

Material Science – ENGR 320, Section 01

Abilene Christian University

Fall, 2016

Contact Information

Name:
Office:
Phone:
Email:
Office hours:

Course Description

Application of material science information in applying engineering materials to the design of components. Evaluating, interpreting, and application of industry standards for materials such as American Society for Testing Materials (ASTM), American Society of Mechanical Engineers (ASME), Society of Automotive Engineers (SAE), American Petroleum Engineers (API), Deutsches Institut für Normung (DIN), and others.

Prerequisites: *Credit for MATH 185 or placement into MATH 186 or 286 and Chemistry 131/133. Credit hours: 3.*

Class Meeting Times and Location

This class meets Tuesdays and Thursdays from 4:00 p.m. to 5:30 p.m. in Bennett Room 119.

Required Text

The required text for this course is

Title	Materials Science
Authors	R. S. Khurmi, R. S. Sedha
Publisher	S. Chand, 2010
ISBN	8121901464, 9788121901468

Reference Text(s):

- Practical Data for Metallurgists Timken Steel
<http://www.timkensteel.com/~media/Files/Practical-Data-For-Metallurgists-TimkenSteel.ashx>
- Machinery's Handbook 27th Edition, Industrial Press

Intended Audience

This course is an elective option for students interested in mechanical engineering topics. It is intended to be completed during the sophomore or junior year.

Catalog Description

Application of material science information in applying engineering materials to the design of components. Evaluating, interpreting, and the application of industry standards for materials such as American Society for Testing Materials (ASTM), American Society of Mechanical Engineers (ASME), Society of Automotive Engineers (SAE), American Petroleum Engineers (API), Deutsches Institut für Normung (DIN), and others.

The mission of ACU

To educate students for Christian service and leadership throughout the world.

The mission of the College of Arts and Sciences

The College of Arts and Sciences engages students with humanity's greatest ideas to create understanding, apply insights, and serve the world as Christian thinkers and problem solvers.

The mission of the Engineering and Physics Department

The ACU engineering program strongly supports the university's mission of educating students for Christian service and leadership throughout the world. In support of this mission, ACU engineering graduates will attain:

- A deep and broad understanding of engineering principles and practices as evidenced by professional employment, continued professional development, and graduate study in engineering or other professional fields.
- An extensive knowledge of the innovative design processes unique to engineering professionals as demonstrated by using critical thinking skills to contribute to the scientific and technical literature, patents and intellectual property, professional societies, and creative designs.
- A thorough understanding of Christian service and leadership as shown in their commitments to professionalism, ethics, and service and leadership within the engineering profession, the church, and society.

Teaching Philosophy

Engineering is a well-respected profession. The public entrusts engineers to be honest, competent, and ethical. Many codes of ethics for these fields indicate that the commitment to protecting the health, safety, and welfare of the public is of paramount importance. These values are in harmony with Christian principles and ideals. Christian engineers should be honest (Matthew 5:37), work hard to ensure competency (Colossians 3:23), and put the public's interest ahead of his or her own (Luke 6:31). In light of these principles, this course will be taught such that you will gain an appreciation for the professional nature of engineering. It will be taught so as to give you every opportunity to begin to develop competency in these fields. This will require homework, quizzes, tests, and group discussion. The instructor especially encourages the discussion of topics that would bear on integrating faith and professional responsibilities (cheating on licensure exams, weapons design and manufacture, environmental laws and employment opportunities in developing nations, etc.)

Learning Objectives

The activities of the course support the assessment of the following ABET Outcomes:

Criterion 3

3(a) an ability to apply knowledge of mathematics, science, and engineering

3(e) an ability to identify, formulate, and solve engineering problems

3(i) a recognition of the need for, and an ability to engage in life-long learning

ABET Learning Objectives	Competencies	Measurement
3(a) an ability to apply knowledge of mathematics, science, and engineering	Students will: • Apply engineering material properties to design components • Evaluate, interpret, and the application of industry standards for	Homework, quizzes, and exams

	materials.	
3(e) an ability to identify, formulate, and solve engineering problems necessary for engineering practice	Students will create, analyze, and interpret effective spreadsheet models in Excel.	Homework and reports.
3 (i) a recognition of the need for, and an ability to engage in life-long learning	Students will be exposed to the need to stay current and active in industry specific material specification through engineering societies and industry associations.	Reports.

Course Policies

Attendance and participation

It is the student's responsibility to attend class and to be prepared to discuss and participate in the scheduled materials. If you are absent from class activities it behooves you to obtain the materials that were distributed in class along with additional assignments and/or revisions in the class schedule.

Homework: will be assigned approximately weekly, and will be due in class at the start of the class period. Late homework will not be accepted. The purpose of Homework is an extension to class room learning and the application of the subject matter. I am here to help.

Professionalism: Engineers are expected to behave in a professional manner. For the purposes of this course, professionalism means that you show up, are prepared, are engaged, treat your peers and your professor with respect (both verbally and in written communication), and do not engage in disruptive classroom activities (including but not limited to inappropriate use of phones, computers, tablets, etc.) Place all phones on silent mode and in the rare occasion you should receive an emergency call, quietly answer the call and leave the room and return in the same manner.

Calculators: When calculators are allowed to be used on in-class quizzes and exams, only NCEES approved calculators will be permitted. This is to help you begin preparing for the FE exam. The approved calculators include the following:

- Hewlett Packard – HP 33s, HP 35s, and no other
- Casio – All FX-115 models. Any Casio calculator must contain FX-115 in its model name.
- Texas Instruments – All TI-30X and TI 36X models. Any TI calculator must contain either TI-30X or TI-36X in its model name.
- If a student is unsure about his or her calculator, it is his or her responsibility to check with the instructor for approval.

Course Grading

Quizzes: There will be a number (at least 8) of short in-class quizzes, roughly corresponding to homework due dates. These quizzes will be closed book and closed notes, will take place at the beginning of the class period, and **no make-ups will be allowed**. While you won't necessarily be quizzed following each assignment, you should expect a quiz at this time.

Exams: There will be four in-class exams and a cumulative final exam. Make-up exams will not be given. If you must miss an exam for a University-approved reason, let me know as far in

advance as possible. All exams are open notes not open book, if you have it in your notes you may use it. Copies of the textbook are not allowed.

Reports: Technical Reports will be assigned during the semester to enhance the student's understanding of the subject material. Maximum 2 pages, double-spaced, 12 point font, ½" margins with minimum of two reference cited.

Grading: Course grades will be calculated according to the following formula:

Homework	10%
Quizzes	10%
Exams 1~4	45%
Final exam	20%
Reports	10%
Professionalism	5%

All Quizzes and Exams grades are based on individual class curve.

Calculation of Final Course Grade*

The grading scale will be as follows:

90% and above	A
80% - 89%	B
70% - 79%	C
60% - 69%	D
59% and below	F

*Instructor reserves the right to decrease the lower bound of the grade cut-offs.

University Policies

Academic Integrity

Academic integrity is defined as academic work completed as assigned for each class by the individual or group responsible for the work. Violations of academic integrity and other forms of cheating involve the intention to deceive, mislead, or misrepresent and therefore, are a form of lying. Such actions are contrary to behavioral norms that flow from the nature of God. Academic misconduct includes, but is not limited to, the following: 1) Failing to give credit to sources used in a work in an attempt to present the work as one's own, 2) Submitting papers or projects obtained from another source (e.g., research service or club paper file) as one's own, 3) Falsifying information orally or in writing, and 4) Receiving, giving, or using unauthorized aid on an examination or quiz. Academic misconduct may result in, but is not limited to, a zero on the assignment and/or an F in the course. Additionally, the department chair, Dean of the College of Arts and Sciences, and the Dean of Student Life will be notified. See the full university policy, including how to appeal a decision, by following this link:
<http://www.acu.edu/academics/provost/policies/index.html>.

ADA Compliance Statement

"Abilene Christian University is dedicated to removing barriers and opening access for students with disabilities in compliance with ADA and Section 504 of the Rehabilitation Act. The Alpha Scholars Program facilitates disability accommodations in cooperation with instructors. In order to receive accommodations, you must be registered with Alpha Scholars Program, and you must complete a specific request for each class in which you need accommodations. If you have a documented disability and wish to discuss academic accommodations, please call our office directly at 325-674-2667."

Tentative Course Schedule

While every effort will be made to closely follow this schedule, the instructor reserves the right to alter this schedule to best achieve the objectives of the class.

Class Meeting	Week	Topics and Events
1	1	Structure of Atoms
2	1	Crystal Structure
3	2	Bonds in Solids Electron Theory of Metals and Review for Exam
4	2	Number 1
5	3	Exam Number 1 Return Exam Number One and Mechanical Properties of
6	3	Metals Mechanical Properties of
7	4	Metals Mechanical Tests of Metals
8	4	Mechanical Tests of Metals
9	5	Deformation of Metals and review for Exam Number
10	5	Two
11	6	Exam Number 2 Return Exam Number Two and Fracture of Metals
12	6	Fracture of Metals
13	7	Iron Carbon Alloy System
14	7	Iron Carbon Alloy System
15	8	Heat Treatment
16	8	Heat Treatment and Review for Exam Number 3
17	9	Exam Number 3 Return Exam Number 3 and Ferrous and Nonferrous
18	9	Alloys Ferrous and Nonferrous
19	10	Alloys
20	10	Industry Specific Specifications- ASME
21	11	Industry Specific Specifications- ASTM
22	11	Industry Specific Specifications- API & SAE and review for Exam Number 4
23	12	

24	12	Exam Number 4
		Return of Exam Number 4
		and International Materials
25	13	Specifications- DIN, JIS, etc.
		Special Topics in Material
26	13	Science
27	14	Semiconductors
28	14	Insulating Materials
30	15	Plastics
31	15	Review for Final Exam
32	16	Final Exam