### 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] New course with supporting documents
- [ ] Add existing course offered at another campus
- [ ] Expiration of a course
- [ ] Change in course number
- [ ] Change in course title
- [ ] Change in course credit/type
- [ ] Change in course attributes (department head signature only)
- [ ] Change in instructional hours
- [ ] Change in course description
- [ ] Change in course requisites
- [ ] Change in semesters offered (department head signature only)
- [ ] Transfer from one department to another

### PROPOSED:

- **Subject Abbreviation:** MSE
- **Course Number:** 445
- **Long Title:** Materials Engineering Systems Analysis and Design
- **Short Title:** Matf Sys Anal & Desgn

### EXISTING:

- **Subject Abbreviation:**
- **Course Number:**
- **Long Title:** Materials Engineering Systems Analysis and Design
- **Short Title:** Matf Sys Anal & Desgn

### TERMS OFFERED:

- **Check All That Apply:**
  - [X] Fall
  - [ ] Spring
  - [ ] Summer

### CAMPUS(ES) INVOLVED:

- [ ] Calumet
- [X] N. Central
- [ ] Cont Ed
- [ ] Tech Statewide
- [ ] Ft. Wayne
- [X] W. Lafayette

### CREDIT TYPE:

1. **Fixed Credit: Cr. Hrs.** 3
2. **Variable Credit Range:**
   - **Minimum Cr. Hrs:**
   - **Maximum Cr. Hrs:**
3. **Equivalent Credit:** Yes

### COURSE ATTRIBUTES:

- [ ] Pass/Not Pass Only
- [ ] Satisfactory/Unsatisfactory Only
- [ ] Repeatable
- [ ] Maximum Repeatable Credit:
- [ ] Credit by Examination
- [ ] Special Fees
- [ ] Instructor
- [ ] Registration Approval Type
- [ ] Department

### COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Integration of materials engineering core coursework with statistical, economic and environmental considerations for analysis and design of systems. Analysis of primary materials processing operations using mathematical and statistical models for predicting interactive effects and process optimization. Specification of materials and processes for mechanical designs, incorporating properties assessment and tradeoffs, cost analysis, and performance optimization with multiple constraints.

### Schedule Type:

- [ ] Lecture
- [ ] Laboratory
- [ ] Clinic
- [ ] Experiential
- [ ] Research
- [ ] Ind. Study
- [ ] Pract/Internship

### Minutes Per Mtg:

- [ ] 50
- [ ] 3

### Meetings Per Week:

- [ ] 16
- [ ] 100

### Cross-Listed Courses:

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

### Department Head:

- [ ] Calumet Department Head: Date
- [ ] Fort Wayne Department Head: Date
- [ ] Indianapolis Department Head: Date
- [ ] West Lafayette Department Head: Date

### School Dean:

- [ ] Calumet School Dean: Date
- [ ] Fort Wayne School Dean: Date
- [ ] Indianapolis School Dean: Date
- [ ] West Lafayette College School Dean: Date

### Chancellor:

- [ ] North Central Chancellor: Date

### Registrar:

- [ ] Date

**OFFICE OF THE REGISTRAR**

12/16/08
### Instruction

- **New course with supporting documents**: [X]
- **Add existing course offered at another campus**: }
- **Expiration of a course**: }
- **Change in course number**: }
- **Change in course title**: }
- **Change in course credit/type**: }
- **Change in course attributes (department head signature only)**: }
- **Change in instructional hours**: }
- **Change in course description**: }
- **Change in course requisites**: }
- **Change in semesters offered (department head signature only)**: }
- **Transfer from one department to another**: }

### Proposed

- **Subject Abbreviation**: MSE
- **Course Number**: 445
- **Long Title**: Materials Engineering Systems Analysis and Design
- **Short Title**: Mat Eng Sys ana & desg

### Existing

- **Subject Abbreviation**: 
- **Course Number**: 

### Terms Offered

- **Check All That Apply**: 
  - Summer
  - Fall [X]
  - Spring

### Campus(es) Involved

- **Calumet**
- **Conf Ed**
- **N. Central**
- **Ft. Wayne**
- **Tech Statewide**
- **Indianapolis**
- **W. Lafayette**

### Credit Type

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<th>2. Variable Credit Range:</th>
<th>3. Equivalent Credit:</th>
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### Schedule Type

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### Course Attributes

- **6. Registration Approval Type**: Department
- **7. Variable Title**: Instructor
- **8. Honors**: 
- **9. Full Time Privilege**: 
- **10. Off Campus Experience**: 

### Course Description

Integration of materials engineering core coursework with statistical, economic and environmental considerations for analysis and design of systems. Analysis of primary materials processing operations using mathematical and statistical models for predicting interactive effects and process optimization. Specification of materials and processes for mechanical designs, incorporating properties assessment and tradeoffs, cost analysis, and performance optimization with multiple constraints.

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**Calumet Department Head**: 
**Date**:  

**Calumet School Dean**: 
**Date**:  

**Ft. Wayne Department Head**: 
**Date**:  

**Ft. Wayne School Dean**: 
**Date**:  

**Indianapolis Department Head**: 
**Date**:  

**Indianapolis School Dean**: 
**Date**:  

**North Central Chancellor**: 
**Date**:  

**West Lafayette Department Head**: 
**Date**:  

**West Lafayette College/School Dean**: 
**Date**:  

**West Lafayette Registrar**: 
**Date**:  

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**OFFICE OF THE REGISTRAR**
TO: The Engineering Faculty

FROM: The Faculty of the School of Materials Engineering

DATE: March 1, 2008

RE: New Undergraduate Course, MSE 445

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 445  Materials Engineering Systems Analysis and Design
Sem. 1. Class 3, Cr. 3.
Prerequisites: MSE 330 and MSE 340; Co-requisites: MSE 430 or consent of instructor.

Description: Integration of materials engineering core coursework with statistical, economic and environmental considerations for analysis and design of systems. Analysis of primary materials processing operations using mathematical and statistical models for predicting interactive effects and process optimization. Specification of materials and processes for mechanical designs, incorporating properties assessment and tradeoffs, cost analysis, and performance optimization with multiple constraints.

Reason: This class is currently (Spring 2008) offered as MSE 497C with an enrollment of 17 students. The updated School of Materials Engineering curriculum (EFD 50-07) will make this a required course for students entering MSE. The course content is new and reflects an emphasis on integrating topics from several core courses simultaneously in a systems approach.

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

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes  # 60
Date 10-8-08
Chairman ECC  R. J. Pras
MSE 445
Materials Engineering Systems Analysis and Design
Instructor:  Professors M. J.M. Krane, krane@purdue.edu, ARMS 2231, 494-4107
            K. Trumble, driscol@ecn.purdue.edu, ARMS 2333, 494-4114

Course Description: Integration of Materials Engineering core coursework with statistical, economic and environmental considerations for analysis and design of systems. Analysis of primary materials processing operations using mathematical and statistical models for predicting interactive effects and process optimization. Specification of materials and processes for mechanical designs, incorporating properties assessment and tradeoffs, cost analysis, and performance optimization with multiple constraints.

Prerequisites: MSE 330 and MSE 340; Co-requisites: MSE 430 or consent of instructor.

Goals: Most of the core MSE courses focus on individual aspects of materials structure, properties, or processing. The goal of this course is to integrate these elements of the field, together with other constraints of practice (economic, environmental, etc.), to quantitatively analyze and design engineering systems.

Objectives:
After completing the course, students will be able to:
- Use models based on core Materials Engineering topics to describe and simulate industrial processes.
- Apply concepts of engineering cost analysis to process models to minimize cost and evaluate impact of process changes.
- Describe the behavior of commercial processes using statistical process control charts.
- Assess material properties data and the impact of uncertainty in performance predictions.
- Select materials for specific applications involving multiple property constraints and trade-offs.
- Specify the materials and processing to optimize engineering components and systems for cost and performance.

Text(s):

The Iron Blast Furnace: Theory and Practice, J. G. Peacey and W. G. Davenport, Pergamon (1979). (This text reflects the choice of the blast furnace as the current example process. In different years, other processes will be featured and appropriate reading material will be selected.)
Assessment: Design Projects (50%), Homework (30%), Two Exams (20%)

Weekly syllabus:

Week 1: Introduction
Week 2-3: Materials production process modeling
Weeks 4-5: Statistical process control
Week 6-7: Introduction to engineering economics
Week 8-10: Materials properties in design
Week 11-13: Materials and processing specifications
Week 14-15: Optimization