INSTRUCTOR: Dr. Bob Jones, Professor
Email: Robert.jones@utrgv.edu
Office: ENGB 3.246
Phone: 665-5019

OFFICE HOURS: Mon, Wed, Thur, 2:00-3:30

TEXTBOOK: Materials Science and Engineering: An Introduction, 9th Ed., W.D. Callister
The text is highly recommended but not required. You will need to purchase a TopHat access code.

COURSE PREREQUISITE: CHEM 1307/1107 (preferred) or 1301/1101

PREREQUISITE KNOWLEDGE
- Basic chemistry
- Algebra and Trigonometry
- Use of Computer Spreadsheets

COURSE OBJECTIVES:
*Introduce the fundamental concepts of materials science and the principle mechanical and physical properties of engineering materials including ferrous and non-ferrous alloys, polymers, and composites.

*Explore advanced topics in long term durability of structures including corrosion and fatigue as well as examining the next generation of structural materials and their properties.

*Develop the professional skills and mindset for good selection of materials and productive professional interaction with materials specialists in your future roles as design and project engineers.

Departmental Objectives
This course is a significant component of departmental objectives 1,5, 8,10,14, and 16.

The Educational Objectives of the Mechanical Engineering Program at The University of Texas-Rio Grande Valley are to produce graduates who:

1. Have the knowledge and technical skills required to be and to remain Productive in the field of Mechanical Engineering.
2. Have an understanding of the importance of professionalism, ethics, safety and socioeconomic concerns in resolving technical problems.
3. Are capable of functioning in diverse environments.
4. Are able to use knowledge of mathematics, basic sciences and engineering to analyze (identify, formulate, and solve) problems in mechanical engineering.
5. Are able to design and conduct experiments and interpret the results.
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7. Are able to function in multi-disciplinary teams.
8. Are able to communicate ideas effectively in graphical, oral and in written media.
9. Understands the professional responsibility of an engineer and how engineering solutions impact safety, economics, ethics, politics, societal, cultural and contemporary issues.
10. Understands the need for life-long learning to keep abreast of current practice.
14. Have the ability to specify and evaluate materials and manufacturing steps for mechanical components.
15. Have the ability to conceive and conduct experiments to measure the performance of materials, components and systems and to communicate the results.
16. Have the ability to acquire new skills and specialized knowledge from published sources.

ASSIGNMENTS:
This course is information intensive and there is less opportunity for traditional engineering problem solving. In the real world, there are always multiple materials solutions to a problem so the critical skill this course seeks to develop is the ability to think through the requirements of the application and choose one of the better options from a group of acceptable choices. It is important that you fully grasp a core of principles and are familiar with a broad area of information. This is best done through the reading assignments. To assure that you are mastering the skills and concepts a combination of homework, daily quizzes, and midterm exams will be employed.

HOMEWORK
Homework will be assigned primarily through the online homework system which can be accessed at:
https://melearn.utrgv.edu/ley/hws/materials/login.php

NOTEBOOK
It is wise in all classes to build and maintain a notebook to aid in your studying. It should contain:
1. Syllabus
2. Class Notes
3. Worked homework problems in standard format
4. Other quizzes and assignments
5. Midterm exams. Though you will be submitting your homework online, you will have to work out most of the problems on paper. You should keep those worked problems for review when preparing for exams. Notebooks will not be collected but they are a very good habit to develop.

READINGS AND PRECLASS ASSIGNMENTS:
To allow us to do more problems and case studies in class, you will be expected to do assigned readings and watch instructional videos through blackboard and come to class prepared for the topic at hand. To motivate you to do this, short homeworks of mostly multiple choice questions as well as blackboard quizzes will be assigned before every class period. Class will begin with a quiz over the reading and video material.

Supplemental Instruction/Peer Coaching:
SI sessions will be offered either early morning, before class, or immediately after class Mon-Thur. Attendance of three sessions per week is required to receive the 5 points on the final grade assigned to SI. If you score a 75 or better on any given exam, you do not have to attend SI sessions the following week to keep your points for the final grade.
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QUZZES:  
Approximately twenty short daily quizzes will test your mastery of basic concepts and terminology from both the lecture and the reading. Quizzes will be given in the first five minutes of class. Late arrivals will receive no special consideration.

EXAMINATIONS:  
In general, semester examinations will consist of problems and short answer questions. They will be written so that the average student can complete them in one hour.

All Students must find a **non-programable calculator** for use on exams. It should have logarithmic and trigonometric functions but should not be programmable nor should it have infrared or digital communication capability. The Fundamentals of Engineering examination allows the use of the following: HP 33s and 35s, Casio fx-115 models, and TI-30X or 36X in all their variations. These are all acceptable and most cost less than $10.

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**Rules for Examinations**

1. No calculator covers will be permitted in the exam.
2. Backpacks and purses will be stowed against the wall or on the floor in front of your desk.
3. No caps or hats may be worn or placed on the desk.
4. Students may not leave the exam room and return for any reason. Plan your diet/drinks accordingly.
5. No programmable calculators. You must have a calculator from the pre-approved list or a similar model.
6. Needed paper will be provided. All you need is a pencil, calculator, and straight edge.
7. Cell phones must be off and in backpack/purse. Anyone receiving a message will have their test collected. NO SMART WATCHES will be permitted in the exam. Possession of a smart watch will be treated as evidence of intent to cheat and your exam will be collected.
8. Students arriving later than 15 minutes after exam start will be turned away unless prior arrangements have been made. The instructor must be notified ahead of time if a late arrival is expected.

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**CURVES**

There will be no curve applied to grades. Corrections may be applied to exams if I determine some problems were poorly conceived or worded. You should be able to do everything I ask so there will be no curve.

**COURSE GRADE:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Quizzes*</td>
<td>20%</td>
</tr>
<tr>
<td>SI Participation</td>
<td>5%</td>
</tr>
<tr>
<td>Semester Exams*</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam#</td>
<td>25%</td>
</tr>
</tbody>
</table>

* The lowest two quizzes and one semester exam will be dropped  
# If you pass all midterms (65+), your midterm average (without your lowest grade) can be used in place of your final exam grade and you can skip the final.
GRADING:
The grading scale will be the standard 90-100=A, 80-89=B, 70-79=C, 65-69=D, <65=F. If your final course average is on the border between two grades, I reserve the right to give you the higher grade based on any or all of three factors:

A. Fraction of homework done and homework average
B. Evidence of improving mastery shown by improving grades over the semester
C. Performance on final exam.

A grade of incomplete ("I") will be given only in situations where a student is unable to finish the semester due to circumstances beyond his/her control. It will not be given if you fail to plan.

SCHOLASTIC INTEGRITY:

Originality of Submitted Work:
If it is determined that submitted work is not original (either a copy of a solutions manual or another student’s work) the plagiarism will be reported to the Dean of Students for administrative action. Minimum penalty for such activity is loss of credit for work but may include expulsion from the course. The university has a two strikes policy. Cheating twice will result in suspension from UTRGV.

UTRGV POLICY:
As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

MAKE-UP AND LATE WORK:
Assignments are due at the date and time specified. LATE WORK WILL NOT BE ACCEPTED unless prior (24 hour) arrangements have been made. Provision may be made for genuine emergencies or business trips at the professor's discretion. However, you must contact the instructor well in advance of any business required absences or special arrangements cannot be made. Because only four out of five exams will be used in the grade calculation, there will be no make-up exams given for the semester exams. This no-late-work policy is mandated by departmental policies.
DROP POLICY:
Students can withdraw from a course through the Office of the Registrar on or prior to:

- June 8, 2017: Last day to drop a class before it appears on the transcript and counts toward the “6-drop” limit. Last day to receive a 100% refund for dropped classes (other policies apply when a student is withdrawing from all classes).
- June 30, 2017: Drop/Withdrawal Deadline; last day for students to drop the course and receive a “DR” grade. After this date, students will be assigned a letter grade for the course that will count on the GPA.

COURSE DROPS:
According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENTS WITH DISABILITIES:
If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at accessibility@utrgv.edu.

SEXUAL HARASSMENT, DISCRIMINATION AND VIOLENCE:
In accordance with UT System regulations, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

Mandatory Course Evaluations (July 2 -July 11):
Students are required to complete an ONLINE evaluation of this course, accessed through your UTPA account (https://my.utpa.edu/); you will be contacted through email with further instructions. The evaluation window closes at 11:59 pm on July 11, the last day of Summer I classes. Students who complete their evaluations by that date will have priority access to their grades.
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**Date Chapt. Topics**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/5</td>
<td>1.1</td>
<td>Introduction, Basic physics review, Classes of Materials, 1st Universal Principle,</td>
</tr>
<tr>
<td>6/6</td>
<td>1</td>
<td>Units, Dimensional Analysis Atomic Structure, Quantum numbers, Bonding</td>
</tr>
<tr>
<td>6/7</td>
<td>2</td>
<td>Atoms, Electron structures, bonding</td>
</tr>
<tr>
<td>6/8</td>
<td>3.1-7, 11-15</td>
<td>Dimensional analysis, Crystal structures</td>
</tr>
<tr>
<td>6/9</td>
<td>4.1-7</td>
<td>Crystalline Defects</td>
</tr>
</tbody>
</table>

**************Examination I,  1:30 Friday 6/9 Chapt 1-4 in EHABW Room W1.302

**Week 2**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/12</td>
<td>4.8-10</td>
<td>Materials analysis: x-ray diffraction, x-ray microanalysis, SEM</td>
</tr>
<tr>
<td>6/13</td>
<td>5.1-7</td>
<td>Diffusion First Law and 2nd Universal Principle: Arrhenius processes</td>
</tr>
<tr>
<td>6/14</td>
<td>5.1-7</td>
<td>Diffusion 2nd Law</td>
</tr>
<tr>
<td>6/15</td>
<td>6.1-12</td>
<td>Mechanical Properties: Stress-Strain, Modulus</td>
</tr>
</tbody>
</table>

**************Examination II.  2:30 p.m. Friday 6/16 Chapt 1-6 in EHABW Room W1.302************

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recovery/Recrystallization/Grain Growth</td>
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</table>

**Week 3**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
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</thead>
<tbody>
<tr>
<td>6/19</td>
<td>8.1-6</td>
<td>Fracture: Mechanics</td>
</tr>
<tr>
<td>6/20</td>
<td>8.7-12</td>
<td>Fatigue: S/N approach</td>
</tr>
<tr>
<td>6/21</td>
<td>8.13-16</td>
<td>Creep and generalized time dependent deformation</td>
</tr>
</tbody>
</table>

**************Examination III – 2:30 Friday 6/23 Chaps 1-9 in EHABW Room W1.302

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/23</td>
<td>10</td>
<td>The Iron Carbon Diagram and Non-equilibrium processing: Heat Treatment/TTT Diagrams</td>
</tr>
</tbody>
</table>

**Week 4**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
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<tbody>
<tr>
<td>6/26</td>
<td></td>
<td>TTT part II, Non-ferrous materials</td>
</tr>
<tr>
<td>6/28</td>
<td>15.1-7</td>
<td>Polymers: Mechanical Properties</td>
</tr>
<tr>
<td>6/29</td>
<td>15.8-17</td>
<td>Polymers: DSC Interpretation</td>
</tr>
<tr>
<td>6/30</td>
<td>15.8-17</td>
<td>Polymers: Failure mechanisms &amp; Environmental Effects</td>
</tr>
</tbody>
</table>

***** Examination IV – 2:30 pm, Friday 6/30 Chaps 1-15 in EHABW Room W1.302

**Week 5**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/3</td>
<td>16</td>
<td>Composites Micromechanics</td>
</tr>
<tr>
<td>7/4</td>
<td></td>
<td>Independence Day Holiday</td>
</tr>
<tr>
<td>7/5</td>
<td>16</td>
<td>Composites Micromechanics</td>
</tr>
<tr>
<td>7/6</td>
<td>17</td>
<td>Corrosion: Chemistry</td>
</tr>
<tr>
<td>7/7</td>
<td>17</td>
<td>Corrosion: Design for Corrosion prevention</td>
</tr>
</tbody>
</table>

*****Examination V  2:30 Friday 7/7 Chaps 1-17 in EHABW Room W1.302************

**Finals Week**

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapt.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/11</td>
<td>Final Exam  (optional) 11:50-1:35</td>
<td></td>
</tr>
</tbody>
</table>
Keys to Success in this Class

1. Do the readings and watch the videos
   - Before class if you want the quiz credits.
   - Read and watch the videos before trying the homework problems to get an overview

2. Use the lectures
   - Be on time (quizzes)
   - Be alert, ask questions, participate
   - When I tell you something will be on a test...believe it.
   - Review the objectives before each class...be sure you fulfill them.

3. Do the homework
   - If you need motivation, see the graph below.
   - Be sure you really understand what you’ve done

4. Learn from Exams
   - Clarify anything you miss immediately

5. Utilize the Professor’s Expertise
   - Office hours are free consulting (worth $150/hour)
   - Engineers are paid as much for knowing where to find an answer as for knowing the answer.

6. ORGANIZE
   - Keep a binder
   - Take notes and organize/review them
   - Keep track of your grades

![Course Avg vs. Hwk](image.png)