New Course Request

Check Appropriate Boxes:

- Undergraduate credit [✓]
- Graduate credit [ ]
- Professional credit [ ]

1. School/Division: School of Engineering and Technology
2. Academic Subject Code: MET
3. Course Number: 3480 C (must be cleared with University Enrollment Services)
4. Instructor: Rongrong Chen
5. Course Title: Engineering Materials
   Recommended Abbreviation (Optional): MET (Limited to 32 Characters including spaces)
6. First time this course is to be offered (Semester/Year): Fall/2009
7. Credit Hours: Fixed at 4 or Variable from _______ to _______
8. Is this course to be graded S-F (only)? Yes [ ] No [✓]
9. Is variable title approval being requested? Yes [ ] No [✓]
10. Course description (not to exceed 50 words) for Bulletin publication:
    C: None.
    An overview of structures, properties and applications of metals, polymers, ceramics, and
    composite materials is presented. Problem-solving skills are developed in material
    selection, evaluation, measurement, and testing. Laboratory activities include testing
    various properties of different materials, and selection of materials for engineering
    applications.
11. Lecture Contact Hours: Fixed at 3 or Variable from _______ to _______
12. Non-Lecture Contact Hours: Fixed at 2 or Variable from _______ to _______
13. Estimated enrollment: 25 of which 0 percent are expected to be graduate students.
14. Frequency of scheduling: yearly
15. Will this course be required for majors? Yes
16. Justification for new course: Combining current MET 141 and MET 344 to one course
17. Are the necessary reading materials currently available in the appropriate library? Yes
18. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other
    materials.
19. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap
    is necessary, desirable, or unimportant.
20. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be
    overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments
    directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus
    consulted.

Submitted by:

[Signature]
Department Chairman/Division Director
Date 9-19-09

Approved by:

[Signature]
Dean
Date 9-28-09

Dean of Graduate School (when required)
Date

Chancellor/Vice-President
Date

University Enrollment Services
Date

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.

UPS 724
MET 348 Engineering Materials

Syllabus
Fall, 2009

1. Instructor:
   Dr. Rongrong Chen
   • Office: ET 209
   • Telephone: 274-4280
   • E-mail: rochen@iupui.edu
   • Office Hours: Tuesday 9:30 – 11:30 am

2. Textbook:
     Budinski and Michael K. Budinski

Reference:
   • “Introduction to Materials Science for Engineers,” 7th edition, James F.
     Shackelford,
     F. Smith and Javad Hashemi

3. Prerequisites: Chem-C 101 and Chem-C 121

4. Course Description:
   Chem-C121 C: None. An overview of structures, properties and applications
   of metals, polymers, ceramics, and composite materials is presented.
   Problem-solving skills are developed in material selection, evaluation,
   measurement, and testing. Laboratory activities include testing various
   properties of different materials, and the selection of materials for engineering
   applications.

5. Course Objectives:
   • Students will gain an understanding of how the elements are the building
     blocks for engineering materials and how engineering materials, such as
     metals, polymers, ceramics, and composites are related in origin and
     structural characteristics.
   • Through hands-on experimental activities, students will explore and test
     different physical, chemical and mechanical properties of various types of
     engineering materials.
   • Students will learn how polymerized organic materials form engineering
     materials, what the differences are between polymer families, how
thermoplastic and thermoset plastics and polymer composites are shaped into parts.

- Students will understand of how steels are made, how cold/heat treatment and alloy additions alter steel properties. Other metals, such as Cu, Al, Ni, Zn, Ti and their alloys will be studied to understand how alloy composition, metallurgy affect mechanical, physical/chemical properties.
- Students will learn application of nano-materials for real-world technical and engineering applications and methods to fabricate nano-materials.
- Students will learn basic selection criteria used for engineering materials during the design/production stages of a product.

6. **Course Meeting Time and Location:**
   - Lecture: Mon. and Wed. 2:00 – 3:15 pm, Room: ET 121
   - Lab: Mon. or Wed. 4:00 – 5:50 pm, Room: ET 125

7. **Teaching Assistant:**
   - TBD

8. **Attendance and Expectations:**
   Attendances in class and laboratory sessions are expected. Material covered in class will follow the book closely in some chapters, and will deviate from it in others. **Students who missed classes are responsible for the material covered and the homework assigned.**

Correct behavior in class is expected. Making noise, talking, sending or reading text message on your cell phone, having your cell phone make noises, leaving early or arriving late can be very distracting to everyone. Students who are disruptive to the class will be asked to leave the room. In the case that you will arrive late or leave early, please minimize class disruption.

9. **Grading:**
   The course grade is based on numerical scores including homework, lab reports, quizzes, exams, group problems and a cumulative final according to the following point system:

   - **Homework** 20 points each
   - **Quiz** 10 points each
   - **Exam I** 100 points
   - **Exam II** 100 points
   - **Exam III** 100 points
   - **Lab reports** 20 points each
   - **Final** 200 points

Bonus points will be given for research reports related to each lectures or lab experiments. One report for one topic will be accepted every week. Each report
will be graded up to 10 bonus points. If a presentation of the research work is given, up to 10-extra points will be given.

10. Grading Scale:

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Accumulated point</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>900-1000</td>
</tr>
<tr>
<td>B</td>
<td>800-899</td>
</tr>
<tr>
<td>C</td>
<td>700-799</td>
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<tr>
<td>D</td>
<td>600-699</td>
</tr>
<tr>
<td>F</td>
<td>599 and below</td>
</tr>
</tbody>
</table>

11. Make-up Exam Policy:
   No make-up exams will be given without an excused absence supported by a written notice.

12. Assignments:
   Homework assignments constitute a major part of this course. In addition to your performance in tests, you can demonstrate your technical abilities through the way you present solutions to homework problems. Therefore, it is important that your solutions be correct and your presentation of the solutions be complete. The following is a list of the minimum requirements:
   - Late assignments will be accepted but there is a penalty of 5% for each late date.
   - An 8.5 by 11 in standard size paper must be used for all assignments, including the figures. Computer printouts must be cut to 8.5 by 11 in size.
   - Assignment sheet(s) should be attached to the front.
   - If graphs are required, an appropriate scale should be used for each graph, and an accurate plot of functions should be provided. Graphs should contain titles, axis labels, legends and units.

13. Honest Policy:
   All students are expected to be honest in all work submitted and exams taken in this course and all others. You are reminded of the statements made regarding cheating in the IUPUI "Student Rights and Responsibilities" booklet. Such academic misconduct will be handled according to the guidelines in that booklet. Penalties for such misconduct include lowering of a student's grade as well as disenrollment from school. The following quote from the booklet is important to note: "It is the responsibility of the student not only abstain from cheating but, in addition, to guard against making it possible for others to cheat. Any student who helps another student to cheat is as guilty of cheating as the student he/she assists." All lab reports and HW assignments must reflect student's individual effort.

14. Draft of Course Outline: Topics are subject to change (see next page)
10 lab sections will be conducted. A draft of lecture sections is as following.

### Lecture Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Homework Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/26</td>
<td>Introduction to the course</td>
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<tr>
<td></td>
<td>- Objectives of the course</td>
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<td></td>
<td>- What are going to teach</td>
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<tr>
<td></td>
<td>- Expectations for lab and lecture</td>
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</tr>
<tr>
<td>8/31</td>
<td>Chapter 1 - Engineering Materials (EMs)</td>
<td>HW#1</td>
</tr>
<tr>
<td>9/2</td>
<td>Chapter 2 - Nature and Formation of EMs</td>
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<tr>
<td>9/9</td>
<td>Chapter 3 - Chemical and Physical Properties of EMs</td>
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<tr>
<td>9/14</td>
<td>Chapter 4 - Mechanical Properties of EMs</td>
<td>HW#2</td>
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<tr>
<td>9/16</td>
<td>Chapter 5 - Tribology in EMs</td>
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<tr>
<td>9/21</td>
<td>Chapter 6 - Corrosion in EMs</td>
<td>HW#3</td>
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<tr>
<td>9/23</td>
<td>Review Chap. 1-6</td>
<td></td>
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<tr>
<td>9/28</td>
<td>Exam #1</td>
<td></td>
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<tr>
<td>9/30</td>
<td>Chapter 7 - Principles of Polymeric Materials</td>
<td>HW#4</td>
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<td>10/5</td>
<td>Chapter 8 - Polymer Families</td>
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<td>10/7</td>
<td>Chapter 9 - Polymer Fabrication Processes</td>
<td>HW#5</td>
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<tr>
<td>10/12</td>
<td>Chapter 10 - Selection of Polymeric Materials</td>
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<tr>
<td>10/14</td>
<td>Review Chap. 7-10</td>
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<tr>
<td>10/19</td>
<td>Exam #2</td>
<td></td>
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<tr>
<td>10/21</td>
<td>Chapter 11 - Ceramics</td>
<td>HW#6</td>
</tr>
<tr>
<td>10/26</td>
<td>Chapter 12 - Steels</td>
<td></td>
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<tr>
<td>10/28</td>
<td>Chapter 13 - Heat Treatment of Steels</td>
<td>HW#7</td>
</tr>
<tr>
<td>11/2</td>
<td>Chapter 14 &amp; 15 &amp; 16 - Carbon and Alloy Steels</td>
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<tr>
<td>11/4</td>
<td>Chapter 17 - Cast Iron</td>
<td>HW#8</td>
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<tr>
<td>11/9</td>
<td>Chapter 18 Copper and Its Alloys</td>
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<tr>
<td>11/11</td>
<td>Review Chap. 11-18</td>
<td></td>
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<tr>
<td>11/16</td>
<td>Exam #3</td>
<td></td>
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<tr>
<td>11/18</td>
<td>Chapter 19 - Aluminum and Its Alloys</td>
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<tr>
<td>11/23</td>
<td>Chapter 20 - Other Alloys</td>
<td>HW#9</td>
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<tr>
<td>11/30</td>
<td>Chapter 21 - Surface Engineering</td>
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<tr>
<td>12/2</td>
<td>Chapter 22 - Nanomaterials</td>
<td>HW#10</td>
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<tr>
<td>12/7</td>
<td>Chapter 23 - Material Selection</td>
<td></td>
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<tr>
<td>12/9</td>
<td>Review Chap. 19-23</td>
<td></td>
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<tr>
<td>12/14</td>
<td>No class</td>
<td></td>
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<tr>
<td>Final Exam</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>
PURDUE SCHOOL OF ENGINEERING & TECHNOLOGY
COURSE OUTCOMES AND ASSESSMENT DATA SHEET

This is an internal document to identify and record expected outcomes and anticipated assessment strategies for all courses taught within the School of Engineering and Technology. Submission of this form, as noted below, is required and must accompany all new course and course change requests. Copies of this form should also be retained within the department and kept on file with the outline or syllabus for each course.

Course Number: MET48 Course Title: Engineering Materials

Procedure:

1. First, identify all instructional outcomes expected for this course, and then select all ABET outcomes which are consistent with those anticipated objectives from TABLE 1 below.

<table>
<thead>
<tr>
<th>#</th>
<th>TECHNOLOGY - TAC Criteria #1 (Proposed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Demonstrate an appropriate mastery of the knowledge, techniques, skills and modern tools of their discipline.</td>
</tr>
<tr>
<td>2</td>
<td>Apply current knowledge and adapt to emerging applications in mathematics, science, engineering and technology.</td>
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<tr>
<td>3</td>
<td>Conduct, analyze and interpret experiments and apply experimental results to improve processes.</td>
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<td>4</td>
<td>Apply creativity in the design of systems, components or processes appropriate to program objectives.</td>
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<td>5</td>
<td>Function effectively on teams.</td>
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<td>6</td>
<td>Identify, analyze and solve technical problems.</td>
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<td>7</td>
<td>Communicate effectively.</td>
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<td>8</td>
<td>Recognize the need for and possess the ability to pursue lifelong learning.</td>
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<td>9</td>
<td>Understand professional, ethical and societal responsibilities.</td>
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<td>10</td>
<td>Recognize contemporary professional, societal and global issues and be aware of and respect diversity.</td>
</tr>
<tr>
<td>11</td>
<td>Have a commitment to quality, timeliness and continuous improvement.</td>
</tr>
</tbody>
</table>

2. Subsets for each of the six IUPUI Principles of Undergraduate Learning (PUL) are given on the reverse side in TABLE 2. Using a number corresponding to each ABET outcome identified from TABLE 1 above to select a column, place a "V" or "X" mark in the applicable TABLE 2 row(s) cell for each PUL. Courses will often address multiple ABET outcomes and ABET outcomes frequently will overlap more than one PUL subset. Thus, it is expected completed data sheets may contain marks in several cells thereby indicating the course simultaneously satisfies multiple Principles of Undergraduate Learning while fulfilling its intended ABET objective(s).

3. After completing TABLE 2, briefly define or explain how the course outcomes or objectives will be evaluated within the context of the departmental assessment program in the space below:

Students will gain understanding of structures, properties, processing and applications of different types of engineering materials, measured in individual work, team work, exams, and lab reports.

Submitted by: Rongcong Chen Date: 01/18/09
TABLE 2 - MATRIX OF EXPECTED COURSE OUTCOMES

(Suggestion - while completing Table 2, place a copy of the ABET outcomes from Table 1 along side for easy cross referencing.)

<table>
<thead>
<tr>
<th>PRINCIPLES OF UNDERGRADUATE LEARNING - &quot;Require All Students to Demonstrate an Ability to&quot;</th>
<th>TECHNOLOGY OUTCOMES - TAC CRITERIA #1: items (a) to (k)</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
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</thead>
<tbody>
<tr>
<td>1(a) Express ideas and facts effectively in written format</td>
<td>X</td>
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<td>1(b) Comprehend, interpret, and analyze texts</td>
<td>X</td>
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<td>1(c) Communicate orally in one-on-one and group settings</td>
<td>X</td>
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<td>1(d) Solve problems that are quantitative in nature</td>
<td>X</td>
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<td>1(e) Make efficient use of information resources and technology for personal and professional needs</td>
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<tr>
<td>2(a) Analyze complex issues and make informed decisions</td>
<td>X</td>
<td>X</td>
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<td>2(b) Synthesize information in order to arrive at reasoned conclusions</td>
<td>X</td>
<td>X</td>
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<td>2(c) Evaluate the logic, validity, and relevance of data</td>
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<td>2(d) Solve challenging problems</td>
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<td>2(e) Use knowledge and understanding to generate and explore new questions</td>
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<td>3(a) Apply knowledge to enhance personal lives</td>
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<tr>
<td>3(b) Apply knowledge to meet professional standards and competencies</td>
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<td>3(c) Apply knowledge to further the goals of society</td>
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<tr>
<td>4(a) Demonstrate substantial knowledge and understanding of at least one field of study</td>
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<td>4(b) Compare and contrast approaches to knowledge in different disciplines</td>
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<td>4(c) Modify their approach to an issue or problem based on the contexts and requirements of particular situations</td>
<td>X</td>
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<tr>
<td>5(a) Compare and contrast the range of diversity and universality in human history, societies, and ways of life</td>
<td>X</td>
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<td>5(b) Analyze and understand the interconnections of global and local concerns</td>
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<tr>
<td>6(a) Operate with civility in a complex social world</td>
<td>X</td>
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<tr>
<td>6(b) Recognize the importance of aesthetics in their personal lives and to society</td>
<td>X</td>
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PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE (100-400 LEVEL)

DEPARTMENT: Engineering and Technology
EFFECTIVE SESSION: Fall 2009

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

- 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: MET
- Course Number: 348
- Long Title: Engineering Materials
- Short Title: Engineering Materials

EXISTING:
- Subject Abbreviation
- Course Number
- Long Title
- Short Title

TERMS OFFERED:
- Check All That Apply: Summer, Fall, Spring
- CAMPUS(ES) INVOLVED: Calumet, Cont Ed, Ft. Wayne, Indianapolis, N. Central, Tech Statewide, W. Lafayette

CREDIT TYPE:
- Fixed Credit Cr. Hrs.: 4
- Variable Credit Range: 2
- Minimum Cr Hrs: (Check One) To
- Maximum Cr Hrs: (Check One) To
- Equivalent Credit: Yes
- Thesis Credit: Yes

COURSE ATTRIBUTES:
- Pass/Not Pass Only
- Satisfactory/Unsatisfactory Only
- Repeatable
- Maximum Repeatable Credit: 15
- Credit by Examination: 10
- Designator Required: 11
- Full Time Privilege: 12
- Special Fees: 15
- Off Campus Experience: 15

COURSE DESCRIPTION (INCLUDE PREREQUISITES):
MET 548 Engineering Materials (4) Gass, 3. Lab: 1, P. Chem-C101 and Chem-C121. C: None. An overview of structures, properties and applications of metals, polymers, ceramics, and composite materials is presented. Problem-solving skills are developed in material selection, evaluation, measurement, and testing. Laboratory activities include testing various properties of different materials, and the selection of materials for engineering applications.

Date: Cauemt School Dean: Date

Date: Fort Wayne School Dean: Date

Date: Indianapolis School Dean: Date

Date: Fort Wayne Department Head: Date

Date: Indianapolis Department Head: Date

Date: North Central Department Head: Date

Date: West Lafayette Department Head: Date

Date: West Lafayette Registrar: Date

OFFICE OF THE REGISTRAR