

- Course Number and Title: M E 511. Dynamics
- Catalog Description: An advanced study of the dynamical behavior of systems of particles and rigid bodies, with emphasis on the theoretical background of dynamics.
- Credit Hours: 3 Credits (3)
- Prerequisite(s) / Corequisite(s): Prerequisite(s): (M E 328 and ENGR 234) or Consent of Instructor
Corequisite(s): None
- Required: Graduate Core
- Course Availability: Fall Semester
- Instructor (Usual): Dr. Abdessattar Abdelkefi (See <https://mae.nmsu.edu/people/faculty.html>)
- Textbook:
 - 1) F. C. Moon, Applied Dynamics, 2008, John Wiley & Sons, Inc.
 - 2) H. Schaub and J. Junkins, Analytical Mechanics of Space Systems, 2009, AIAA Education Series.
- Course Learning Objectives: After completing this course, a student should be able to:
 - 1) Learn techniques to describe the motion of mechanical systems
 - 2) Derive the equations of motion of dynamical systems
 - 3) Understand the difference between several methodologies used to derive the governing equations of systems
 - 4) Find and classify the dynamical responses of systems.
- Topics Covered:
 - Kinematics of a single particle
 - Reference frames
 - Vector differentiation formula
 - Dynamics of particles and systems of particles
 - Lagrange equations
 - Constraints: Holonomic and non-holonomic
 - Phase portraits
 - Non-conservative forces
 - Coulomb friction
 - Linear friction
 - Impacts
 - Rigid body kinematics in 3D
 - Rotation matrix
 - Euler angles
 - Principle of virtual power for rigid bodies
 - Multiple rigid bodies and introduction to small oscillations and normal modes
 - Hamiltonian mechanics

