

ME 318: Dynamics of Machines
Spring Semester Only

Type (check one): Required: Elective:

2005-2006 Catalog Data: The dynamic analysis of machine parts by use of the principles of linear and angular momentum and the work-energy relationships. Graphical and analytical methods. Analysis and balancing of shaking forces in machines, flywheel analysis, basic gear analysis, gyroscopic forces in machines. *One semester; three credits*

Prerequisites: ME 317

Co-Requisites: None

Textbook: R.L. Norton, *Design of Machinery - An Introduction to the Synthesis and Analysis of Mechanisms and Machines*, Third Edition, McGraw-Hill, 2004

Other Required Materials: None

Other References: None

Instructor: Dr. Yeu-Sheng Paul Shiue, Professor of Mechanical Engineering

Course Objectives:

1. Deepen understanding of dynamical analysis as an essential element of the design process
2. Develop mastery of analytical, graphical, and numerical methods for calculating dynamics of machine elements
3. Develop understanding of vibration and its impact on engineering design
4. Develop understanding of dynamic balancing, flywheel analysis, gyroscopic forces and moments
5. Relate static analysis to dynamic analysis as applied to machinery

Prerequisites by Topics:

1. Differential and integral calculus
2. Kinematics and dynamics of particles and rigid bodies
3. Kinematics of machine elements

Topics:

1. Static force analysis
2. Dynamic force analysis
3. Balancing rotating masses
4. Balancing reciprocating masses
5. Flywheels; gyroscopic effects
6. Critical whirling speeds
7. Torsional vibration of shafts
8. Robotic manipulators

Class Schedule: Three 50-minute sessions per week

Prepared by: Dr. Yeu-Sheng Paul Shiue

Date: 24-Oct-05

Professional Component:

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| Category (check one) | <input type="checkbox"/> Math/Basic Science <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> General Education <input type="checkbox"/> Other |
| Design (check one) | <input type="checkbox"/> Significant <input type="checkbox"/> Some <input checked="" type="checkbox"/> None |
| Realistic Constraints (check all that apply) | <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input type="checkbox"/> Sustainability <input checked="" type="checkbox"/> Manufacturability <input type="checkbox"/> Ethical <input type="checkbox"/> Health & Safety <input type="checkbox"/> Social <input type="checkbox"/> Political |

Relationship to Program Outcomes:

Check all that apply:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice