

**DESCRIPTION OF COURSE:** Properties of engineering materials and their performance so as to minimize or eliminate failure modes. An introduction to manufacturing or processes with the usage of fundamental concepts to improve quality assurance.

**EDUCATIONAL OBJECTIVES:** The course has the following objectives:

- A. Students will have demonstrated the fundamental concepts of material structure, properties, processing and performance.
- B. Students will have the ability of applying phase equilibria toward microstructures, transport phenomena (e.g., mass transfer, fluid flow and heat transfer), and kinetics.
- C. Students will have the ability to select metallic and non-metallic systems for applications.

**TEXT:**

1. J. F. Shackelford: Introduction to Materials Science for Engineers, Pearson, 2015.

**REFERENCES:**

1. D. R. Askeland, P. P. Fulay and W. J Wright: The Science and Engineering of Materials, 7<sup>th</sup> Edition, Cengage Learning, 2016.
2. W. D. Callister: Materials Science and Engineering: An Introduction, 7<sup>th</sup> edition, John Wiley & Sons, 2007.

**GRADING:** Exams and assignments will weigh as follows:

ITEM	WEIGHT
Assignments*	10 Points/Assignment
Class Examinations	250 points/Examination
Final Examination	350 points

\*Assignments will be suggested and the grading will depend on the characteristics of the course. Examinations will be based on readings assigned for the text by Shackelford, lectures, technical references given in class and class "throwaways."

Final Grade*	Minimum Points
A	0.90 X Total Points
B	0.80 X Total Points
C	0.70 X Total Points
D	0.60 X Total Points

\* At the end of the semester, a grade of Incomplete will not be given unless hospitalization occurs. Make-up examinations will not be given.

**ATTENDANCE POLICY:** Attendance will be sporadically taken during the semester and with excessive absences, a student will be dropped from the course. In addition, examinations will be prepared from class notes, readings from technical references given in class and class "throwaways," as well as the readings given in the course outline noted for text by Shakelford.

**COURSE OUTLINE  
ME 2331**

Monday of Week	Description of Class Lectures for the Week	Reading Assignment for Class
1. Aug 22	Introduction, Organization and Schedule	
2. Aug 29	Atomic Bonding, Crystalline Structure	Chapters 1 and 2
3. Sep 5	(No class on September 5) Crystal Defects in Metals and Ceramics	Chapters 3 and 4
4. Sep 12	Diffusion and Mechanics in Solids	Chapters 5 and 6
5. Sep 19	Phase Diagrams and Microstructural Analysis	Chapter 9
6. Sep 26	Continuation of Microstructures	
7. Oct 3	Ferrous Alloys Initiated from Fe-C Phase Diagram	Chapter 11
8. Oct 10	Time-Temperature-Transformation Diagrams	Sections 10.1-10.3
9. Oct 17	<b>(Examination)</b> Aluminum Alloys and Precipitation Hardening	Sections 10.4-10.5
10. Oct 24	Titanium Alloys and Ti Aluminides	Sections 11.1
11. Oct. 31	High Temperature Reactions of Oxide and Carbide Systems	Sections 11.2
12. Nov 7	Continuation of High Temperature Reactions of Metals and Ceramic Systems	Sections 11.3
13. Nov 14	Solidification and Casting Analysis	Sections 11.3
14. Nov 21	Electronic Materials primarily Si and ZrO <sub>2</sub> systems	Sections 13.4-13.5
15. Nov. 28 Dec. 5	Continuation of Electronic Materials <b>Comprehensive Final Examination on Friday, Dec. 9, at 7:00 – 9:45 AM</b>	