Department of Mechanical Engineering
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uttyler.edu/engineering

# MENG 3319 – Materials Science and Manufacturing
## Course Syllabus

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| Semester / Year | Spring 2025 |
| Catalog Description | Introduction to materials science including the microstructure of metals, ceramics, and polymers, the materials properties by mechanical testing, the relationship between processing techniques on microstructure and material properties, and the materials manufacturing methods. Two hours of lecture and three hours of 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(s) | 030, 031L |
| Instructor | Dr. S Maloney |
| Contact info | Email: smaloney@uttyler.edu |
| Class Type / Location | f2f<br>030: A218<br>031L: B223 |
| Class Times | 030: M/W: 11:15AM – 12:20PM<br>031L: F: 8:00AM – 10:45AM |
| Office Hours | M/W: 9:30AM to 11:00AM, or by appointment |
| Credits | 3 |
| Textbooks and Reference Materials | Materials Science and Engineering: An Introduction, William D. Callister and David G. Rethwisch, 10th Edition, 2018, ISBN# 9781119405498 |
| Optional References | Class handouts |
| Additional requirements | AI is permitted only for specific assignments or situations, and appropriate acknowledgment is required. |
| Evaluation Method | Quizzes: 15%<br>Exam 1: 15%<br>Exam 2: 15%<br>Lab Reports: 30%<br>Final Exam: 25% |
| Grading Policy / Scale | Grading in this course will be based on the following:<br>Scale: A = > 90, B = > 80, C = > 70, D = > 60, F < 60.<br>Grade appeal: grades can be appealed by meeting the instructor during office hours, but no later than a week after the grade has been given. |
| Important events/dates | 1. Census date: 1/27/2025 (Mo)<br>2. First Midterm Exam: 2/17/2025 (Mo)<br>3. Second Midterm Exam: 3/31/2025 (Mo)<br>4. Last Day to withdraw from one or more courses: 3/31/2025 (Mo) |

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| | 5. Final Exam: 4/28/2025 (Mo) |
| Attendance / Makeup policy/Other rules | 1. Lecture attendance will be checked regularly using Canvas. Students who come to class after attendance is taken will be considered absent.<br>2. Lab attendance is mandatory.<br>3. No make-up exam(s) will be provided unless a university accepted excused absence is submitted with accompanying documentation justifying the absence.<br>4. Email submission of assignments, homework, lab reports will not be accepted. All assignments MUST be submitted to Canvas for grading.<br>5. Late submissions of assignments, homework, lab reports if due at 11:59:00 pm, and received any time after 11:59:00 pm is considered late and will result in a **20 % deduction per day** from the graded score.<br>6. Student with SAR status should contact the UT Tyler Office of Student Accessibility and Resources for exam arrangements<br>7. Attendance is expected per university policy. Regular attendance is highly recommended. It is imperative if you want to do well in this course.<br>8. In case you must miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class.<br>9. Students will not be permitted to leave the classroom during lectures except for extreme emergencies.<br>10. Questions involving knowledge covered in class will be answered if the student proves that they have tried to come up with the answer.<br>11. Solution to homework and focus problems will not be given. However, students can work on the right solution by checking their work with the instructor.<br>12. Any minor violation of the Student Behavior (see below) by a student as deemed by the instructor will result in a full letter grade reduction for each incident while any major violation(s), such as cheating and plagiarism, by a student as deemed by the instructor will result in automatic failing grade in the course.<br>13. The use of cellular phones during lectures and exams is prohibited.<br>14. Students are encouraged to utilize any tutoring services available if needed and come prepared to each week's class. For group assignments, each student is expected to work with the group in a professional manner in case of any group activities. It is important |

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| | to communicate clearly and professionally any concerns or issues to the instructor.<br>15. Canvas should be the primary mode of contacting the instructor, so consult the Canvas announcements and discussion board to check for information about the course. In addition, your university provided patriots' email should be the official communication method and you should check your email regularly. Emails from external addresses will not be answered. Use the above email address or Canvas messaging to email the instructor. Please use MENG 3319-your section, your question or concern title in the email subject line. Please allow at least one to two business days for a response to your email. Emails with improper language will not be answered. Emails with the same concerns or questions from multiple students will be answered/covered during class time.<br>16. The syllabus is subject to change during the semester as deemed necessary. Students will be notified of any major changes. |
| Course Learning Objectives / ABET & PEOs relation | By the end of this course students will be able to:<br>1. Explain atomic structure, crystal structures, and types of defects in metals.<br>2. Describe common processing techniques through strain hardening, diffusion, and solution hardening of metal alloys.<br>3. Describe common structures, properties, processing methods, and applications of polymer and ceramics.<br>4. Perform mechanical testing and metallographic procedures to report material properties and microstructures of various metal alloys in laboratory reports. |
| Tentative Topics | 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 |
| University Policies | https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf |

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**Course Plan:** Two one-hour lectures on both Monday and Wednesday and one three-hour lab on Friday.

| Week | Month | Day | Date | Lab | Topic | Chapter |
|---|---|---|---|---|---|---|
| 1 | Jan | Mo | 13 | | Syllabus | |
| | | We | 15 | | General Introduction | 1 |
| | | Fr | 17 | 1 | Introduction & Lab Safety | |
| 2 | | Mo | 20 | | MLK Day – No Lecture | |
| | | We | 22 | | Atomic Structure | 2 |
| | | Fr | 24 | 2 | Report Writing Review & Exercise | |
| 3 | | Mo | 27 | | Interatomic Bonding | 2 |
| | | We | 29 | | Unit Cells | 3 |
| | | Fr | 31 | 3 | Atomic Structure | |
| 4 | Feb | Mo | 3 | | Crystal Systems | 3 |
| | | We | 5 | | Imperfections | 4 |
| | | Fr | 7 | 4 | Metrology, Microscopy & Grain Size | |
| 5 | | Mo | 10 | | Diffusion | 5 |
| | | We | 12 | | Problems & Review | 1-5 |
| 6 | | Mo | 17 | | 1st Midterm Exam | 1-5 |
| | | We | 19 | | Mechanical Properties | 6 |
| | | Fr | 21 | 5 | Tensile Test | |
| 7 | | Mo | 24 | | Mechanical Properties | 6 |
| | | We | 26 | | Dislocation | 7 |
| 8 | Mar | Mo | 3 | | Strengthening | 7 |
| | | We | 5 | | Failure | 8 |
| | | Fr | 7 | 6 | Strain Hardening | |
| 9 | | Mo | 10 | | Phase Diagrams | 9 |
| | | We | 12 | | Phase Diagrams | 9 |
| 10 | | | 17-23 | | Spring Break – No Lectures | |
| 11 | | Mo | 24 | | Phase Transformations | 10 |
| | | We | 26 | | Problems & Review | 6-10 |
| | | Fr | 28 | 7 | Charpy Impact Test | |
| 12 | | Mo | 31 | | 2nd Midterm Exam | 6-10 |
| | Apr | We | 2 | | Forming & Casting | 11 |
| 13 | | Mo | 7 | | Heat Treatment | 11 |
| | | We | 9 | | Ceramics | 12 |
| | | Fr | 11 | 8 | Heat Treatment | |
| 14 | | Mo | 14 | | Ceramics Processing | 13 |
| | | We | 16 | | Polymers | 14 |
| | | Fr | 17 | 9 | Manufacturing | |
| 15 | | Mo | 21 | | Processing of Polymers | 15 |
| | | We | 23 | | Problems & Review | 11-15 |
| 16 | | Mo | 28 | | Final Exam | 11-15 |