**PURDUE UNIVERSITY**
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE
(50000-60000 LEVEL)

**DEPARTMENT:** Engineering  
**EFFECTIVE SESSION:** Fall 2009

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- [ ] 1. New course with supporting documents (complete proposal form)
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit type
- [ ] 7. Change in course attributes
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

**PROPOSED:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>Subject Abbreviation</th>
<th>Course Number</th>
<th>Short Title</th>
<th>Long Title</th>
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<tbody>
<tr>
<td></td>
<td>ME</td>
<td>502</td>
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**TERMS OFFERED**

- [ ] Summer
- [ ] Fall
- [ ] Spring

**CAMPUS(ES) INVOLVED**

- [ ] Columbus
- [ ] Ft. Wayne
- [ ] Indianapolis
- [ ] Tech Station
- [ ] W. Lafayette
- [ ] N. Central

**CREDIT TYPE**

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<tr>
<th>Credit Type</th>
<th>Minutes per Mgr.</th>
<th>Meetings per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
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**COURSE ATTRIBUTES**

- [ ] 1. Pass/No Pass Only
- [ ] 2. Satisfactory/Unsatisfactory Only
- [ ] 3. Repeatable
- [ ] 4. Credit by Examination
- [ ] 5. Special Fees
- [ ] 6. Registration Approval Type
- [ ] 7. Variable Title
- [ ] 8. Honors
- [ ] 9. Full Time Privilege
- [ ] 10. Off Campus Experience

**SCHEDULE TYPE**

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<th>Schedule Type</th>
<th>Minutes per Mgr.</th>
<th>Meetings per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
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<td>Lecture</td>
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<td>Pract/Observ</td>
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**COURSE DESCRIPTION (INCLUDE REQUIREMENTS/RESTRICTIONS):**

**OFFICE OF THE REGISTRAR**

(Grad Form 40G [Excel format] - Does not include the Graduate Council's required supporting document. See pdf version of Form 40G)
ME562 - Advanced Dynamics

Spring 2010: None None
Credit Hours: 3

Learning Objective:
To provide a comprehensive understanding of the principles of dynamics of rigid bodies and multi-body systems, and to develop an ability to analyze such systems.

Description:
Kinematics of paths and particle motion; kinetics of particles, rigid bodies and multi-body systems; momentum and energy methods; linearized equations for mechanical systems; Lagrangian formulation for mechanics of mechanical systems; holonomic and non-holonomic constraints; Lagrange's equations; Hamilton's principle for holonomic systems; classification and stability of vibratory systems; applications to vehicle dynamics, orbital motion, robotics.

Topics Covered:
Kinematics of paths and particle motion; kinetics of particles, rigid bodies and multi-body systems; momentum and energy methods; linearized equations for mechanical systems; Lagrangian formulation for mechanics of mechanical systems; holonomic and non-holonomic constraints; Lagrange's equations; Hamilton's principle for holonomic systems; classification and stability of vibratory systems; applications to vehicle dynamics, orbital motion, robotics.

Prerequisites:
Vectors and matrices; linear algebra and elements of ordinary differential equations—material covered in most undergraduate curricula in mechanical engineering and physics; undergraduate course in dynamics.

Homework:
Weekly assignments of two or three problems.

Projects:
Information not available at this time.

Exams:
One one-hour midterm exam and one two-hour final exam.

Textbooks:

Computer Requirements:
CEE minimum computer requirements. Homework assignments may sometimes require MATLAB and MAPLE/Mathematica.

ProEd Minimum Requirements: [link]

Tuition & Fees: [link]
Other Requirements:
Information not available at this time.
Bongsu Kang, Ph.D.

CURRENT EMPLOYMENT

Associate Professor of Mechanical Engineering
Department of Engineering
College of Engineering, Technology, and Computer Science
Indiana University – Purdue University Fort Wayne
August 2006
321E Engineering and Technology Building
2101 East Coliseum Blvd., Fort Wayne, Indiana, 46805, USA
(260) 481-5712 / (260) 481-6281
kang@engr.ipfw.edu
http://engr.ipfw.edu/~kang

EDUCATION

Wayne State University, Michigan, USA
Ph.D. in Mechanical Engineering, May, 2000
Thesis: An Analytical Study of Vibration and Instability of Automotive Disc Brakes
M.S. in Mechanical Engineering, May, 1996
Thesis: Elastic Wave Motion in an Axially Strained, Rotating Timoshenko Shaft with General Boundary Conditions
Yonsei University, Seoul, Korea
B.S. in Mechanical Engineering, February, 1988

RESEARCH INTERESTS AND EXPERIENCE

• Dynamics and Vibration analysis of linear and nonlinear distributed parameter systems subjected to moving distributed loads with applications to mechanical and civil engineering beam/column-type structures.
• Stability analysis of gyroscopic systems such as spinning disk and shafts. Applications include computer hard disks, automotive/aircraft disc brakes, gyroscopes, turbines, saw blades, and power transmission machinery.
• Chaotic vibration analysis of nonlinear mechanical systems involving distributed contact and friction with application to automotive/aircraft disc brakes, clutches, and machining tools. Also investigating applications of this research to ocean and civil structures excited by a potential flow.
• Wavelets applications

RESEARCH GRANTS

• PI, 2004-2005, Indiana 21st Century Research and Technology Fund, Real Time Transportation Infrastructure Information System: An Innovative Platform for Indiana’s Automotive Future, $286,900
• IPFW 2003 Summer Faculty Research Grant, Dynamics and Vibration Behavior of a Cracked Curved Beam, $7,000
• IPFW 2002 Summer Faculty Research Grant, Friction-Induced Structural Instability: Application to Disc Brakes, $8,000

INDUSTRIAL EXPERIENCE

1988 - 1993
Hyundai Technical Research and Development Center, Seoul, Korea
Research & Development Engineer – Vehicle Chassis Division
• Design of anti-lock brake systems

RECENT JOURNAL PUBLICATIONS


RECENT CONFERENCE PUBLICATIONS


TEACHING EXPERIENCE

Courses Taught:

ENGR122 C/C++ Programming for Engineers (S03, F03, F04)
ME250 Statics (S01, F06, S07, F08, S09)
ME251 Dynamics (F02, F03, S07, F08, S09)
ME303 Materials Science and Engineering (F00, F01, F03)
ME361 Kinematics and Dynamics of Machinery (F00, F01, S02, F02, S06)
ME371 System Dynamics and Introduction to Control (S01, S02, S03, S04, S05, F05, F06, F08)
ME454 Intermediate Dynamics with Computer Applications (S04)
ME471 Vibration Analysis (F02, F04)
ME487 Mechanical Engineering Design I (F01, F02)
ME488 Mechanical Engineering Design II (S02)