Materials Science ENGR 3322/ENTC 3410
Department of Engineering
Fall 2019

A. COURSE INFORMATION

Course number/section: ENGR 3322.001/ ENTC3410.001
Class meeting time: MW 10:00-10:50 AM/ MWF 10:00-10:50 AM
Class location: CI 128
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Rajeev Kumar
Office location: EN 210
Office hours: Tue/Wed/Thurs 2:30 PM - 4:30 PM, or by appointment
Telephone: 361-825-2559
e-mail: rajeev.kumar@tamucc.edu
Appointments: Correspond using ISLANDER email or drop-in

C. COURSE DESCRIPTION

Catalog Course Description
Structure and properties of metallic and nonmetallic materials; microstructure, mechanical testing, phase diagrams, heat treatment, testing, ceramics, polymers, composites, construction materials, failure analysis, nondestructive evaluation, corrosion and thermal properties of materials.

D. PREREQUISITES AND COREQUISITES

Prerequisites
CHEM 1411 - General Chemistry I and PHYS 2425 - University Physics I
Corequisites None.

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)
Optional Textbook(s) or Other References: None.
Supplies: Scientific calculator.
F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Demonstrate an understanding of various groups of materials, different material properties and the types of atomic bonding present in different materials.
2. Demonstrate an ability to classify and analyze crystalline structures and defects.
3. Demonstrate an understanding of the mechanical behaviors of materials and apply the knowledge to conduct mechanical behavior experiments and analyze the results.
4. Demonstrate an understanding and analyze thermal behaviors of materials.
5. Demonstrate an understanding of phase diagrams and microstructure development.
6. Demonstrate an ability to classify and analyze structural materials for applications.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

This course is a foundational course for several other courses such as Strength of Materials, Manufacturing Processes, Solid Mechanics etc. This course will introduce you to new terminologies, concepts, and definitions that are used in the field of engineering related to materials. Therefore, this course will include understanding, memorizing and applying the terminologies learned during the semester. Getting all the material for each activity at one reading is not often achievable. The student may need to spend multiple sittings reading the material, preparing study materials to be properly prepared for exams.

Textbook Readings
Covering all the material that is in the text is not achievable in the provided lecture time. The student cannot rely solely on lecture notes to gain a deep and thorough understanding of the material. The student will need to read/review the material prior to the week of lecture.

Lecture Quizzes
A brief quiz or questionnaire comprising of fill in the blanks, true/false, quick calculation type will be held in almost every lecture. Students will find the answers in the lecture although some questions (requiring thinking) may require original answers. In the end, out of say 15 quizzes, top 10 quiz scores will be counted for 5% of your final grades.
Homework/Activities
Homework will be provided for selected topics. Homework (possibly weekly) assignments will be posted on Blackboard. Homework will count 15% of the course grade.

Lab Projects/Activities:
The projects and activities are part of the lab section. Students will conduct the project experiments in groups. The instructor for each lab section will make the assignments, grade the reports, and report the grades for inclusion in your course grade. The overall grade from the lab will count 15% of your overall course grade.

Semester Tests
There are two one-hour tests in this course (see course schedule, below). These two tests will each count for 20% of the course grade. Therefore, the two tests combined will be counted for 40% of the course grade.

Final Exam
The final exam will be comprehensive of all of the topics and assignments covered in the course. It will count for 25% of the grade. The final exam will be scheduled as per university schedule.

H. MAJOR COURSE REQUIREMENTS AND GRADING

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Quiz</td>
<td>5%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Lab</td>
<td>15%</td>
</tr>
<tr>
<td>Test 1</td>
<td>20%</td>
</tr>
<tr>
<td>Test 2</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
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</tbody>
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Grading scale:
- 90-100 = A
- 80-89 = B
- 70-79 = C
- 60-69 = D
- < 60 = F
I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Chapter(s)</th>
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<tbody>
<tr>
<td>26 Aug 2019</td>
<td>1st day of class; Mechanical Behavior (Metals)</td>
<td>6.1</td>
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<tr>
<td></td>
<td>Materials for Engineering</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Atomic Bonding</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Crystalline Structure -- Perfection</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Crystal Defects and Non-crystalline Structure -- Imperfection</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Diffusion</td>
<td>5</td>
</tr>
<tr>
<td>3 Sept 2019</td>
<td>Last day to late register or add a class</td>
<td></td>
</tr>
<tr>
<td>7 Oct 2019</td>
<td>Test No. 1; Chs. 1-5, 6.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical Behavior</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Thermal Behavior</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Failure Analysis and Prevention</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Phase Diagrams</td>
<td>9</td>
</tr>
<tr>
<td>8 Nov 2019</td>
<td>Last day to drop a class</td>
<td></td>
</tr>
<tr>
<td>11 Nov 2019</td>
<td>Test No. 2; Chs. 6 (minus 6.1)-9</td>
<td></td>
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<tr>
<td></td>
<td>Kinetics -- Heat Treatment</td>
<td>10</td>
</tr>
<tr>
<td>28-29 Nov 2019</td>
<td>Thanksgiving Holidays</td>
<td></td>
</tr>
<tr>
<td>09 Dec (Monday)</td>
<td>Final Exam -- comprehensive</td>
<td>Tentative</td>
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<tr>
<td></td>
<td>Time: TBD</td>
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Dates and topics for tests are tentative and may be changed. At least one week’s notice will be given for a change in test schedule. Changes will be announced in class and via Blackboard and/or e-mails.

J. COURSE POLICIES

Attendance
Attendance will be taken daily and reported at the end of the semester. No part of your grade will be based specifically on attendance; however, regular attendance in class will significantly improve your performance on homework, tests, and the final exam.

Tests and Final Exam
Tests will be closed book, closed notes, with use of only of a calculator. Tests will be a combination of concepts, vocabulary, short work out problems, and full work out problems similar to homework. The final exam will be comprehensive in the material.

Missed tests: Those excuses that fall under university approved will merit a makeup quiz. Missing a quiz due to illness will require evidence from a clinic and will be given at the discretion of the instructor. Makeup exams and quizzes will not be the same as administered to the class.
Homework
Problems will be assigned for the student to work on so that they can develop their skill on applying particular topics. Some problems will be required to be submitted, but not all problems will be collected. Homework, when collected, will be collected on a due date stated when the assignment is given. **Homework must be turned in at the beginning of class on the date that it is due unless otherwise instructed.**

Student Collaboration: Some homework assignments will be designated as **team assignments**. On these assignments, students may work in teams of up to but not more than three students. You are not required to work on a team on such an assignment. If you do work on a team, each team member should turn in his or her own copy of the assignment, listing the other team members who worked on the assignment under that student’s name (i.e., each team member will turn in a copy of the assignment with his or her name at the top and the other team members listed below). Collaboration on homework is encouraged. It can help many of you to understand the ideas better if you explain them to each other. Collaboration to understand problems and concepts is how best to succeed in the working world. **It is important that each student fully understands the material as there will be no collaboration on quizzes or exams.**

Late Homework: **Once homework has been returned and/or solutions posted, no homework will be accepted.** Homework submitted after due date will be reduced by 25%.

K. COLLEGE AND UNIVERSITY POLICIES

- **Academic Integrity (University)**
  It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior. See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events
can sometimes occur that make dropping a course necessary or wise. *Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.* Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

**Grade Appeals (College of Science and Engineering)**

As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

**Disability Services**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116. If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816. [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

L. **OTHER INFORMATION**

None.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.