UNIVERSITY OF KENTUCKY
APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR & MINOR

1. Submitted by College of Engineering
   Department/Division offering course Chemical & Materials Engineering
date 9/15/05

2. Changes proposed:
   (a) Present prefix & number MSE 401G Proposed prefix & number Same
   (b) Present Title Metals & Alloys
       New Title SAME
   (c) If course title is changed and exceeds 24 characters (Including spaces), include a sensible title (not to exceed 24 characters) for use on transcripts:

   (d) Present credits: 4 Proposed credits: 3
   (e) Current lecture: laboratory ratio 3/3 Proposed: 3/0
   (f) Effective Date of Change: (Semester & Year) Fall 2006

3. To be Cross-listed as:

4. Proposed change in Bulletin description:
   (a) Present description (including prerequisite(s):
       Crystal structures, phase diagrams, diffusion, nucleation and growth, deformation, recovery, recrystallization and grain growth are discussed to understand the structure-property relations in metals and alloys. Lecture, 3 hours; laboratory 3 hours per week. Prereq: MSE 102 and MSE 301 and Engineering Standing

   (b) New description:
       Crystal structures, phase diagrams, diffusion, nucleation and growth, deformation, recovery, recrystallization and grain growth are discussed to understand the structure-property relations in metals and alloys. Prereq: MSE 201, 301 and Engineering Standing.

   (c) Prerequisite(s) for course as changed: MSE 201, 301 and Engineering Standing

5. What has prompted this proposal?
   Upon recommendation from our advisory board, and input from students and faculty, we are dropping the lab component of this course, along with that of four others, and are creating two 3-credit hour labs, to be offered in two consecutive semesters.

6. If there are to be significant changes in the content or teaching objectives of this course, indicate changes:

7. What other departments could be affected by the proposed change?

8. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? Yes ☑ No ☐

9. Will changing this course change the degree requirements in one or more programs?*
   If yes, please attach an explanation of the change.* Yes ☐ No ☑

10. Is this course currently included in the University Studies Program? If yes, please attach correspondence indicating concurrence of the University Studies Committee. Yes ☐ No ☑
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12. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales. □ Check here if 400G-500.

□ Yes □ No

12. Is this a minor change?

(Note: See the description on this form of what constitutes a minor change. Minor changes are sent directly from the Dean of the College to the Chair of the Senate Council. If the latter deems the change not to be minor, it will be sent to the appropriate Council for normal processing.)

13. Within the Department, who should be consulted for further information on the proposed course change?

Name: Dr. Lynn Penn Phone Extension: J-7897

Signatures of Approval:

[Signatures]

Unanimous approval by Materials Fac

Date

9/20/05

11/9/05

Date

10/20/05

Date

1-24-06

Date

Date of Notice to the Faculty

Date of Notice to University Senate

**If applicable, as provided by the Rules of the University Senate.

ACTION OTHER THAN APPROVAL

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The Minor Change route for courses is provided as a mechanism to make changes in existing courses and is limited to one or more of the following:

a. change in number within the same hundred series;
b. editorial change in description which does not imply change in content or emphasis;
c. editorial change in title which does not imply change in content or emphasis;
d. change in prerequisite which does not imply change in content or emphasis;
e. cross-listing of courses under conditions set forth in item 3.0;
f. correction of typographical errors. [University Senate Rules, Section III - 3.1]

Rev 3/04
Credit Hours: 3

Course Description: Crystal structures, dislocation, phase diagrams, solid solution, nucleation and growth, deformation, iron-carbon alloy systems. Lecture, three hours.

Prerequisites: MSE 201 and MSE 301 and Engineering standing.


Instructor: Fuqian Yang (Ph.D.), Assistant Professor
161 Anderson Hall, Phone: 257-2994
Email: fyang0@engr.uky.edu

Schedule: MWF 11:00AM – 11:50AM (Lecture); 3 Hrs (3 Sessions) per week.

Objectives: To recognize the importance of microstructure in determining the structure-property relationships in metals and alloys.

Have basic knowledge of crystal structure, stereographic projection and defects.

Understand the fundamental crystallography and its relation with deformation behavior.

Have basic concept of dislocations and understand the relation between dislocations and plastic deformation.

Understand the concept of solid solutions and strengthening mechanisms.

Have basic knowledge on the phase diagrams and be able to apply the phase diagram to analyze the iron-carbon alloy system.

Topics:

1. The fundamental crystallography
2. the stereographic projection
3. structure of metals
4. Dislocations
5. Dislocations and plastic deformation
6. Grain boundaries
7. Vacancies
8. Solid solutions
9. Phase equilibrium
10. Unary phase diagrams
11. Binary phase diagrams
12. Iron-carbon alloy system

Course Relevance: This course will provide students with a working knowledge of the fundamentals of crystallography, defects, plastic deformation, phase diagrams, and the iron-carbon alloy system. This consists of the following major areas: 1) the fundamental crystallography, 2) the stereographic projection, 3) structure of metals, 3) dislocations, 4) plastic deformation, 5) grain boundaries, 6) phase equilibria, 7) unary phase diagrams, 8) binary phase diagrams, 9) annealing, and 10) the iron-carbon alloy system. It aims to provide student the knowledge needed to build a strong foundation for understanding the structure of metals and alloys.

Outcomes:

Knowledge of crystal structure and crystal binding,

Understanding of defects including screw dislocations and edge dislocations,

Understanding of the role of dislocations in controlling the plastic deformation of metals,

Understanding of grain boundary and the dislocation model of small angle tilt grain boundary,

Understanding of the thermodynamics of vacancies and solid solutions,

Ability to analyze simple plastic deformation using dislocation theory,

Understanding of phase diagrams,
Ability to perform basic analysis on the iron-carbon system using phase diagram.

**Grading:**  
(undergraduate student)  
Homework, 20%  
Midterm Exam, 35%  
Final Exam, 45%

**Grading:**  
(graduate student)  
Homework, 10%  
Term paper, 10%  
Midterm Exam, 35%  
Final Exam, 45%

A term paper is required for graduate students in addition to the requirement for undergraduate students. The term paper will have 10% weight on the final grade.

A is 90-100, B is 80-89, C is 70-79, D is 60-69, and E is 59 or below.

**Homework Policy:**

Homework will generally be assigned each week on Friday and due the following Friday. Students need to finish the homework independently. The homework is to be turned in at the beginning of the class period. No late homework will be accepted. Students finding difficulty understanding a particular topic or homework problem are encouraged to meet with the instructor during the office hours.

**Exams:**

There will be two exams. Failure to write an exam will result in a score of zero and loss of 40% the final grade. No makeup exams will be given. Upon prior notification of the instructor, allowances will be made under extreme circumstances. Upon the receipt of a graded exam, if you find that an exam problem was graded incorrectly, it must be re-submitted to the instructor within 48 hours from the time the exam was returned.