C
   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. Be able to derive a differential equation model of a dynamic system [2]
      3. Be able to solve for the solutions of simple unforced and forced vibrational systems [2]
      4. Be able to design a proportional feedback control law for a first or second order dynamic system [2]
      5. Be able to perform kinematic analysis using moving reference frames [3]
      6. Be able to compute eigenvalues and eigenvectors to determine modal behavior of coupled systems [4]
      7. Be able to write simple Matlab code for dynamic analysis [5]
      Numbers refer to Course Objectives below, e.g. for course outcome 1, [1] refers to course objective 1.
   b. *Course Objectives and Relation to Student Outcomes*
      1. To teach dynamic analysis based on Newton’s second law [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 matrix techniques for formulating and solving coupled ODEs [1, 5]
5. To teach the use of Matlab as an engineering tool for dynamic system analysis

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
   - Basic Dynamic System Concepts
   - Solution of 1st and 2nd Order Differential Equations
   - Formulation of Equations of Motion
   - Nonlinear Models and Linearization
   - Numerical Solutions for Differential Equations
   - Electrical Circuit Models
   - Transfer Functions and Block Diagram
   - Electromechanical Systems
   - Roots and Root Locus
   - Laplace Transform
   - Introduction to Feedback dynamics
   - Predictors and Measures of Performance
   - Modes and System Response
   - Frequency Response
   - Vibration Isolation
   - Vibration Absorption