# Course Details

## Course Information
- **Department:** Mechanical Engineering
- **Course #:** EML 3013C, 4 credits
- **Course Title:** Dynamic Systems I
- **Type Course:** Required
- **Terms Offered:** Spring, Summer

## 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.

## Prerequisites
- EML 3002C, Mechanical Engineering Tools; EML 3004C, Introduction to Mechanical Engineering

## Corequisite
- MAP 3305, Engineering Math I

## Area Coordinator
- Dr. Emmanuel Collins

## Responsible Faculty
- Instructor of Record: Dr. Emmanuel Collins

## Date of Preparation
- 5-24-01 (Collins)

## Textbooks/Required Material

## Science/Design (%):
- 85/15

## Contribution to Meeting the Professional Component:
- 85% engineering science, laboratory experience
- 15% engineering design

## Course Topics
1. Kinematics of a Particle
2. Kinetics of a Particle: Newton’s 2nd Law
3. Kinetics of a Particle: Energy Methods
4. Kinetics of a Particle: Momentum Methods
5. Mechanical Vibrations
6. Elementary Feedback Control
7. Rigid Body Kinematics
8. Rigid Body Dynamics: Newton’s 2nd Law
10. Rigid Body Dynamics: Momentum Methods

## Assessment Tools
1. Weekly Homework Problems
2. Weekly Quizzes Based on the Reading Journal
3. Weekly Lab Reports
4. Exams

## Course Objectives
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. \([9]\)

<table>
<thead>
<tr>
<th>COURSE OUTCOMES*</th>
<th>(Numbers shown in brackets are links to course objectives listed above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>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])</td>
</tr>
<tr>
<td>2.</td>
<td>Given a kinetic analysis problem, be able to determine and apply the most efficient method for its analysis. ([1])</td>
</tr>
<tr>
<td>3.</td>
<td>Be able to derive a differential equation model of a dynamic system. ([2])</td>
</tr>
<tr>
<td>4.</td>
<td>Be able to solve for the solutions of simple unforced and forced vibrational systems. ([2])</td>
</tr>
<tr>
<td>5.</td>
<td>Be able to design a proportional feedback control law for a first or second order dynamic system. ([2])</td>
</tr>
<tr>
<td>6.</td>
<td>Be able to analyze the kinematic behavior of four-bar linkages. ([3])</td>
</tr>
<tr>
<td>7.</td>
<td>Be able to perform kinematic analysis using moving reference frames. ([3])</td>
</tr>
<tr>
<td>8.</td>
<td>Complete and provide a report on several dynamic system labs. ([4, 5])</td>
</tr>
<tr>
<td>9.</td>
<td>Be able to write simple MathCAD programs for dynamic analysis. ([5])</td>
</tr>
<tr>
<td>10.</td>
<td>Completion of the assignments in a reading journal based on the course text. ([6])</td>
</tr>
</tbody>
</table>