A. **Academic Division:** Business, Industry and Technology  
B. **Discipline:** Mechanical Engineering  
C. **Course Number and Title:** MECT2230 Engineering Materials  
D. **Course Coordinator:** Ken Ekegren  
   **Assistant Dean:** Daniel Wagner  
**Instructor Information:**  
- **Name:** Click here to enter text.  
- **Office Location:** Click here to enter text.  
- **Office Hours:** Click here to enter text.  
- **Phone Number:** Click here to enter text.  
- **E-Mail Address:** Click here to enter text.  
E. **Credit Hours:** 3  
   - Lecture: 2 hours  
   - Laboratory: 2 hours  
F. **Prerequisites:** None  
G. **Syllabus Effective Date:** Fall, 2017  
H. **Textbook(s) Title:**  
   *Practical Metallurgy and Materials of Industry*  
   - **Author:** Neely and Bertone  
   - **Copyright Year:** 2002  
   - **Edition:** 6th  
   - **ISBN #:** 0130945803  
I. **Workbook(s) and/or Lab Manual:** None; Class Handouts will be distributed  
J. **Course Description:** Physical metallurgy emphasizing commercial alloys, heat treatment, and surface treatment of the iron, steel, aluminum, copper, and aerospace metals. The laboratory covers basic metallographic techniques of specimen polishing, etching, and examination. (TAG # OET013)  
K. **College-Wide Learning Outcomes:**  

<table>
<thead>
<tr>
<th>College-Wide Learning Outcome</th>
<th>Assessments - - How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication – Written</td>
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<td>Communication – Speech</td>
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<td>Intercultural Knowledge and Competence</td>
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<td>Critical Thinking</td>
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<td>Information Literacy</td>
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<td>Quantitative Literacy</td>
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Updated: 2/15/2017
L. **Course Outcomes and Assessment Methods:**

Upon successful completion of this course, the student shall:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Assessments – How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. List how engineering materials, metals, polymers, ceramics, and composites are related in origin and structural characteristics. (crystal structure, organic composition and properties, basic chemistry and atomic structure)*</td>
<td>This material is covered in Chapters 2 and 4, over physical properties and structures of metals. It is also covered in the last section over composite materials (non-metallic origin, including organic). Exams at Week 5, 10 and Final Exam</td>
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<tr>
<td>2. List the properties that must be reviewed when making materials selections. (modulus of elasticity, tensile strength, yield strength, shear strength)*</td>
<td>Physical properties of materials is covered in Chapter 7, Plastic Deformation, as well as during lab exercises performing yield, tensile and shear strength testing. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports</td>
</tr>
<tr>
<td>3. Differentiate between the properties of stiffness, strength, and toughness. (stiffness – modulus, strength – tensile strength, yield, shear strength)*</td>
<td>Physical properties relating to stiffness, strength and toughness are covered during lab exercises using Charpy Impact testing, tensile and shear testing. It is also covered in Chapters 4 and 7, Structure of Metals and Plastic Deformation. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports</td>
</tr>
<tr>
<td>4. Define vocabulary used in steel terminology.*</td>
<td>Multiple lessons contain vocabulary relating to steel. Chapters 11 thru 17 cover steel related terms from cast iron to stainless steel. This vocabulary is also presented during most labs. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports</td>
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<tr>
<td>5. Describe how steels are made. (melting, casting, hot rolling, cold rolling)*</td>
<td>This material is covered within Chapter 11 thru 17, specifically Chapter 11 on the melting, casting and rolling. Exams at Week 5 and Final Exam</td>
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<tr>
<td>6. List and describe the common heat treatments used on steels. (annealing – heat and slow cool, quenching - fast cooling, tempering - low temperature reheating)*</td>
<td>Heat treating is covered in Chapters 13 and 14, Cooling Rates of Steel and Heat Treating. Lab exercises involved in quench and tempering high carbon steel is performed, as well as forging steel above its critical temperature. Exams at Week 5, 10 and Final Exam</td>
</tr>
<tr>
<td>7. Describe how cold working and alloy additions alter steel properties. (increase strength, lower ductility)*</td>
<td>This material is covered in Chapter 7, Plastic Deformation as well as in lab exercises where steel is cold worked and hardness is monitored. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports</td>
</tr>
<tr>
<td>8. Specify tool steels based upon their properties and the heat treatment to which they have been subjected. (evaluate operating temperature, strength, stiffness, cyclic loading)*</td>
<td>Tool steel material is covered in Chapter 15, along with a presentation of tool steels, their make-up and properties. A presentation of carbide cutters is also given. Exams at Week 10 and Final Exam</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Assessments – How it is met &amp; When it is met</td>
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<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>9. Develop a guideline on how to screen candidate materials and arrive at the proper choice.*</td>
<td>Chapter 7, Plastic Deformation, along with tensile tests and non-destructive hardness testing lab exercises are used to develop skills in material selection. This is also covered in each chapter as non-ferrous and non-metallic material information is introduced. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports</td>
</tr>
<tr>
<td>10. Demonstrate a basic understanding of polymers, aluminum, and copper</td>
<td>Chapters 18 through 23 cover non-ferrous materials, plus a presentation of composite materials provides information. Week 10 midterm and Final Exam</td>
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M. Topical Timeline (Subject to Change):

- Wk 1  Space Lattices, Unit Cells, Nucleation, Gram Growth, Dendrites, Allotropy Crystal Defects, Alloy Types, Deformation, Recovery, Recrystallization
- Wk 3  Cooling Curves, Equilibrium Diagrams, Iron-Carbon Diagram
- Wk 4  Heat Treatment, T-T-T or IT Curve, C-C Curve and Critical Cooling
- Wk 5  Hardenability, Joining Test, Quenching, Tampering Problems, Interrupted Quenches
- Wk 6  Surface Treatments - Surface Hardening, Surface Coatings, Corrosion
- Wk 6  Commercial Steels - SAE and AISI Classifications Trade Designations
- Wk 7  Irons - Wrought, Gray, White, Ductile, Malleable
- Wk 8  Stainless Steel
- Wk 10 Other Light Metals - Alloy Systems and Properties, Heat Treatment Hazards
- Wk 11 Copper Metals - Alloy Systems and Commercial Designations, Application Heat Treatment, Properties
- Wk 12 Nickel Metals
- Wk 13 Powder Metallurgy - Description, Characteristics, Application
- Wk 14 Foundry - Melting, Alloying, Fluxing, Problems

- Wk 1  Examinations of Lab Equipment
- Wk 1  Discussion of Lab Safety
- Wk 2  Specific gravity and density
- Wk 2  Discussion of Report Writing
- Wk 3  Tension test
- Wk 4  Properties of wood
- Wk 5  Hardness testing
- Wk 6  Determine tension test with stress raisers
- Wk 7  Shear test
- Wk 9  Check Buckling
- Wk 10 Beam deflection
- Wk 12 Composite Materials

N. Course Assignments:

Graded assignments:
1. Written lab reports
2. Lab exercises
3. Midterm
4. Final Exam
O. **Recommended Grading Scale:**

<table>
<thead>
<tr>
<th>NUMERIC</th>
<th>GRADE</th>
<th>POINTS</th>
<th>DEFINITION</th>
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</thead>
<tbody>
<tr>
<td>93–100</td>
<td>A</td>
<td>4.00</td>
<td>Superior</td>
</tr>
<tr>
<td>90–92</td>
<td>A-</td>
<td>3.67</td>
<td>Superior</td>
</tr>
<tr>
<td>87–89</td>
<td>B+</td>
<td>3.33</td>
<td>Above Average</td>
</tr>
<tr>
<td>83–86</td>
<td>B</td>
<td>3.00</td>
<td>Above Average</td>
</tr>
<tr>
<td>80–82</td>
<td>B-</td>
<td>2.67</td>
<td>Above Average</td>
</tr>
<tr>
<td>77–79</td>
<td>C+</td>
<td>2.33</td>
<td>Average</td>
</tr>
<tr>
<td>73–76</td>
<td>C</td>
<td>2.00</td>
<td>Average</td>
</tr>
<tr>
<td>70–72</td>
<td>C-</td>
<td>1.67</td>
<td>Below Average</td>
</tr>
<tr>
<td>67–69</td>
<td>D+</td>
<td>1.33</td>
<td>Below Average</td>
</tr>
<tr>
<td>63–66</td>
<td>D</td>
<td>1.00</td>
<td>Below Average</td>
</tr>
<tr>
<td>60–62</td>
<td>D-</td>
<td>0.67</td>
<td>Poor</td>
</tr>
<tr>
<td>00–59</td>
<td>F</td>
<td>0.00</td>
<td>Failure</td>
</tr>
</tbody>
</table>

P. **Grading and Testing Guidelines:**

Click here to enter text.

Q. **Examination Policy:**

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R. **Class Attendance and Homework Make-Up Policy:**

Click here to enter text.

S. **Classroom Expectations:**

Click here to enter text.

T. **College Procedures/Policies:**

**Attendance Requirements:** All students are required to attend all scheduled classes and examinations. Each faculty member has the right to establish regulations regarding attendance that he/she considers necessary for successful study.

Students who do not attend classes may be administratively withdrawn from those classes. However, failure to attend classes does not constitute withdrawal, and students are expected to process a formal withdrawal through the Student Records Office in Kee Hall.

**Student engagement requirements:**

Student engagement is based on the “active pursuit” of learning which can be measured by class attendance, class participation (in class or online), taking required quizzes/examinations, and submission of work assignments or papers. Student engagement consists of a student attending at least 60% of the class sessions (there should be attendance throughout the term) and/or completing 75% of the assignments listed on the syllabus at the midpoint in the term. Exceptions can be made when there is on-going communication between the student and faculty member. The communication must be documented and the faculty member and student must be in agreement regarding the exception. Students not meeting the expectation will be administratively withdrawn from class. If a student believes he/she was administratively withdrawn in error, he/she may file an appeal. Being administratively withdrawn may have program and financial aid implications.
**Academic Misconduct** is any activity that tends to compromise the academic integrity of the college, or subvert the educational process. Examples of academic misconduct include, but are not limited to:

1. **Violation of course or program rules** as contained in the course syllabus or other information provided to the student; violation of program requirements as established by departments and made available to students.

2. **Plagiarism** including, but not limited to, submitting, without appropriate acknowledgment, any written, visual or oral material that has been copied in whole or in part from the work of others (whether such source is published or not) even if the material is completely paraphrased in one’s own words. This includes another individual’s academic composition, compilation, or other product, or a commercially prepared paper. Plagiarism also includes submitting work in which portions were substantially produced by someone acting as a tutor or editor.

   Such practices constitute plagiarism regardless of motive. Those who deny deceitful intent, claim not to have known that the act constituted plagiarism, or maintain that what they did was inadvertent are nevertheless subject to penalties when plagiarism has been confirmed.

3. **Cheating** and dishonest practices in connection with examinations, papers and projects, including but not limited to using unauthorized notes, study aids or information on an examination; obtaining help from another student during an examination; taking an exam or doing work for another student; providing one’s own work for another student to copy and submit as his/her own; or allowing another student to do one’s work and then submitting the work as one’s own. Also included would be altering a graded work after it has been returned, then submitting the work for re-grading; or submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

4. **Fabrication** including but not limited to falsifying or inventing any information, data or citation; presenting data that were not gathered in accordance with defined appropriate guidelines, and failing to include an accurate account of the method by which data were collected.

5. **Obtaining an Unfair Advantage** including, but not limited to stealing, reproducing, circulating, or otherwise gaining access to examination materials prior to the time authorized by the instructor; unauthorized collaborating on an academic assignment; taking, hiding or altering resource material; or undertaking any activity with the purpose of creating or obtaining an unfair advantage over another student’s academic work.

6. **Aiding and Abetting Academic Dishonesty** including, but not limited to providing material, information or other assistance to another person with the knowledge that such aid could be used in any of the violations stated above, or providing false information in connection with any inquiry regarding academic integrity.

7. **Alteration of Grades or Marks** including but not limited to, action by the student in an effort to change the earned credit or grade.

In addition, cases of academic dishonesty may involve photocopied materials. Materials used may fall under the Copyright Act. Violations of said Act may subject the user and/or the College to sanctions.

**Statement on Disabilities:** Any student who requires reasonable accommodations related to a disability should inform the course instructor and the Coordinator of Specialized Services (Room 138 in Kee Hall; phone 419-755-4727).

Students who encounter difficulty in any of their courses are encouraged to visit the Tutoring Resource Center (Room 119 in Fallerius Technical Education Center) for tutoring assistance, and the Student Success
Center (Room 136 in Kee Hall) for academic assistance, advising services, referrals for personal counseling and Learning Disability (LD) Testing.

**Statement on Withdrawals:** As a student, you are expected to attend class. If you are unable or choose not to attend class, or if for whatever reason you are unable to keep up with the requirements of a course, you need to officially drop the class at the Student Records Office. Refund dates and withdrawal dates will vary slightly from term to term. Contact the Student Records Office for applicable dates. Additionally these dates are posted on the academic calendar available on the college’s website, [www.ncstatecollege.edu](http://www.ncstatecollege.edu), under the Academics heading on the home page and are available at the Student Records Office in Kee Hall. Students should go to the Student Records Office (Room 142 in Kee Hall) to process their withdrawal from any class.

If you choose to walk away from your class without officially withdrawing from it, the faculty member teaching the class must grade your classroom performance on the material available to him or her. This normally results in an "F" grade. An "F" grade can lower your grade point average considerably depending on the total credits accumulated.