



**Important Note:** Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. It is your responsibility to check Blackboard for corrections or updates to the syllabus. Any changes will be clearly noted in course announcement or through email.

## Part 1: Course Information

**Course Title:** Introduction to Engineering Mechanics of Composites

**Course Catalog # & Section:** MEC456 or MEC556

**Credit Hours:** 3

**Prerequisite:** MEC 363 or equivalent course (working knowledge of linear matrix algebra and basic coding skills in MATLAB)

**Lectures:** **Mondays 4:25 PM to 7:15 PM** (online, zoom meetings set up on blackboard)

**Join URL:**

**<https://stonybrook.zoom.us/j/99327917977?pwd=dHdiby81Y3QvRTR5NHQvdStuMGxjdz09>**

**General Education Designation(s):**

**Instructor Name:** Kedar Kirane

**Instructor Contact Information:**

**Email:** kedar.kirane@stonybrook.edu

**Phone:** NA

**Office Hours:** Tue, Thu 3:30 – 5:30PM (online, zoom meetings set up on blackboard)

**Join URL:**

**<https://stonybrook.zoom.us/j/99178955056?pwd=cEhNUmk1QVZCQVM5VGhq0ZOTkNVZz09>**

## **Course Description:**

Introduction to the engineering mechanics of fiber reinforced composites. Brief history of the development of fiber composites, their properties, advantages, limitations and applications. Overview of the different types of composites but with focus on long fiber reinforced composites; particularly, lamina and laminate concepts characteristics and configurations. The course introduces various length-scales at which composites are analyzed (individual fibers/matrix, lamina and laminates). Topics covered include: elastic properties of unidirectional lamina, strength (and progressive failure) of unidirectional lamina, elastic behavior of multidirectional laminates and strength and progressive failure of multidirectional laminates. Design methodologies and considerations for structural composite materials. The course also introduces the students to various modes of failure in composites, various lamina failure theories, classical laminate theory, and briefly fracture mechanics.

## **Required Course Textbook and Materials:**

- Engineering Mechanics of Composite Materials, Isaac M. Daniel & Ori Ishai. Oxford Press (2006, second edition) ISBN 978-0-19-515097-1

## **Recommended Readings/Bibliography:**

- Autar K. Kaw, "Mechanics of Composite Materials," 2nd ed., Taylor and Francis
- Robert M. Jones, "Mechanics of Composite Materials," Taylor and Francis.

## **Details of topics covered:**

- Introduction - Relevant terminology, advantages & disadvantages of composites, role of constituents (fibers, matrix), synthesis and fabrication techniques, types of composites, degrees of anisotropy
- UD lamina – Elastic constitutive relations, relations between mathematical and elastic constants, plane stress constitutive relation, transformation of elastic parameters, effective elastic properties (fiber volume ratio, rule of mixtures)
- Strength of UD lamina – Failure mechanisms and failure criterion, failure theories (stress, strain, Tsai Hill, Tsai Wu)
- Multi-directional laminates – Macro-mechanical Analysis, Elastic properties, Laminate theory, (Cross-Ply, Moment-Curvature, Basic), Stress and Failure analysis
- Failure and Design of Laminates - Ply Arrangements, Failure Theories, Failure Criterion
- Other topics: Fatigue, Fracture mechanics, Quasi-brittleness, Size Effects, Mechanical testing methods overview, Hygro-thermal effects

## **Course Delivery Mode and Structure:**

This is an online course, delivered in the Blackboard learning management system (LMS). Students must be mindful of all course expectations, deliverables and due dates. All assignments and course interactions will utilize internet technologies. See "Technical Requirements" section for more information.

Regular in class lectures will be replaced by live and synchronous zoom sessions (to be held during class times, sessions will be accessible through blackboard). These sessions will be recorded and will be available to view afterwards as well, along with transcript. The instructor will be available during regular office hours, via live Zoom sessions, also accessible through blackboard

## **How We Will Communicate:**

Course-related questions and other personal/private issues, my preferred method of contact is via email listed at the top of this syllabus. Your Stony Brook University email must be used for all University related communications. You must have an active Stony Brook University e-mail account and access to the Internet. *All instructor correspondence will be sent to your SBU e-mail account.* Please plan on checking your SBU email account regularly for course related messages.

## **Technical Requirements:**

This course uses Blackboard for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The Blackboard course site can be accessed at <https://blackboard.stonybrook.edu> You are responsible for having a reliable computer and Internet connection throughout the term.

The following list details a minimum recommended computer set-up and the software packages you will need to have access to, and be able to use:

- PC with Windows 10
- Macintosh with OS 10.13 or higher
- Latest version of Chrome, Firefox or Explorer; Mac users may use Chrome, Firefox or Safari. (A complete list of supported browsers and operating systems can be found on the My Institution tab of the [Blackboard website.](#))
- High speed internet connection
- Word processing software (Microsoft Word, Pages, etc.)
- Speakers (either internal or external) or headphones
- Ability to download and install free software applications and plug-ins (note: you must have administrator access to install applications and plug-ins).
- Adobe Flash player with the latest update is crucial for playing multiple videos throughout the course
- Computer and Internet Connection: This course requires that you have a good, reliable (preferably wired internet connection) to a reliable and working computer with a webcam and microphone. Cheap wifi connections might not work well and in the past students have had difficulties taking exams when they were connected to unreliable wifi access points, such as at coffee shops. We will not be responsible for you not being able to connect to the servers during the exam and no extensions on time will be given. Please do not underestimate the importance of having a reliable computer and internet connection.
- Respondus LockDown Browser: You will need to use this browser to take quizzes and exams online; please download it from this link:  
<http://www.respondus.com/lockdown/download.php?id=772113517>  
Please scroll to the end for detailed instructions
- Camscanner software

## **Technical Assistance:**

If you need technical assistance at any time during the course or to report a problem with Blackboard you can:

- submit a help ticket on the web at <http://it.stonybrook.edu/services/itsm>)
- call (631) 632-9800 (technical support, log-in issues, computer support, wifi, software & hardware)
- call (631) 2-CELT [631-632-2358]

## **Part 2: Course Learning Objectives and Assessments**

### **Learning Objectives and Activities:**

Upon completion of the course, students will be able to:

1. Become familiar with the advantages and limitation of fiber composites in comparison with conventional structural materials
2. Be able to use stress-strain linear elastic constitutive relations in structural analysis, including isotropic, anisotropic, orthotropic and transverse isotropic relations
3. Understand coordinate transformation of stress, strain, stiffness and compliance matrices
4. Understand various theoretical methods for predicting effective elastic properties and their relative advantages and limitations
5. Be able to determine the onset of failure in composites using various strength-based failure theories
6. Be able to determine the elastic behavior of multidirectional laminates composed of plies with different orientations
7. Be able to appreciate the shortcomings of strength-based failure theories, and importance of fracture mechanics

CLO Assessment tool for all above CLOs will be homework and exams

### **Assignments and Expectations:**

- Homework assignments will be assigned on blackboard and will have to be submitted online. Students will work out your solutions on paper and submit scanned PDF copies
- A group project will also be assigned towards the end of the semester which will involve reviewing a published research article and making a class presentation. (the grade for the project will be counted under homework)
- All exams will be held online with the aid of the Respondus LockDown browser. The dates and times will be announced at the beginning of the semester. The exams will be deployed on blackboard and you can appear for the exam remotely. Your activity during the exam will be recorded. A trial test will be deployed in order for you to test your setup and get used to the process. All exams will be open book and open notes. An exam absence will be scored as a zero, unless a justifiable excuse with appropriate documentation is presented to the instructor within one week following the exam.

### Part 3: Course Schedule

\*\*\*subject to changes\*\*\*

Please note that this schedule is tentative. Our exact schedule during the semester might differ depending on our progress, weather related class cancellations etc. Updates to this schedule will be posted on blackboard

WEEK	Date	CLASS		
1	8/24	1	Chapter 1, 2	Intro, basic concepts
2	8/31	2	Chapter 3	Lamina elastic - micromechanics
3	9/7		Labor day no class	
4	9/14	3	Chapter 4	Lamina elastic - macromechanics
5	9/21	4	Chapter 4	Lamina elastic - macromechanics
6	9/28	5	Chapter 5	Lamina failure - micromechanics
7	10/5	6	Chapter 5 + 6	Lamina failure - macromechanics
8	10/12		MIDTERM	
9	10/19	7	Chapter 6	Lamina failure - macromechanics
10	10/26	8	Chapter 6, 7	Lamina failure, Laminate - elastic
11	11/2	9	Chapter 7, 9	Laminate - elastic, laminate failure (FPF)
12	11/9	10	Chapter 9, 8	Laminate failure, Hygrothermal effects
13	11/16	11	Chapter 8	Hygrothermal effects
14	11/23		Thanksgiving	
15	11/30	12	--	Project Presentations
16	12/7	13	--	Presentations, HW discussion, Revision
17	12/9*		Final exam	

\* (To be confirmed)

## Part 4: Grading, Attendance, and Late Work Policies

### **Assessment & Grading:**

***Viewing Grades on Blackboard:*** Points you've earned for graded activities will be posted to the MyGrades screen in the Tools area of Blackboard.

Semester letter grade will be decided based on your relative ranking in the class. An average score will be considered equivalent to a B. Your aggregate score to determine your location in the curve is based on the following categories:

Homework, includes project (about every 2 weeks)	40%
Mid-Term Exam	30%
Final Exam	30%

### ***Letter Grades:***

Final grades assigned for this course will be based on the percentage of total points earned and are assigned as follows:

Letter Grade	GPA/Points	Performance
A	4.0	Excellent Work
A-	3.7	Nearly Excellent Work
B+	3.3	Very Good Work
B	3.0	Good Work
B-	2.7	Mostly Good Work
C+	2.3	Above Average Work
C	2.0	Average Work
C-	1.7	Mostly Average Work
D+	1.3	Below Average Work
D	1.0	Poor Work
F	0.0	Failing Work

### **Attendance and Late Work Policy:**

*Version with absenteeism penalties:* Attendance in this online course is accrued through your timely participation in discussions and completion of assignments.

***Late Work Policy:*** I will accept late work but with a penalty and will be decided on a case to case basis.

## Part 5: Course and University Policies

### Student Accessibility Support Center Statement

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact the Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748.

They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

<https://www.stonybrook.edu/commcms/studentaffairs/sasc/facstaff/syllabus.php>

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: <https://ehs.stonybrook.edu/programs/fire-safety/emergency-evacuation/evacuation-guide-people-physical-disabilities>

- To access mental health services, call Counseling and Psychological Services at 631-632-6720; Counselors are available to speak with 24/7.
- For updated information on the Academic Success and Tutoring Center please check [www.stonybrook.edu/tutoring](http://www.stonybrook.edu/tutoring) for the most up-to-date information.
- For IT Support: Students can visit the Keep Learning website at <https://sites.google.com/stonybrook.edu/keeplearning> for information on the tools you need for alternative and online learning.

Need help? Report technical issues at <https://it.stonybrook.edu/services/itsm> or call 631-632-2358.

For information on Library services and resources please visit the Continuity of Library Operations guide.

### Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at [http://www.stonybrook.edu/commcms/academic\\_integrity/index.html](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

### Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

## **Understand When You May Drop This Course:**

It is the student's responsibility to understand when they need to consider disenrolling from a course. Refer to the Stony Brook Academic Schedule for dates and deadlines for registration: [http://www.stonybrook.edu/commcms/registrar/calendars/academic\\_calendars](http://www.stonybrook.edu/commcms/registrar/calendars/academic_calendars)

## **Incomplete Policy:**

Under emergency/special circumstances, students may petition for an incomplete grade. Circumstances must be documented and significant enough to merit an Incomplete. If you need to request an incomplete for this course, contact me for approval as far in advance as possible.

## **Course Materials and Copyright Statement:**

Course material accessed from Blackboard, Zoom sessions, Homework Assignments, Exams, Lecture videos or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.

All federal and state copyright interests are reserved for all original material presented in this course through any medium, including lecture, electronic transmission or print. Individuals may not sell, be paid or receive anything of value for class notes made during this course from any person or entity without the express written permission of (author). In addition to legal sanctions, violation of these copyright prohibitions may result in University disciplinary action.

## **Allowed Calculators:**

Only the following calculators will be permitted to be used on all midterm and final exams in the Department of Mechanical Engineering. There will be no exceptions! This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year, as well as Professional Engineering (PE exam) that you may take.

Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name.

Hewlett Packard: The HP 33s and HP 35s models, but no others.

Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

For detailed information, follow <https://ncees.org/exams/calculator-policy/>

## **Make up exams:**

The class policy on make-up exams is consistent with university policy on Student Participation in University Sponsored Events, the policy on Final Exams and the New York State Education Law regarding Equivalent Opportunity and Religious Absences.

## **Lockdown Browser + Webcam Requirement & Detailed Instructions**

This course requires the use of LockDown Browser and a webcam for online exams. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. Watch this brief video to get a basic understanding of LockDown Browser and the webcam feature.

<https://www.respondus.com/products/lockdown-browser/student-movie.shtml>

## **Download Instructions**

Download and install LockDown Browser from this link:

<https://download.respondus.com/lockdown/download.php?id=772113517>



## Once Installed

Start LockDown Browser; Log into Blackboard Learn and Navigate to the test

Note: You won't be able to access tests with a standard web browser. If this is tried, an error message will indicate that the test requires the use of LockDown Browser. Simply start LockDown Browser and navigate back to the exam to continue.

## Guidelines

When taking an online test, follow these guidelines:

Ensure you're in a location where you won't be interrupted

Turn off all other devices (e.g. tablets, phones, second computers) and place them outside of your reach

Before starting the test, know how much time is available for it, and also that you've allotted sufficient time to complete it

Clear your desk or workspace of all external materials not permitted - books, papers, other devices

Remain at your computer for the duration of the test

If the computer, Wi-Fi, or location is different than what was used previously with the "Webcam Check" and "System & Network Check" in LockDown Browser, run the checks again prior to the exam

To produce a good webcam video, do the following:

Avoid wearing baseball caps or hats with brims

Ensure your computer or device is on a firm surface (a desk or table). Do NOT have the computer on your lap, a bed, or other surface where the device (or you) are likely to move

If using a built-in webcam, avoid readjusting the tilt of the screen after the webcam setup is complete

Take the exam in a well-lit room, but avoid backlighting (such as sitting with your back to a window)

Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted

## Getting Help

Several resources are available if you encounter problems with LockDown Browser:

The Windows and Mac versions of LockDown Browser have a "Help Center" button located on the toolbar. Use the "System & Network Check" to troubleshoot issues. If an exam requires you to use a webcam, also run the "Webcam Check" from this area

Respondus has a Knowledge Base available from [support.respondus.com](http://support.respondus.com). Select the "Knowledge Base" link and then select "Respondus LockDown Browser" as the product. If your problem is with a webcam, select "Respondus Monitor" as your product

If you're still unable to resolve a technical issue with LockDown Browser, go to [support.respondus.com](http://support.respondus.com) and select "Submit a Ticket". Provide detailed information about your problem and what steps you took to resolve it

## **Online Communication Guidelines and Learning Resources:**

***Maintain Professional Conduct Both in the Classroom and Online:*** The classroom is a professional environment where academic debate and learning take place. I will make every effort to make this environment safe for you to share your opinions, ideas, and beliefs. In return, you are expected to respect the opinions, ideas, and beliefs of other students—both in the face-

to-face classroom and online communication. Students have the right and privilege to learn in the class, free from harassment and disruption. The course follows the standards set in the Student Code of Conduct, and students are subject to disciplinary action for violation of that code. If your behavior does not follow the course etiquette standards stated below, the grade you receive for a posting may suffer. I reserve the right to remove any discussion messages that display inappropriate language or content.

**Online Post Etiquette:**

- Offensive language or rudeness will not be tolerated. Discuss ideas, not the person.
- Avoid cluttering your messages with excessive emphasis (stars, arrows, exclamations).
- If you are responding to a message, include the relevant part of the original message in your reply, or make sure to refer to the original's contents so as to avoid confusion;
- Be specific and clear, especially when asking questions.
- Use standard punctuation and capitalization. Using all UPPERCASE characters gives the appearance of shouting and makes the message less legible;
- Remember that not all readers have English as their native language, so make allowances for possible misunderstandings and unintended discourtesies.

**Online Classes Require Better Communication:** It is important to remember that we will not have the non-verbal cues that occur in a face-to-face classroom. I cannot see the confused, frustrated, or unhappy expressions on your face if you encounter problems. **You MUST communicate with me so that I can help.** To make the experience go smoothly, remember that you're responsible for initiating more contact, and being direct, persistent, and vocal when you don't understand something.

**Student Learning Resources:**

- **Academic and Transfer Advising Services:** Have questions about choosing the right course? Contact an advisor today. Phone: (631) 632-7082 (option 2); email: [advising@stonybrook.edu](mailto:advising@stonybrook.edu); website: <http://www.stonybrook.edu/commcms/advising/>
- **Amazon @ Stony Brook:** Order your books before classes begin. Phone: (631) 632-9828; email: [Bookstore Liaison@stonybrook.edu](mailto:Bookstore_Liaison@stonybrook.edu); website: <http://www.stonybrook.edu/commcms/bookstore/>
- **Bursar:** For help with billing and payment. Phone: (631) 632-9316; email: [bursar@stonybrook.edu](mailto:bursar@stonybrook.edu); website: <http://www.stonybrook.edu/bursar/>
- **Career Center** The Career Center's mission is to support the academic mission of Stony Brook University by educating students about the career decision-making process, helping them plan and attain their career goals, and assisting with their smooth transition to the workplace or further education. Phone: (631) 632-6810; email: [sbucareercenter@stonybrook.edu](mailto:sbucareercenter@stonybrook.edu); Website: <http://www.stonybrook.edu/career-center/>
- **Counseling and Psychological Services:** CAPS staff are available by phone, day or night. <http://studentaffairs.stonybrook.edu/caps/>
- **Disability Support Services:** Students in need of special accommodations should contact DSS. Phone: (631) 632-6748; email: [dss@stonybrook.edu](mailto:dss@stonybrook.edu); <http://www.stonybrook.edu/commcms/studentaffairs/dss/>
- **Library:** Access to online databases, electronic journals, eBooks, and more!
  - **Library Instruction Website** - <http://library.stonybrook.edu/workshops-this-week-citation-skills-worldcat-and-endnote-the-hsc/>
  - **SBU Library Research Guides and Tutorials** <http://library.stonybrook.edu/research/research-basics/>
- **Registrar:** Having a registration issue? Let them know. Phone: (631) 632-6175; email: [registrar\\_office@stonybrook.edu](mailto:registrar_office@stonybrook.edu); <http://www.stonybrook.edu/commcms/registrar/>
- **Writing Center:** Students are able to schedule face-to-face and online appointments. <https://www.stonybrook.edu/writingcenter/>

- **Support for Online Learning**  
<http://www.stonybrook.edu/commcms/onlineed/student.html>
- **Ombuds Office** The Stony Brook University Ombuds Office provides an alternative channel for confidential, impartial, independent and informal dispute resolution services for the entire University community. We provide a safe place to voice your concerns and explore options for productive conflict management and resolution. The Ombuds Office is a source of confidential advice and information about University policies and procedures and helps individuals and groups address university-related conflicts and concerns.  
<http://www.stonybrook.edu/ombuds/>