Course alpha, number, title	ME 464 Intermediate Dynamics
Required or elective	Elective
Course (catalog) description	Kinematics and kinetics of particle and rigid body systems. Virtual work, Lagrangian method, and Euler equations. Basic vibrations of discrete and continuous systems. Elementary wave propagation.
Prerequisite(s)	(ME 361)
Textbook(s) and/or other required material	F. C. Moon, Applied Dynamics: With Applications to Multibody and Mechatronic Systems, 2nd Edition, Wiley, 2008 (SUGGESTED REFERENCE)
Class/Lab schedule:	Total Credits: 3 *Lecture/Laboratory/Discussion Hours: 3/0/0*

Topics covered

(a) Three-dimensional kinematics
(b) Newtonian dynamics of particles and systems of particles
(c) Dynamics of rigid bodies in two and three dimensions
(d) Euler equations
(e) Virtual work
(f) Lagrange method
(g) Applications to dynamics of machinery
(h) Applications to rotor balancing
(i) Applications to vehicle dynamics
(j) Applications to satellite dynamics

Course learning objectives

The student shall be able to:

(1) identify the forces acting on a system by the environment and draw a correct free body diagram,
(2) apply Newton/Euler laws and/or Lagrangian methods to derive the equations of motion for the system,
(3) analyze the equations and obtain solutions analytically when possible,
(4) find solutions by numerical methods,
(5) study the results and explain the implications for stability, dynamic loads, and other design issues,
(6) make reasonable assumptions to simplify a mechanical system to the degree that it can be modeled by the principles of dynamics.

Relationship of course to ME program outcomes

The following measurement standard is used to evaluate the relationship between the course outcomes and the educational-program outcomes:
3 = Strong Emphasis, 2 = Some Emphasis, 1 = Little or No Emphasis.

(a) an ability to apply knowledge of mathematics, science, and engineering—3
(b) an ability to design and conduct experiments, as well as to analyze and interpret data—1
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability—2
(d) an ability to function on multidisciplinary teams—1
(e) an ability to identify, formulate, and solve engineering problems—3
(f) an understanding of professional and ethical responsibility—2
(g) an ability to communicate effectively—2
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context —1
(i) a recognition of the need for and the ability to engage in life-long learning—1
(j) a knowledge of contemporary issues—1
(k) an ability to use the techniques, skills, and modern engineering tools necessary for

	engineering practice—3 (l) application of advanced mathematics—2 (m) design, build, and test in mechanical systems area—1 (n) design, build, and test in thermal/fluids area—1 (o) capstone design experience—1
Contribution to professional component:	70% Engineering Science 30% Engineering Design
Person(s) who prepared this description	Steve Shaw
Date of Preparation	March 11, 2010