

Tentative Syllabus

The instructor holds the right to amend course policies and grade distribution during the semester if needed. Any changes will be announced to students.

Dates/Time/Location: T/R 11:00 AM– 12:15 PM – Dolve 215

Instructor: Dr. Ali Amiri, E-mail: ali.amiri@ndsu.edu
Office: 102D Dolve Hall **Phone:** 701-231-7215
Office hours: Wednesdays 10am –11am or by appointment in case this time does not work

Prerequisites: ME331, and graduate standing for 674

Catalog Description: Materials, properties, stress, and strength analyses; engineering design and manufacturing aspects of short and continuous fiber-reinforced materials.

Required Textbook (eTextbook):

Analysis and Performance of Fiber Composites, 4th ed., Agarwal, Broutman, & Chandrashekhara, Wiley Inc., 2018.

Class Lectures and Topics: (Please check the detailed schedule at the end of this syllabus)

1. Properties and characteristics of fibers and matrices used in composite materials
2. Processing, properties, and characteristics of various polymer matrix composites, ceramic matrix composites, and metal matrix composites
3. Function of the interface in composite materials
4. Anisotropic characteristics of composites and become familiar with the micromechanics of composites
5. Analysis of discontinuous fiber reinforced composites using Halpin-Tsai models
6. Ply mechanics, transformation equations and elastic constants, and basic concepts in lamination theory
7. Main composite failure mechanisms and composite failure criteria
8. Energy absorption mechanisms of composites during impact
9. Investigation of emerging composite material technology
10. Apply composite knowledge to structural design

LECTURES, EXAMINATION, ASSIGNMENTS & GRADING

1- GRADING:

Grades for the course will be determined as follows:

	ME474	ME674
Exam1	20%	20%
Exam2	20%	20%
Final Exam	20%	15%
Pop Quizzes	15%	10%
Assignments	10%	10%
Term Project	15%	15%
Term Paper	-	10%
Total	100%	100%

Contract Grades: $F < 60\% \leq D < 70\% \leq C < 80\% \leq B < 90\% \leq A$

2- **WORK EXPECTED IN THIS COURSE: 12 HOURS PER WEEK**

Attending lectures count as “lecture hours” and is a small portion of the work expected in this course. For a 3-credit course, 9 hours of additional time is expected of you each week outside classroom. This includes but not limited to; Reading textbook, reviewing class notes, completing assignments, review and solving “solved examples” of the textbook, practicing end of chapter problems, stop by office hours, etc.... It is recommended that students solve/practice/review all end of chapter exercises. Ask a lot of questions and stop by instructor’s office for help.

3- **ATTENDANCE EXPECTATIONS (Pop Quizzes and Participation):**

- Please review NDSU [Policy 333](#) for specific student and instructor responsibilities regarding class attendance.
- Students are expected to attend every class and remain in class for the duration of the session.
- Lecture attendance is not mandatory for ME 474/674 and the instructor does not keep track of attendance. However, there are pop quizzes done during lectures which are part of your grade. If you must miss a lecture due to a valid excuse, it is encouraged to contact the instructor in advance.

An excused absence is one of the following situations explained below:

- *1- A situation laid out by [NDSU Policy 333](#) (item 4, 5, 6 and &) and at the discretion of the instructor. In this situation, the student is encouraged to contact the instructor prior to missing a lab or lecture and be excused.*
- *2- An emergency situations/problem/health issue – in this case you need to notify the instructor as soon as you are safe and able to communicate with the instructor, being excused is at the discretion of the instructor.*
- As much as family is important to all of us, family vacations/trips, family gatherings, etc... are not excused absences.
- There will be pop quizzes and activities during lectures, missing class will result in no credit for those activities or pop quizzes. **THERE IS NO MAKE-UP FOR POP QUIZZES.**
- **There are no make-ups for pop-quizzes or class activities for any reason.**
- Whether you are present in lecture or not, you are responsible for materials and announcements discussed in lecture.
- No cell-phones usage or texting is allowed during lectures without prior approval by the instructor.
- No earphones, laptops, headsets, headphones, earbuds, AirPods, etc... usage is allowed during lectures and exams.
- You will be asked to leave the lecture if you are caught using any of the electronic devices mentioned above. And no credit will be granted for missing a pop-quiz as a result of this.
- **Copyright of Course Materials:** In this course recording the lectures is prohibited with your own personal devices (without prior express approval from the instructor).

Please review Resources compiled by IT for students: <https://kb.ndsu.edu/learn>

4- **ASSIGNMENTS**

- All assignments are due on BB 1 min BEFORE lecture on due dates. Please check BB>Assignments
- **NO LATE SUBMISSION OF ANY ASSIGNMENT IS ACCEPTED.** The submission link disappears exactly at due time/date and will not be accessible.
- A corrupt file, or a wrong file, is a failed assignment and a failed submission. You have to double check your submission and make sure it is the correct file, it is complete, and it has gone through properly.
- All assigned problems are posted on BB > Assignments
- Reading assignments are also part of your assignments and students will be quizzed often from assigned readings from the textbook.
- To get full credit, homework must be in acceptable engineering form:
 - *One problem per page. Include Homework #, name, and date on top of the first page.*
 - *"Given" and "Find" statements.*
 - *Assumptions (if applicable)*
 - *Sketch, process diagrams (if necessary)*
 - *Detailed solution steps and correct units.*
 - *Highlighted (e.g, circle) final answer*
- Please check solved examples in the textbook for more details on the format of the HW assignments.
- Working together on assignments are permitted, but copying someone else’s work and submitting it as yours is considered plagiarism and will result in penalties laid out by policy #6 of this course syllabus.

5- EXAMINATION

- Exams are all done in-person in the classroom during lecture. Final Exam might be done in “Take-home” format.
- There are no make-ups for missed exams without prior approval. If you must miss an exam because of serious illness, family death, interview, etc., notify the instructors as soon as possible.

6- HONESTY:

All work in this course must be completed in a manner consistent with NDSU University Senate [Policy 335](#), Code of Academic Responsibility and Conduct. Violation of the Code will result in a penalty or penalties to be determined by the instructor to fit the gravity of the offense and the circumstances of the particular case. The instructor may (1) fail the student for the particular assignment or test, (2) give the student a failing grade in the course, or (3) recommend that the student drop the course.

7- IMPORTANT GRADING POLICY:

Once a grade is posted on BB, or any graded work is returned to you, please examine it carefully and bring any issues, confusion, questions, etc... to the attention of Dr. Amiri within 1 week. The window for final exam is 3 days after final exam grade is posted to BB.

8- AMERICAN WITH DISABILITIES ACT STATEMENT:

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the [Disability Services Office](#) as soon as possible. Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance, preferably before the first test.

9- FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA) STATEMENT:

Your personally identifiable information and educational records as they relate to this course are subject to FERPA.

10- CLASS COMMUNICATION:

NDSU Policy 609 establishes that “Email, like postal and campus mail, is an official means by which the university communicates with employees and students” and stipulates that “Instructors may determine how e-mail or other forms of electronic communication (i.e., Blackboard) shall be used to facilitate teaching and learning” and that they “may expect that students are accessing their e-mail on a regular basis as specified in this policy.” Students are responsible for information disbursed via email from instructor. Make sure to check both of these resources regularly. Failure to check your emails or BlackBoard is not a valid excuse for missing on some important information or violating course policies.

11- EMAIL ETIQUETTE:

You are expected to communicate with me and other students in a professional manner. When sending an email you should always include a subject, an appropriate greeting (e.g., “Dear Dr.” or “Hello Professor”), followed by which class/section you are enrolled in and concise and respectful content. Make sure to be clear in your questions and comments. You can consider this practice for future emails sent to a manager, supervisor, etc.

12- COVID-19 and FACE COVERINGS

- If you were exposed to COVID-19, please follow CDC guidance available [here](#).
- If you tested positive for COVID-19, please follow CDC guidance available [here](#).

Detailed Tentative Schedule

Week		Date	Topic	Reading Assignment	Week		Date	Topic	Reading Assignment
WEEK 1	T	1/9	Introduction	CH 1	WEEK 9	T	3/12	Orthotropic Lamina	5.3
	R	1/10	Introduction	CH 1		R	3/14	Orthotropic Lamina	5.4
WEEK 2	T	1/16	Fibers and Matrices	2.1-2.2	WEEK 10	T	3/19	Orthotropic Lamina	5.4
	R	1/18	composite fabrication	2.2-2.3		R	3/21	Laminated Composites	6.1-6.2
WEEK 3	T	1/23	composite fabrication		WEEK 11	T	3/26	Laminated Composites	6.2-6.3
	R	1/25	Unidirectional composites	3.1-3.3		R	3/28	Laminated Composites	6.4
WEEK 4	T	1/30	Unidirectional composites	3.3-3.5	WEEK 12	T	4/2	Laminated Composites	6.5
	R	2/1	Unidirectional composites	3.7		R	4/4	Laminated Composites	6.6
WEEK 5	T	2/6	Short Fiber Composites	4.1	WEEK 13	T	4/9	Laminated Composites	6.7
	R	2/8	Short Fiber Composites	4.2		R	4/11	REVIEW	
WEEK 6	T	2/13	Short Fiber Composites	4.3	WEEK 14	T	4/16	EXAM 2	
	R	2/15	REVIEW			R	4/18	Failure Modes	?
WEEK 7	T	2/20	EXAM 1		WEEK 15	T	4/23	Chapter 8.3	8
	R	2/22	Orthotropic Lamina	5.1-5.2		R	4/25	Chapter 9	9
WEEK 8	T	2/27	Orthotropic Lamina	5.2	WEEK 16	T	4/30	REVIEW	
	R	2/29	Orthotropic Lamina	5.3		R	5/2	REVIEW	
SPRING BREAK	T	3/5	SP		FINALS	T	5/7	FINAL EXAM	
	R	3/7	SP			R	5/9		

Additional Resources to Support you:For students on campus and remotely (telehealth):Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>In a crisis or emergency:

Call University Police: 701-231-8998, Call 9-1-1

Go to a Hospital Emergency Room

Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.)

Call the FirstLink Help Line: 1-800-273- TALK (8255) or 2-1-1

Call Rape and Abuse Crisis Center: 701-293-7273

Course OutcomesAffected
Student
Outcomes

Students must develop an understanding of the properties and characteristics of fibers and matrices used in composite materials.

Students must develop an understanding of the processing, properties, and characteristics of various polymer matrix composites, ceramic matrix composites, and metal matrix composites.

Students must develop an understanding of the function of the interface in composite materials.

Students must understand the anisotropic characteristics of composites and become familiar with the micromechanics of composites.

Students must develop a basic understanding of the analysis of discontinuous fiber reinforced composites using Halpin-Tsai models.

Students must develop basic understanding of ply mechanics, transformation equations and elastic constants, and basic concepts in lamination theory.

Students must be familiar with main composite failure mechanisms and composite failure criteria.

Students must be able to apply composite knowledge to structural design.

ABET STUDENT OUTCOMES:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.