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MENG 3319 – Materials Science and Manufacturing
Course Syllabus

Semester / Year	Fall 2023
Catalog Description	Introduction to materials science including the structure of metals and polymers, the testing of mechanical properties of materials, the relationship between material properties, structure and processing techniques, and the capabilities and limitations of modern manufacturing methods. Two one-hour lectures and one three-hour lab per week.
Prerequisites	C or better in CHEM 1311 and CHEM 1111 or equivalent, MENG 1301 or completion of a Computer Aided Drafting course.
Section Number	001, 001L, 002L
Instructor Name	Dr. Shih-Feng Chou
Contact Information	3900 University Blvd., RBN 3005, Tyler TX. 75799 Phone: 903-566-6209 Email: schou@uttyler.edu
Class Type / Instruction Mode / Location	001: f-2-f / RBN 3038 001L: f-2-f / RBN 3038 002L: f-2-f / RBN 3040
Class Time	001: TuTh 8:00 – 8:55 AM 001L: We 2:00 – 4:45 PM 002L: Fr 8:00 – 10:45 AM
Office Hours	TuTh 10 – 11 AM and We 1 – 2 PM or by appointment.
No. of Credits	3
Required Textbook	Materials Science and Engineering: An Introduction, William D. Callister and David G. Rethwisch, 10th Edition, 2018, ISBN# 9781119405498
Optional References	Lecture notes.
Additional Rules and Requirements	N/A
Evaluation Method	Attendance: 5%; Homework: 15%; Exams: 30%; Lab Reports: 30%l Final Exam: 20%

Grading Policy / Scale	Letter grades, scale: A: 90 – 100, B: 80 – 89, C: 70 – 79, D: 60 – 69, F: < 60
Important Events / Dates	9/1/2023 (Fr): Census Date. 9/19/2023 (Tu): 1st Exam. 10/24/2023 (Tu): 2nd Exam. 10/30/2023 (Mo): Last day to withdraw from one or more classes. 12/5/2023 (Tu): Final exam
Attendance / Makeup policy / other rules	1. Lecture attendance will be recorded using sign-in sheets. 2. Lab attendance is mandatory. 3. No make-up assignment(s) and exam(s). 4. All assignments must be submitted to Canvas for grading. 5. Students with SAR status should contact the UT Tyler Office of Student for accommodations.
Course Learning Objectives / ABET & PEOs Relation	By the end of this course, students will be able to: 1. Explain atomic structure, crystal structures, and types of defects in metals. 2. Describe common processing techniques through strain hardening, diffusion, and solution hardening of metal alloys. 3. Describe common structures, properties, processing methods, and applications of polymer and ceramics. 4. Perform mechanical testing and metallographic procedures to report material properties and microstructures of various metal alloys in laboratory reports.
Tentative Topics / Course Plans	Atomic Structure and Bonding; Structure of Crystalline Solids; Imperfection in Solids; Mechanical Properties of Materials; Diffusion; Dislocation and Strengthening; Phase Diagrams; Processing of Metal Alloys; Polymers and Ceramics; Processing of Polymers and Ceramics. Course Plan: **Course Plan:** Two one-hour lectures per week.

Week (Date)	Topic	
1 (8/22, 8/24)	(Tu) Syllabus	(Th) Ch1: Introduction
2 (8/29, 8/31)	(Tu) Ch2: Atomic Structure	(Th) Ch2: Interatomic Bonding
3 (9/5, 9/7)	(Tu) Ch3: Unit Cells	(Th) Ch3: Crystal Systems
4 (9/12, 9/14)	(Tu) Ch4: Imperfections	(Th) Problem & Review
5 (9/19, 9/21)	(Tu) **1st Midterm (Wk.1 – Wk.4)**	(Th) Ch5: Diffusion
6 (9/26, 9/28)	(Tu) Ch6: Mechanical Properties	(Th) Ch6: Mechanical Properties
7 (10/3, 10/5)	(Tu) Ch7: Dislocation	(Th) Ch7: Strengthening
8 (10/10, 10/12)	(Tu) Ch8: Failure	(Th) Ch9: Phase Diagram
9 (10/17, 10/19)	(Tu) Ch9: Phase Diagram	(Th) Ch10: Phase Transformation
10 (10/24, 10/26)	(Tu) Problem & Review	(Th) **2nd Midterm (Wk.5 – Wk.10)**
11 (10/31, 11/2)	(Tu) Ch11: Forming/Casting	(Th) Ch12: Ceramics
12 (11/7, 11/9)	(Tu) Ch13: Ceramic Processing	(Th) Ch14: Polymers
13 (11/14, 11/16)	(Tu) Ch15: Polymer Processing	(Th) Biomaterials/Guest Lecture
14 (11/21, 11/23)	**Thanksgiving Break – No Class**	
15 (11/28, 11/30)	(Tu) Problem & Review	(Th) Problem & Review
16 (12/5)	**Final Exam (Wk.1 to Wk.15)**	

(Dr. Chou reserves the right to change schedule in course plan.)

<table>
<tr><td></td><td>Lab Plan:
Lab Plan: One three-hour lab per week on either Wednesdays (001L) or Fridays (002L).
<table>
<tr><th>Week (Date)</th><th>Topic</th><th>Reports</th></tr>
<tr><td>1 (8/23, 8/25)</td><td>Lab1: Introduction and Lab Safety</td><td></td></tr>
<tr><td>2 (8/30, 9/1)</td><td>Lab2: Report Writing Exercises</td><td>Short Report</td></tr>
<tr><td>3 (9/6, 9/8)</td><td>Lab3: Atomic Structures</td><td>Short Report</td></tr>
<tr><td>4 (9/13, 9/15)</td><td>Lab4: Metrology, Microscopy, and Grain Size</td><td>Short Report</td></tr>
<tr><td>5 (9/20, 9/22)</td><td>Midterm, No Lab</td><td></td></tr>
<tr><td>6 (9/27, 9/29)</td><td>Lab5: Tensile Test</td><td></td></tr>
<tr><td>7 (10/4, 10/6)</td><td>Lab6: Data Analysis</td><td>Short Report</td></tr>
<tr><td>8 (10/11, 10/13)</td><td>Lab7: Strain Hardening (Rolling) and Hardness Test</td><td></td></tr>
<tr><td>9 (10/18, 10/20)</td><td>Lab8: Metallography</td><td>Full Report</td></tr>
<tr><td>10 (10/25, 10/27)</td><td>Midterm, No Lab</td><td></td></tr>
<tr><td>11 (11/1, 11/3)</td><td>Lab9: Heat Treatment of Aluminum Alloys</td><td></td></tr>
<tr><td>12 (11/8, 11/10)</td><td>Lab10: Metallography</td><td>Full Report</td></tr>
<tr><td>13 (11/15, 11/17)</td><td>Lab11: Charpy Impact Test</td><td>Full Report</td></tr>
<tr><td>14 (11/22, 11/24)</td><td>Thanksgiving Break, No Lab</td><td></td></tr>
<tr><td>15 (11/29, 12/1)</td><td>Lab12: Manufacturing</td><td></td></tr>
<tr><td>16 (12/6, 12/8)</td><td>Final Exam, No Lab</td><td></td></tr>
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(Short reports are individual reports, and full reports are group reports.)
(Dr. Chou reserves the right to change schedule in lab plan.)</td></tr>
<tr><td>University Policies</td><td>https://www.uttyler.edu/academic-affairs/files/syllabus_information_2021.pdf</td></tr>
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