

Composite Materials (ONLINE) – Fall 2020

MME 3314 – CRN: 16440

MME 4314 – CRN: 19903

MME 5390 – CRN: 16176

MASE 6390 – CRN: 16100

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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

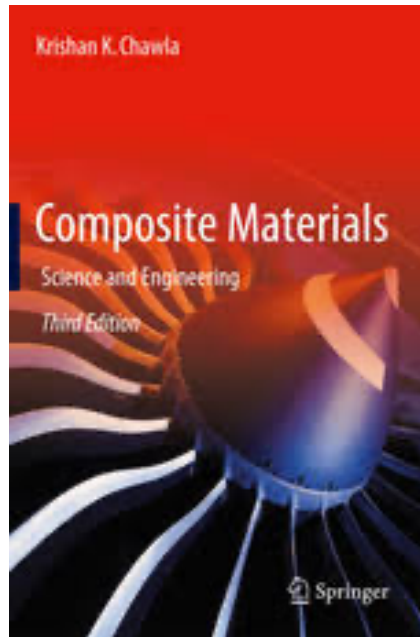
- Introduction to families of composites, properties and applications
- Physical characteristics of composites: volume fraction, density, heat capacity, etc
- Elastic micromechanics of continuous-fiber composites
- Laminates: mechanics, design and performance
- Reinforcing fibers: manufacturing and properties
- 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: 11/01/2020)
10% Homework Assignments
25% Final Exam

Note: Students enrolled in the MME 5390 and MASE 6390 sections of this course will be subjected to more rigorous, comprehensive and exhaustive assignments and examinations, in accordance to 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 AND EXAMS

All homework assignments and exam solutions 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.

I strongly encourage you to NOT wait until the last minute to submit assignments and exams to avoid delays due to technical issues, and to give yourself time to contact the Help Desk to resolve any issues encountered. I will only accept email submissions or assignments or exam solutions in the case of truly exceptional circumstances.

TECHNOLOGY REQUIREMENTS

Course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

For office hour discussions on MS Teams, 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 COMMUNICATION

Because this is an online class, we won't see each other in the ways you may be accustomed to: during class time, small group meetings, and regular office hours. However, there are a number of ways we can keep the communication channels open:

- **Office Hours:** We will not be able to meet on campus, but I will still have office hours for your questions and comments about the course. My office hours will be held on MS Teams each Friday from 9:00am – 12:00pm (Mountain) or by appointment.
- **Email:** UTEP email is the best way to contact me. I will make every attempt to respond to your e-mail within 24 hours of receipt. When emailing me, be sure to email from your UTEP student account and please include the course title in the subject line. In the body of your email, clearly state your question. At the end of your email, be sure to include your first and last name along with your university identification number.
- **Discussion Boards:** If you have a question that you believe other students may also have, please post it in the Help Board of the discussion boards inside of Blackboard. Please respond to other students' questions if you have a helpful response.
- **Announcements:** Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

NETIQUETTE

As we have all learned by experience, communication online can sometimes be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.

- When reacting to someone else’s message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

ATTENDANCE AND PARTICIPATION

Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important not only for your learning and success but also to create a community of learners. Participation is determined by completion of the following activities:

- Reading/viewing all course materials to ensure understanding of assignment requirements
- Participating in engaging discussion with your peers on the discussion boards
- Other activities as indicated in the weekly lecture modules
- Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

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](#).

CLASS RECORDINGS

The use of recordings will enable you to have access to class lectures. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action.

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, or;
- (3) have had recent contact with a person who has received a positive coronavirus test.

Reports should be made at screening.utep.edu. If you know of anyone who should report any of these three criteria, you should encourage them to report. If the individual cannot report, you can report on their behalf by sending an email to COVIDaction@utep.edu.

For each day that you attend campus—for any reason—you must complete the questions on the UTEP screening website (screening.utep.edu) prior to arriving on campus. The website will verify if you are permitted to come to campus. Under no circumstances should anyone come to campus when feeling ill or exhibiting any of the known COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, and alternative instruction will be provided. Students are advised to minimize the number of encounters with others to avoid infection. Wear face coverings when in common areas of campus or when others are present. If you choose not to wear a face covering, you may not come on campus. Students who refuse to wear a face covering and follow preventive COVID-19 guidelines will be subject to disciplinary action according to Section 1.2.3 *Health and Safety* and Section 1.2.2.5 *Disruptions* in the UTEP Handbook of Operating Procedures.

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.

WEEKLY CALENDAR (Subject to Change)

	Topic	Lecture	Assignments	Notes
Week 1 8/24-8/28	Course introduction, syllabus, and technology verification	N/A	Make sure you can connect to all course resources in Blackboard	Contact IT Help Desk for assistance as needed
Week 2 8/31-9/4	Composite materials introduction	1	1	Assignment 1 due date: 9/6
Week 3 9/7-9/11	Matrix Materials	2	2	Assignment 2 due date: 9/13
Week 4 9/14-9/17	Composite Interfaces	3	3	Assignment 3 due date: 9/20
Week 5 9/21-9/25	Composite Reinforcements Part 1	4	4	Assignment 4 due date: 9/27
Week 6 9/28-10/2	Composite Reinforcements Part 2	5	5	Assignment 5 due date: 10/4
Week 7 10/5-10/9	Composite Reinforcements Part 3	6	6	Assignment 6 due date: 10/11
Week 8 10/12-10/16	Exam 1	Exam 1 Review Outline	N/A	N/A

Week 9 10/19-10/23	Composite Micromechanics Part 1	7	7	Assignment 7 due date: 10/25
Week 10 10/26-10/30	Composite Micromechanics Part 2	8	N/A	Special Topic Report due date: 11/1
Week 11 11/2 – 11/6	Composite Macromechanics	9	8	Assignment 8 due date: 11/8
Week 12 11/9-11/13	Design Considerations	10	9	Assignment 9 due date: 11/15
Week 13 11/16-11/20	Exam 2	Exam 2 Review Outline	N/A	N/A
Week 14 11/23-11/27	Composite Strength and Fracture	11	N/A	N/A
Week 15 11/30-12/4	Fatigue and Creep	12	10	Assignment 10 due date: 12/6
Finals Week 12/7-12/11	Final Exam	N/A	N/A	Details of final exam format to be determined (pending Exams 1,2)