EFD 45-07

Print Form

Office of the Registrar
FORM 40 REV. 7/08

# PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

DEPARTMENT Materials Engineering

EFFECTIVE SESSION Spring 2009

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

- [X] 1. New course with supporting documents
- [ ] 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 (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

| PROPOSED: | | EXISTING: | |
|---|---|---|---|
| Subject Abbreviation | MSE | Subject Abbreviation | |
| Course Number | 250 | Course Number | |
| Long Title | Physical Properties in Engineering Systems | | |
| Short Title | Phys Prop Eng Systms | | |

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[ ] Summer [ ] Fall [X] Spring

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs ____ (Check One) To [ ] Or [ ] Maximum Cr. Hrs. ____
3. Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
   Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Special Fees [ ]
6. Registration Approval Type: Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

| ScheduleType | Minutes Per Mtg | Meetings Per Week | Weeks Offered | % of Credit Allocated |
|---|---|---|---|---|
| Lecture | 50 | 3 | 16 | 100 |
| Recitation | | | | |
| Presentation | | | | |
| Laboratory | | | | |
| Lab Prep | | | | |
| Studio | | | | |
| Distance | | | | |
| Clinic | | | | |
| Experiential | | | | |
| Research | | | | |
| Ind. Study | | | | |
| Pract/Observ | | | | |

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Class connects math, science and engineering practice and applications. Presents foundational aspects of engineering problem solving, use of computer math tools for engineering problem solving, basic engineering statics, dynamics and mechanics, group problem solving approaches, and introductory aspects of design and materials selection.

| | | | |
|---|---|---|---|
| Calumet Department Head | Date | Calumet School Dean | Date |
| Fort Wayne Department Head | Date | Fort Wayne School Dean | Date |
| Indianapolis Department Head | Date | Indianapolis School Dean | Date |
| North Central Department Head | Date | North Central Chancellor | Date |
| West Lafayette Department Head | Date | West Lafayette College/School Dean 11/10/08 | Date |
| | | West Lafayette Registrar | Date 12/11/08 |

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| Clinic | | | | |
| Experiential | | | | |
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Calumet Department Head Date
Calumet School Dean Date

Fort Wayne Department Head Date
Fort Wayne School Dean Date

Indianapolis Department Head Date
Indianapolis School Dean Date

Central Department Head Date
North Central Chancellor Date

West Lafayette Department Head Date
West Lafayette College/School Dean 11/10/08 Date
West Lafayette Registrar Date

OFFICE OF THE REGISTRAR

Engineering Faculty Document No. 45-07
April 17, 2008

**TO:** The Engineering Faculty

**FROM:** The Faculty of the School of Materials Engineering

**DATE:** March 1, 2008

**RE:** New Undergraduate Course, MSE 250

The faculty of the School of Materials Engineering have approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

**MSE 250** **Physical Properties in Engineering Systems**
Sem. 2. Class 3, Cr. 3.
Prerequisites: PHYS 172 or equivalent Co-requisites: MSE 230 and MA 265 or consent of instructor

**Description**: Class connects math, science and engineering practice and applications. Presents foundational aspects of engineering problem solving, use of computer math tools for engineering problem solving, basic engineering statics, dynamics and mechanics, group problem solving approaches, and introductory aspects of design and materials selection.

**Reason:** This class is currently offered as MSE 497B and IDE 495A with an enrollment of 34 students. It has previously been offered as a course under development in the Multidisciplinary Engineering program with enrollments of 3 students in 2007 and 9 students in 2006. The updated School of Materials Engineering curriculum (EFD 50-07) will make this a required course for students entering MSE. The course content reflects content that is part of ME 270 and NUCL 273; both of these courses are dropped from the new MSE curriculum. The course also serves as the first foundational course for the Multidisciplinary Engineering program, a program proposed for an accredited degree associated with Purdue's Interdisciplinary Engineering program.

Keith J. Bowman, Professor and Head
School of Materials Engineering

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE
CC Minutes #6
Date 10-8-08
Chairman ECC RJCipra

**MSE 250**
**Physical Properties in Engineering Systems**
**Instructor:** Keith Bowman, kbowman@purdue.edu, ARMS 2301, 494-4100

**Course Description:** Class connects math, science and engineering practice and applications. Presents foundational aspects of engineering problem solving, use of computer math tools for engineering problem solving, basic engineering statics, dynamics and mechanics, group problem solving approaches, and introductory aspects of design and materials selection.

Prerequisites: PHYS 172 or equivalent; Co-requisites: MSE 230 and MA 265 or consent of instructor

**Course Outcomes:**
**1. All Students**
A. Can interpret and translate simple mechanical contacts between components in terms of interaction forces in static loading.

B. Can recognize and interpret the physical relationship between properties or conditions of materials and arbitrarily defined coordinate systems.

C. Demonstrate some ability in utilizing basic computer tools for computation of relationships including force, stress, strain and expressions of material properties in the form of second rank tensors.

D. Understand basic equations of motion and the corresponding relations between position, velocity, acceleration, momentum and kinetic energy.

**2. Most Students**
A. Can produce accurate solutions to problems that require them to interpret, translate and simplify mechanical contacts between components in terms of interaction forces in static loading.

B. Can successfully produce accurate solutions to problems that require them to recognize and interpret the physical relationship between properties or conditions of materials and arbitrarily defined coordinate systems.

C. Demonstrate proficiency in utilizing basic computer tools for computation of relationships including force, stress, strain and expressions of material properties in the form of second rank tensors.

D. Show proficiency with the basic equations of motion and the corresponding relations between position, velocity, acceleration, momentum and kinetic energy and can utilize these relationships in simple design contexts.

**3. Some Students**
A. Can formulate solutions to real world problems that require them to interpret, translate and simplify mechanical contacts between components in terms of interaction forces in static loading.

B. Can successfully produce accurate solutions to problems that require them to recognize and interpret the physical relationship between properties or conditions of materials and arbitrarily defined coordinate systems.

C. Demonstrate proficiency in utilizing advanced computer tools for computation of relationships including force, stress, strain and expressions of material properties in the form of second rank tensors.

D. Show high level understanding of the basic equations of motion and the corresponding relations between position, velocity, acceleration, momentum and kinetic energy.

**Textbooks and Materials:**
"Materials Selection in Mechanical Design" 2nd ed., M. F. Ashby,( Butterworth-Heinemann, 1999), Required.
Access to Chabay and Sherwood Vol. 1 Matter and Interactions (Physics 172 text).
Mathcad software (available in MSE labs or student copy from ITAP - BoilerCopyMaker).

**Assessment:**
Each of the outcomes will be assessed through Homework, Quizzes, Midterm, Final exam, Patent Review Paper, Group activity and Class participation.

**Instructors:**
Keith J. Bowman, Alejandro Strachan

**Professional category content:** (estimated by faculty member who prepared this course description)
Engineering Science: 3 credits (100%)

| Week No. | Principle Topics |
|---|---|
| 1 | Introduction and Computational Techniques |
| 2 | Review of PHYS 172 |
| 3 | Statics, Torques |
| 4 | Statics and Introduction to $2^{nd}$ rank Tensors |
| 5 | Coordinate System Rotations and Elasticity |
| 6 | Elastic Strain and Mechanics (Tension, Compression and Bending) |
| 7 | Mechanics, Ashby Mapping |
| 8 | Ashby Mapping |
| 9 | Dynamics, Sound Waves |
| 10 | Review and Exam |
| 11 | Mechanics and Dynamics in Biological Systems, Molecular Dynamics |
| 12 | Mechanical Processes, Stress and Strain |
| 13 | Elasticity and Anisotropy, Thermal and Electrical Conductivity |
| 14 | Fluid Flow |
| 15 | Diffusion |