

Composites – Spring 2022

MME 4314 – CRN: 28260

MME 5313 – CRN: 28261

MASE 6343 – CRN: 28262

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Office Hours: Fridays 9am - 12pm (or by appointment) virtually via MS Teams

COURSE DESCRIPTION

This course is an introduction to composite materials with an emphasis on fiber reinforcement. The properties, design and manufacturing of composite products will be studied. Concepts of adhesion, interfacial shear, critical fiber length, anisotropic plane-stress elasticity, multiaxial strength of anisotropic materials and performance problems will all be covered.

Prerequisites: MME2303 and MME2434 with a grade of “C” or better.

TOPICS TO BE COVERED

- Introduction to families of composites, properties and applications
- Physical characteristics of composites: volume fraction, density, heat capacity, etc
- Elastic micromechanics of continuous-fiber composites
- Laminates: mechanics, design and performance
- Reinforcing fibers: manufacturing and properties
- Strength prediction and failure modes
- Properties and limitations of the following composite types:
 - Polymer-matrix composites (PMC)
 - Metal-matrix composites (MMC)
 - Ceramic-matrix composites (CMC)
- Manufacturing of polymer-matrix composites
- Discontinuous reinforcement: critical length and properties

EXPECTED LEARNING OUTCOMES

- At the conclusion of this course, students will be able to:
- Identify the advantages and disadvantages of composites for particular applications
- Define the interfacial properties between the reinforcement and matrix components based on the bonding type
- Calculate the bulk mechanical properties of composites based on shear and bending modes of loading
- Distinguish between the different fiber material types based on the relationship between fabrication techniques, microstructures and properties
- Describe the relationships between composite mechanical properties, volume fraction, and geometric arrangement of the constituent materials in isotropic, anisotropic and orthotropic composites
- Calculate theoretical composite properties using the rule of mixtures and Halpin-Tsai relationships
- Describe the composite materials selection and design processes.
- Identify possible composite failure modes and how they influence the factors of safety applied to composite systems

REQUIRED MATERIALS

Composite Materials: Science and Engineering, Third Edition, by Krishna K. Chawla, Springer (2013). ISBN: 978-0-387-74364-6.



Resources available via the UTEP library and the internet will also be necessary to complete some assignments, and additional literature material will occasionally be provided, as needed.

COURSE ASSIGNMENTS AND GRADING

Assignments for this course are assessed according to rubrics. You can find these rubrics by clicking on the appropriate assignment link in Blackboard and choosing to “View Rubric” from the button beneath the Points Possible for the assignment.

Grade Distribution:

100-90 = A 89-80 = B 79-70 = C 69-60 = D 59 and Below = F

40% Exams (x2) (20% each)
25% Special Topic Report (Due: 04/01/2022)
10% Homework Assignments
25% Final Exam - Comprehensive

Note: Students enrolled in the MME 5313 and MASE 6343 sections of this course will be subjected to more rigorous, comprehensive, and exhaustive assignments and examinations, in accordance with their respective academic levels (MS vs PhD). However, the grade distribution scale and breakdown will remain the same for all sections of this course.

DEADLINES FOR HOMEWORK

All homework assignments must be uploaded to Blackboard by 11:59 PM (mountain) on the due date listed. Late submissions will not be accepted and will be given a grade of zero.

TECHNOLOGY REQUIREMENTS

This course will be taught in an **in-person format** but will maintain course content online to accommodate those students who may be required to remain off campus for health reasons. All online content will be distributed through the Blackboard learning management system. Students should ensure their UTEP e-mail account is working and that you have access to the internet with a stable web browser.

For MS Teams used for office hours as required, you need to have access to a computer/laptop with a webcam and a microphone. You will need to download and/or update the following software: Microsoft Office 365, available free to registered UTEP students. Check that your computer hardware and software are up-to-date and able to access all parts of the course. Click the following link for more information about [Microsoft Office 365](#).

Important: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Help Desk](#) as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of technical assistance.

COURSE DROP POLICY

According to UTEP Curriculum and Classroom Policies, “When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of “W” before the course drop deadline and with a grade of “F” after the course drop deadline.” See academic regulations in the UTEP Undergraduate Catalog for a list of excused absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24 hours advance notice via email.

Alternatively, if you feel that you are unable to complete the course successfully, please let me know and then contact the [Registrar’s Office](#) to initiate the drop process. If you do not, you are at risk of receiving an “F” for the course.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the [UTEP Center for Accommodations and Support Services](#) (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the [CASS portal](#).

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Student Conduct and Conflict](#)

[Resolution \(OSCCR\)](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#).

PLAGIARISM DETECTING SOFTWARE

Some of your course work and assessments may be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

COVID-19 PRECAUTIONS

You must STAY AT HOME and REPORT if you:

- (1) Have been diagnosed with COVID-19;
- (2) Are experiencing COVID-19 symptoms and are pending a diagnosis.

Reports should be made at covidaction@utep.edu. The UTEP Covid Action team will advise students on the appropriate next steps, and ensure you have the information necessary to obtain the proper level of care. **Do NOT come to class if you are sick!**

STUDENT RESOURCES

Technology Resources:

[Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources:

[UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.

[University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.

[Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.

[History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.

[RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources:

[Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.

[Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.

[Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.