



MENG 3319 – Materials Science and Manufacturing
Course Syllabus

Semester / Year	Fall / 2025
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	Lecture: 001 Lab: 001L, 002L, and 003L
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: Lecture / f-2-f / RBN 3035 001L: Lab / f-2-f / RBN 2011/1024 002L: Lab / f-2-f / RBN 2011/1024 003L: Lab / f-2-f / RBN 2011/1024
Class Time	001: MoWe 11:15 AM – 12:10 PM 001L: Mo 2:00 PM – 4:45 PM 002L: We 2:00 PM – 4:45 PM 003L: Fr 2:00 PM – 4:45 PM
Office Hours	Mo/We 1 – 2 PM and Th 2 – 3 PM or by appointment.
No. of Credits	3
Required Textbook	Materials Science and Engineering: An Introduction, William D. Callister and David G. Rethwisch, 10 th Edition, 2018, ISBN# 9781119405498
Optional References	Lecture notes on Canvas.
Additional Rules and Requirements	This course allows the use AI tools (such as ChatGPT, Copilot, Gemini, etc.) only in lab report writing. Students will be notified as to when these tools should be used, along with guidance on how to use them. Using AI tools outside of these parameters violates UT Tyler's Honor Code, constitutes plagiarism, and will be treated as such.
Evaluation Method	Attendance: 5%; Homework: 25%; Exams: 20%; Lab Reports: 30%; 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	9/8/2025 (Mo): Census Date. 9/24/2025 (We): 1 st Exam. 10/29/2025 (We): 2 nd Exam. 11/3/2025 (Mo): Last day to withdraw from one or more classes. 12/8/2025 (Mo): Final Exam. https://www.utt Tyler.edu/academics/academic-calendar-25-26/																																		
Attendance / Makeup policy / other rules	1. Lecture attendance will be recorded using sign-in sheets. 2. Lab attendance is required during the designated section. 3. Make-up assignment(s) and/or exam(s) require instructor's approval prior to the event. 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: Two one-hour lectures per week. <table border="1"> <thead> <tr> <th>Week (Date)</th> <th>Topics</th> </tr> </thead> <tbody> <tr> <td>1 (8/25, 8/27)</td> <td>(Mo) Syllabus (We) Ch1: Introduction</td> </tr> <tr> <td>2 (9/1, 9/3)</td> <td>(Mo) Labor Day Holiday (We) Ch2: Atomic Structure</td> </tr> <tr> <td>3 (9/8, 9/10)</td> <td>(Mo) Ch2: Interatomic Bonding (We) Ch3: Unit Cells</td> </tr> <tr> <td>4 (9/15, 9/17)</td> <td>(Mo) Ch3: Crystal Systems (We) Ch4: Imperfections</td> </tr> <tr> <td>5 (9/22, 9/24)</td> <td>(Mo) Problem & Review (We) 1st Midterm (Wk.1 – Wk.5)</td> </tr> <tr> <td>6 (9/29, 10/1)</td> <td>(Mo) Ch6: Mechanical Properties (We) Ch6: Mechanical Properties</td> </tr> <tr> <td>7 (10/6, 10/8)</td> <td>(Mo) Ch5: Diffusion (We) Ch7: Dislocation</td> </tr> <tr> <td>8 (10/13, 10/15)</td> <td>(Mo) Ch7: Strengthening (We) Ch8: Failure</td> </tr> <tr> <td>9 (10/20, 10/22)</td> <td>(Mo) Ch9: Phase Diagram (We) Ch9: Phase Diagram</td> </tr> <tr> <td>10 (10/27, 10/29)</td> <td>(Mo) Problem & Review (We) 2nd Midterm (Wk.6 – Wk.11)</td> </tr> <tr> <td>11 (11/3, 11/5)</td> <td>(Mo) Ch10: Phase Transformation (We) Ch11: Alloys and Manufacturing</td> </tr> <tr> <td>12 (11/10, 11/12)</td> <td>(Mo) Ch12: Ceramics (We) Ch13: Ceramic Processing</td> </tr> <tr> <td>13 (11/17, 11/19)</td> <td>(Mo) Ch14: Polymers (We) Ch15: Polymer Processing</td> </tr> <tr> <td>14 (11/24, 11/26)</td> <td>Thanksgiving Break</td> </tr> <tr> <td>15 (12/1, 12/3)</td> <td>(Mo) Problem & Review (We) Problem & Review</td> </tr> <tr> <td>16 (12/8)</td> <td>Final Exam (Wk.1 to Wk.15)</td> </tr> </tbody> </table> <p>(Dr. Chou reserves the right to change schedule in course plan.)</p>	Week (Date)	Topics	1 (8/25, 8/27)	(Mo) Syllabus (We) Ch1: Introduction	2 (9/1, 9/3)	(Mo) Labor Day Holiday (We) Ch2: Atomic Structure	3 (9/8, 9/10)	(Mo) Ch2: Interatomic Bonding (We) Ch3: Unit Cells	4 (9/15, 9/17)	(Mo) Ch3: Crystal Systems (We) Ch4: Imperfections	5 (9/22, 9/24)	(Mo) Problem & Review (We) 1st Midterm (Wk.1 – Wk.5)	6 (9/29, 10/1)	(Mo) Ch6: Mechanical Properties (We) Ch6: Mechanical Properties	7 (10/6, 10/8)	(Mo) Ch5: Diffusion (We) Ch7: Dislocation	8 (10/13, 10/15)	(Mo) Ch7: Strengthening (We) Ch8: Failure	9 (10/20, 10/22)	(Mo) Ch9: Phase Diagram (We) Ch9: Phase Diagram	10 (10/27, 10/29)	(Mo) Problem & Review (We) 2nd Midterm (Wk.6 – Wk.11)	11 (11/3, 11/5)	(Mo) Ch10: Phase Transformation (We) Ch11: Alloys and Manufacturing	12 (11/10, 11/12)	(Mo) Ch12: Ceramics (We) Ch13: Ceramic Processing	13 (11/17, 11/19)	(Mo) Ch14: Polymers (We) Ch15: Polymer Processing	14 (11/24, 11/26)	Thanksgiving Break	15 (12/1, 12/3)	(Mo) Problem & Review (We) Problem & Review	16 (12/8)	Final Exam (Wk.1 to Wk.15)
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	Lab Plan: One three-hour lab per week.		
	Week (Date)	Topics	Location
	1 (8/25, 8/27, 8/29)	Lab1&2: Introduction, Lab Safety, Technical Report Writing [§]	RBN 2011
	2 (9/1, 9/3, 9/5)	Labor Day, No Lab	
	3 (9/8, 9/10, 9/12)	Lab3: Atomic Structures [§]	RBN 2011
	4 (9/15, 9/17, 9/19)	Lab4: Metrology, Microscopy, and Grain Size [§]	RBN 2011
	5 (9/22, 9/24, 9/26)	Midterm, No Lab	
	6 (9/29, 10/1, 10/3)	Lab5: Tensile Test	RBN 1024
	7 (10/6, 10/8, 10/10)	Lab6: Data Analysis [¶]	RBN 2011
	8 (10/13, 10/15, 10/17)	Lab7: Strain Hardening (Rolling) and Hardness Test	RBN 1024
	9 (10/20, 10/22, 10/24)	Lab8: Metallography [¶]	RBN 1024
	10 (10/27, 10/29, 10/31)	Midterm, No Lab	
	11 (11/3, 11/5, 11/7)	Lab9: Heat Treatment of Aluminum Alloys	RBN 1024
	12 (11/10, 11/12, 11/14)	Lab10: Metallography [¶]	RBN 1024
	13 (11/17, 11/19, 11/21)	Lab11: Charpy Impact Test [¶]	RBN 1024
	14 (11/24, 11/26, 11/28)	Thanksgiving Break, No Lab	
	15 (12/1, 12/3, 12/5)	Lab12: Manufacturing	RBN 1024
	16 (12/8, 12/10, 12/12)	Final Exam, No Lab	
[§] A short individual report is due in one week of the corresponding lab section.			
[¶] A full team report is due in one week of the corresponding lab section.			
(Dr. Chou reserves the right to change schedule in lab plan.)			
University Policies	https://www.utt Tyler.edu/offices/academic-affairs/files/syllabus-information.pdf		