SYLLABUS

Applied Dynamics
PHY 215

SPRING 2004

Wayne State College
Physical Science and Mathematics
COURSE DESCRIPTION:

PHY 215  
Applied Dynamics  
Spring 2004  
Semester Hours: 3

Instructor:  Dr. J. Bauer
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Office Hours:  
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Description: Newton's laws of motion are applied to particles and rigid bodies. Topics include absolute and relative motion, forces, acceleration, work and energy, momentum, torque, and angular momentum. A course intended primarily for engineers.

The course is a requirement for pre-professional studies in engineering.

Prerequisite: PHY 214, Applied Statics and PHY 302, University Physics II

Class Meeting Time/Place: 12:30-1:45 P.M. TR, CH 022

COURSE COMPETENCIES: The course will adhere to the Accreditation Board for Engineering and Technology (ABET) Engineering Criteria 2000. More specifically, the course will concentrate on criterion 3(a), 3(c), 3(e), and 3(k).

The student will demonstrate:

(a) An ability to apply knowledge of mathematics, science, and engineering,
(c) An ability to design a system, component, or process to meet desired needs,
(e) An ability to identify, formulate, and solve engineering problems, and
(k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

COURSE GOALS: It is the course's intent:

- To provide a sound knowledge base in applied statics,
- To prepare the student for applied dynamics,
- To provide the student with means for applying learned concepts to specific situations,
- To increase the student's ability to rationalize and organize information, and
- To create a positive outlook toward engineering science.
INSTRUCTIONAL MATERIALS:

(ISBN: 0-07-114057-3)

References:


Recommended Equipment: Graphing calculator, downloaded version of Octave.

Resources/Equipment: Octave (accessible from the MAT Linux-lab)
COURSE OUTLINE:

I. Kinematics of Particles
   • Rectilinear Motion
     o Motion of a Particle
     o Uniform Motion
     o Motion of Several Particles
   • Curvilinear Motion
     o Motion of a Particle
     o Vector Functions
     o Frame of Translation
     o Tangential and Normal Components
     o Radial and Transverse Components

II. Kinetics of Particles: Newton's Second Law
    • Newton's Second Law
    • Momentum
    • Equations of Motion
    • Angular Momentum
    • More Motion
    • Newton's Law of Gravitation

III. Kinetics of Particles: Energy and Momentum Methods
     • Work
     • Kinetic Energy
     • Principle of Work and Energy
     • Power
     • Conservation of Energy
     • Principle of Impulse and Momentum
     • Impact

IV. Systems of Particles
    • Newton's Laws
    • Linear and Angular Momentum
    • Mass Center
    • Conservation of Momentum
    • Work-Energy
    • Principle of Impulse and Momentum

V. Kinetics of Rigid Bodies
    • Translation
    • Rotation
    • General Plane Motion
    • Absolute and Relative Velocity of a Plane
    • Absolute and Relative Acceleration of a Plane
    • Rate of Change with Respect to a Rotating Frame
    • Coriolis Acceleration
VI. Plane Motion of Rigid Body: Forces and Acceleration
- Equations of Motion
- Angular Momentum
- Plane Motion: D'Alembert's Principle
- Axioms of Mechanics
- Systems of Rigid Bodies
- Constrained Plane Motion

VII. Plane Motion of Rigid Body: Energy and Momentum
- Work-Energy
- Work of Forces
- Kinetic Energy
- Systems
- Conservation of Energy
- Power
- Principle of Impulse and Momentum
- Conservation of Angular Momentum
- Impulsive Motion
- Eccentric Impact

*VIII Mechanical Vibrations
- Vibrations without Damping
  - Simple Harmonic Motion
  - Free Vibration of Rigid Body
  - Principle of Conservation of Energy
  - Forced Vibration
- Damped Vibrations

* Unit will be covered if time permits.

EVALUATION: Students may be evaluated on the basis of test scores, homework, and attendance. Each test is worth 20% and will consist of four questions. A fifth question will be randomly selected from assigned homework on the day of the test. Grades will be determined on 10% intervals, i.e. the 90s are an A, the 80s are a B, ... Students will be given a comprehensive final. The final will count 20% of the final grade. The final is to be taken on Thursday May 6th from 10:00-3:00.
WSC STATEMENT OF STUDENT RESPONSIBILITIES:

Wayne State College strives to develop students of a wide range of academic abilities through quality teaching and support. It is our desire to prepare students to accept the privileges, duties, and responsibilities of global citizens; to develop moral and ethical values, to encourage creative ability and develop aesthetic judgments, to encourage the ability to think critically about their world and work; and promote competence in and understanding of fields of knowledge which are required of educated people.

To this end we, the faculty and staff of WSC, have established a standard of student responsibilities in the following statement:

All students will:

Take responsibility for their education. This will include:

- Being knowledgeable of academic requirements and college policies concerning registration, academic standing, payment of tuition and fees, withdrawal and graduation.
- Initiating communication with faculty, advisors and administration regarding questions, concerns and intellectual dialogue.

Cultivate an attitude of integrity both in and out of the class. Integrity is demonstrated by:

- Showing courtesy, dependability, honesty, and respect for instructor expectations concerning attendance, assignments, deadlines and appointments.
- Showing courtesy and respect toward others with diverse points of view in and out of class.
- Displaying a positive work ethic and a genuine interest in welfare of others.
Assignments for Vector Mechanics for Engineers: Dynamics, 6 E

Section 11.1-11.3  11.4, 8, 13, 15, 17, 20, 25, 30
Section 11.4-11.5  11.34, 35, 37, 42, 44, 49, 54, 55
Section 11.6-11.7  11.76, 77, 81, 83
Section 11.8-11.11 11.91, 94, 97, 102, 109, 115, 118

Section 12.1-12.6  12.3, 10, 13, 20, 24, 32, 34, 37, 46, 51
Section 12.7-12.10 12.66, 70, 74, 75, 83, 86

Exam One

Section 13

Exam Two

Section 14

Exam Three

Section 15

Exam Four