

Materials of Science & Lab: Fall 2011
Course #MEC K262 and K263
Technologies Department

Course Description:

(MEC K262) A study of the structure and properties of engineering materials in which materials selection, processing, and heat treatment are presented. The changes in structure and properties during forming, machining, and heat treating operations will be discussed.

(MEC 263) In this lab, students will be exposed to selected experiments demonstrating the effects of processing, including heat treatment, on the properties of engineering materials. Standard materials tests are also performed.

Lecture and Lab Outcomes:

- Students will demonstrate the ability to use appropriate mathematical and computational skills needed for engineering technology applications.
- Students will illustrate an ability to think critically and identify, evaluate and solve complex technical and non-technical problems; demonstrate creativity in designing problem solutions; and conduct and interpret experimental data and outcomes.
- Students will recognize the need to be lifelong learners.

Lecture & Lab Performance Criteria:

The above outcomes will be assessed using these performance criteria:

- Mathematical and computational skills-
 - ✓ Ascertain problem conditions by identifying known and unknown quantities in formulating a problem for solution
 - ✓ Demonstrates the correct selection and application of pertinent formulae, principles and concepts.
 - ✓ Pursue solutions in a methodical, logical manner with results correctly explained with sufficient detail and properly documented
 - ✓ Submit problem solutions with a minimum of computational errors, identifying and selecting the correct dimensional units
- Critical thinking-
 - ✓ Show the ability to evaluate the credibility of sources of information
 - ✓ Demonstrate the ability to refine generalizations, establish rational & pertinent assumptions, and avoid oversimplifications
 - ✓ Exhibit the ability to generate, analyze / evaluate, and assess multiple engineering problem solution options
 - ✓ Produce documentation that reflects organization and application of engineering principles in specifying solution to an engineering problem
- Lifelong learning-
 - ✓ Demonstrate an awareness of what needs to be learned; formulate questions based on research need
 - ✓ Develop a research plan appropriate to the investigative method
 - ✓ Identify, retrieve and organize information
 - ✓ Use a variety of methods and emerging technologies to keep current in the field

Instructor:

PROF Patrick H. Knowles Jr. Room C-160 ph: 885-2379 pknowles@trcc.commnet.edu

Text Book:

Fundamentals of Materials of Science and Engineering - Callister (ISBN 978-07-338016-2)

Procedure:

The course will consist of a lecture followed by a lab. Both the lecture and lab will consist of open discussion, which the student is encouraged to ask questions and relate their own experiences. The discussions will be conducted around the reading assignments and the homework/laboratory problems.

Instructor Assistance:

Seeking help from the instructor outside of class is encouraged if you are having difficulty understanding course material. Feel free to Email/call for an appointment during office hours.

Academic Integrity:

Academic integrity is essential to a useful education. Failure to act with academic integrity severely limits a person's ability to succeed in the classroom and beyond. Furthermore, academic dishonesty erodes the legitimacy of every degree awarded by the College. In this class and in the course of your academic career, present only your own best work; clearly document the sources of the material you use from others; and act at all times with honor.

Attendance:

Attendance will be taken and although it is not intended to be used for grading purposes, it may be used for decision on the part of the final grade.

Course Work Portfolio:

The course work portfolio is a collection of copies of all work performed in the class. The portfolio should be broken into the following sections: (1) homework, (2) quizzes/exams, (3) lab reports. The portfolio is due on 16May and should be contained in a binder or folder. Grading will be based on completeness & organization.

Homework is not mandatory in the sense that it will be collected daily/weekly. However, completing homework has been found to be extremely helpful in understanding and reinforcing the concepts covered in class. Those who attempt and complete (to the best of their ability) the ALL of the homework using the proscribed format can expect to receive a "homework bonus" up to 7.5% added to the final average (after quizzes & exams). Homework is due on the assigned due date at the beginning class. Late homework will not receive credit. To receive the "homework bonus", students will be allowed to miss no more than one assignment. There will be no "prorating" of the bonus percentage for missing more than one assignment.

You may work with others on nightly/weekly homework assignments to determine analysis methods, but you must indicate on your paper from whom you have received assistance.

Comprehension Quizzes:

Comprehension quizzes will be conducted each week. The quiz material is from the assigned reading and lectures. The quizzes will be posted on Blackboard Vista. Each quiz will have an expiration date by which it must be completed

Grading Policy:

Several exams will be given during the semester. The dates of the exams are noted in the Lecture Schedule. Approximately one hour of the class meeting will be devoted for each exam. Final grades will be based on a normal distribution of all students taking the course based on the following weighting:

Quiz	20%
Exam Average	60%
Poster Project	20%

Withdrawal:

A student who finds it necessary to discontinue a course must complete a "Withdrawal Request Form" available in the Registrar's office within the time limits of the semester calendar. Students who do not withdraw, but stop attending will be assigned an "F" signifying a failing grade. The last day to withdraw from classes is 09December2011.

Disabilities Statement:

If you have a question regarding a disability that may affect your progress in this course, please contact one of the college's Disability Service Providers as soon as possible. Chris Scarborough (892-5751) generally works with students who have learning disabilities or attention deficit disorder. Kathleen Gray (885-2328) generally works with students who have physical, visual, hearing, medical, mobility, and psychiatric disabilities. Matt Liscum (860/383-5240) also works with students who have disabilities.

If you will need accommodations for this class, you must contact the Disabilities Counseling Services. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. *The instructor cannot provide accommodations until an accommodation letter from the Disabilities Counselor is received.*

Date	Class #	Topic	Reading
30-Aug	1	Introduction; Atomic Structure and Interatomic Bonding; Metallic Crystal Structures	Chap 1, 2.1-2.6, 2.8, 3.1-3.5, 3.10-3.19
6-Sep	2	Imperfections in Solids; Diffusion & Thermal Expansion; Mechanical Properties of Metals	Chap 5, Chap 6, 7.1-7.5
13-Sep	3	Mechanical Properties; Dislocations & Plastic Deformation; Strengthening Mechanisms; Recovery	7.6-7.20, Chap 17, 8.1-8.14
20-Sep	4	Float Day; Review	
27-Sep	5	Exam1	
4-Oct	6	Fatigue; Creep; Cold Rolling	9.1-9.10, 9.12-9.14, 9.15-9.18
11-Oct	7	Phase Diagrams (binary isomorphous & eutectic)	10.1-10.10
18-Oct	8	Phase Diagrams (eutectic; intermediate phases; iron-iron carbide); Iron-iron Carbide Diagram	10.11-10.15, 10.19-10.21
25-Oct	9	Exam 2	
1-Nov	10	Phase Transformations; Continuous Cooling; Cooling Steels; Precipitation Hardening	11.1-11.12
8-Nov	11	Types of Materials, Fabrication of Metals	Chap 13, 14.1-14.6
15-Nov	12	Welding	handout
29-Nov	13	Corrosion	16.1-16.10
6-Dec	14	Exam 3	
13-Dec	15	Float Day	

Date	Lab #	Topic	Reading
6-Sep	1		
13-Sep	2	Metallographic specimen preparation	
20-Sep	3	Optical Microscopy Examination I	
27-Sep	4	Heat Treatment	
4-Oct	5		
11-Oct	6	Optical Microscopy Examination II	
18-Oct	7	Jominy Test	
25-Oct	8	TENSILE TESTING LABORATORY	
1-Nov	9		
8-Nov	10	Drawing a Wire	
15-Nov	11		
29-Nov	12		
6-Dec	13		
13-Dec	14		
	15		