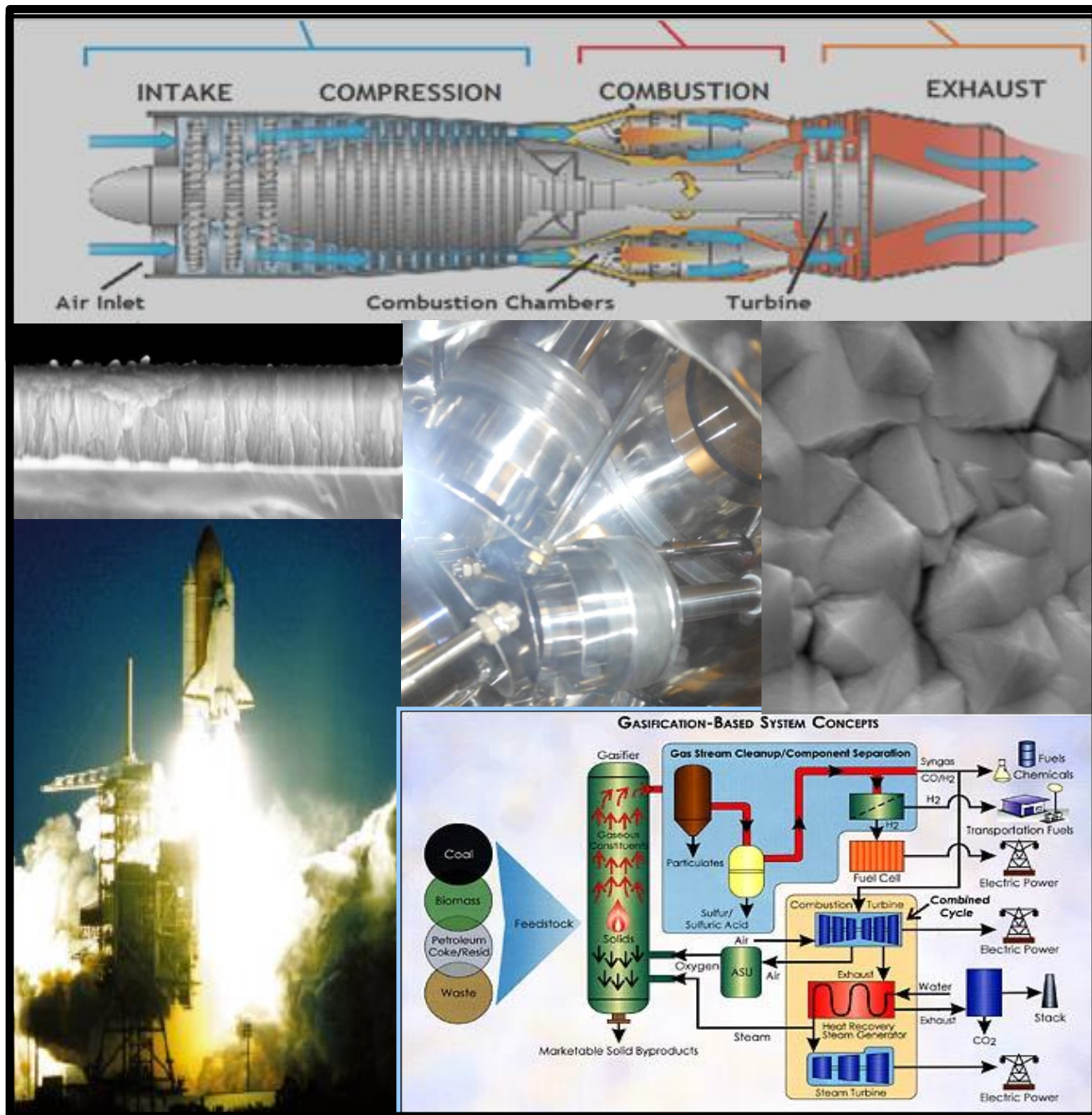


# ME 2331: Materials & Manufacturing Processes

**Class Reference Number:** 15897  
**Class/Lab Meeting:** 5:30 pm - 6:50 pm, MW  
**Class Room:** UGLC 220  
**Instructor:** Ramana V. Chintalapalle, Ph.D.  
Professor  
Department of Mechanical Engineering  
Office: A113; E-mail: [rvchintalapalle@utep.edu](mailto:rvchintalapalle@utep.edu); Tel: 915-747-8690  
**Office Hours: M & W: 3.00 pm - 3.50 pm**  
**Teaching Assistant(s):** Mohan Raj Rajkumar (Email: [mrajkumar@miners.utep.edu](mailto:mrajkumar@miners.utep.edu))

## Overview

In future years, structural materials and processes in aerospace, power, marine, engine and other mechanical and chemical propulsion applications will have to meet the challenges of reaching new heights of efficiency and service life. In this context, engineers must be prepared to better handle the industrial and technological challenges specifically to engineer novel materials and predict their failures due to deterioration. However, the ability to improve the efficiency by engineering and designing can only be derived from the knowledge of structure-property relationships and deterioration mechanisms of a wide range of engineering materials, specifically those as encountered by mechanical engineers in the industry. This course is intended and designated to prepare the mechanical engineers with a broad knowledge and skill set in the topical area of structure and properties of engineering materials. Specifically, students will explore the fundamentals of engineering materials, which include simple metals to advanced ceramics and composites, and their properties. By learning the course contents, students will be able to answer questions for selection of engineering materials in terms of property requirement, processes involved, prediction of service life, and cost and efficiency.



## Course Objectives

- \* Introduce various types of engineering materials that are most common to the mechanical engineers in the industry
- \* Develop familiarity with materials' structure, properties and phenomena for efficient designing

- \* Discuss the structure-property relationships in understanding the mechanical and thermal properties of a wide variety of materials so as to enable to students to choose certain type of materials for a given technological application
- \* Discuss options to further increase the efficiency, reduce costs, and establish the environmental safety

### **Topics Covered**

The topics covered in this class are divided into three sections.

#### **Section – I: Materials Science & Engineering**

1. Introduction to Engineering Materials & Manufacturing
2. Structure & Crystal Imperfections
3. Diffusion – Multicomponent Mechanical Systems
4. Phase Diagrams

#### **Section – II: Mechanical & Thermal Properties**

5. Mechanical Properties – Part I (Strength)
6. Mechanical Properties – Part II (Fracture)
7. Thermal Properties
8. Mechanics of Corrosion and Wear

#### **Section – III: Manufacturing**

9. Casting
  - A. Processes
  - B. Phenomena – Solidification, Shrinkage and Recrystallization
  - C. Designing
  - D. Economics
  
10. Powder Processing
  - A. Processing & Designing
  - B. Metals and Ceramics -
  - C. Composites

\*\*Subjected to revision during the first two weeks of the semester

## Grading

Your grade for this course will be assessed based on your performance in the quizzes, home work and/or assignments, mid-term exams, group project and final exam towards the end of course. Quizzes will be given in the class, every week and throughout the semester. There will be three or four mid-term exams during the course and one final exam at the end of the semester. The following is the breakup of the grades:

**Quizzes (15%)**  
**Homework & Notebook (5%)**  
**Mid-Term Exams (45%)**  
**Final Exam (35%)**

**\*\*Instructor reserves the right to change these proportions any time during the course. However, the changes will be notified to the students.**

**Your FINAL GRADE, following the letter system, will be assigned based on your overall score as per the details below.**

<b>GRADE</b>	<b>SCORE</b>
A	90-100
B	80-89
C	70-79
D	60-69
F	<60

## Policy on Cheating

Students are expected to be above reproach in all scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the university. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, and helping or preparing presentation/term-paper for another person. Scholastic dishonesty harms the individual, all students, and the integrity of the university, policies on scholastic dishonesty will be strictly enforced.

## Text Books

1. **The Science and Engineering of Materials, Donald R. Askeland & Wendelin J. Wright, 7<sup>th</sup> Edition, CENGAGE Learning**
2. Manufacturing Engineering Science and Technology, Serope Kalpakjian and Steven R. Schmid, 6<sup>th</sup> Ed., Prentice Hall.
3. *Structure and Properties of Engineering Materials*, Daniel P. Henkel and Alan W. Pense, McGraw Hill, 2002

## **Disabilities**

If you have a disability and need classroom accommodations, please contact: The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to [cass@utep.edu](mailto:cass@utep.edu), or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at [www.sa.utep.edu/cass](http://www.sa.utep.edu/cass).

## **Mechanical Engineering - Safety Statement**

The Department of Mechanical Engineering at the University of Texas at El Paso is committed to a model of excellence in education that includes providing a safe and healthy environment for its students, staff, faculty, and the general public.

Our goal is to maximize education and research training that can only occur if you, the individual, minimize hazards and risks. This can be done by:

- » providing adequate control of the health and safety risks arising from any and all activities;
- » consulting with employees on matters affecting their health and safety;
- » providing and maintaining safe laboratories and equipment;
- » ensuring safe handling and use of substances;
- » ensuring all employees are competent to do their tasks and have adequate training; and
- » maintaining clean, safe and healthy working conditions;

The principal investigator or individual in charge of each laboratory is ultimately responsible for safety in that respective lab. This includes training and ultimate release of the laboratory. Within the Department, we hold every employee (staff, faculty, student) responsible for implementing our safety practices and our departmental safety policy. We hold every employee (staff, faculty, student) responsible for providing leadership within our department to establish effective environmental, safety and occupational health standards.

## **Prepared by:**

*Ramana V. Chintalapalle, Professor, Mechanical Engineering*