1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING
ME 409 MECHANICAL ENGINEERING ANALYSIS

2. Designation: Required ☐ Elective ☑
   Lower Division ☐ Upper Division ☑

3. Course Description: Setup of vibration, heat transfer, fluid flow, and other mechanical engineering systems as ordinary and partial differential equations; analogies between various physical systems. Classical, transform, numerical, and computer-aided methods for solutions.

4. Prerequisites: Math 215 and Senior Standing


6. Course Objectives: To teach students some basic concepts needed for analysis and design of mechanical engineering systems

   Course Outcomes
   • the ability to apply advanced mathematical methods to the analysis and design of engineering systems
   • the ability and skill to develop idealized mathematical model of physical systems that capture the salient aspects of the system.
   • the ability to apply ordinary and partial differential equations to model engineering systems.
   • the ability apply numerical methods and computer-aided engineering software and perform simulation studies.
   • an ability to communicate effectively.
   • a desire to be a flexible and adaptable team player.

7. Topics Covered: (in Order of Presentation)
   • First Order Differential Equations
   • Linear Differential Equations of Second and Higher Order
   • Development of Mathematical Models
   • Application of Laplace Transformation Solution of Differential Equations to Mechanical Engineering Systems
   • Fourier Analysis
   • Partial Differential Equations

8. Class Schedule: Number of Sessions per week: 2
   Duration of each session: 1 hour 40 minutes

9. Contribution of course to meeting the professional component:

   This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

   Engineering Science 4 units

10. Relationship of course to program objectives:

   This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

   Knowledge outcomes:
   • an ability to apply knowledge of mathematics, science, and engineering (abet a)
   • a knowledge of computer aided design and simulation software

   Skill outcomes:
• an ability to communicate effectively (abet g)
• an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
• an ability to think in a logical sequential process

**Attitudes Outcome:**
• an understanding of responsibility and accountability

**11. Prepared by:** Adel Sharif 05/2005