

COURSE DESCRIPTION

Learning Outcomes:

The students will be able to:

- A) estimate material properties microstructural and structural scales for laminated composites,
- B) predict stress, deformation, and failure of composite plates, and
- C) determine manufacturing processes appropriate for the designed composite structure
- D) design composite material systems (constituents and stacking sequences) that produce required properties,

Text Book: Principles of Composite Material Mechanics, Ronald F. Gibson, CRC Press; Fourth Edition

<https://www.crcpress.com/Principles-of-Composite-Material-Mechanics-Fourth-Edition/Gibson/p/book/9781498720694> (Links to an external site.)

[\(Links to an external site.\)](#)

Topics

1. INTRODUCTION: Definitions, Applications of Composites, Fundamentals of Solid Mechanics

2. MATERIALS: Fibers, Matrix, Thermoset and thermoplastic polymers, Density, Fiber and Void Content, Metal Matrix Composite

3. FABRICATION OF COMPOSITES: Fundamentals Molding, Pultrusion, Filament Winding, etc.

4. BEHAVIOR OF UNIDIRECTIONAL COMPOSITES - Lamina-Scale - Rule of Mixtures; Micro-Mechanics Theories; Longitudinal and Transverse Moduli; Poisson's Ratio, Shear Modulus, Strength and Failure theories;

5. ANALYSIS OF LAMINA- Ply Mechanics: Hook's Law, Stress-Strain Relationships, Engineering Constants, Strengths of Orthotropic Laminae

6. ANALYSIS OF LAMINATED COMPOSITES- Macro-Mechanics: Laminated Structures, Interlaminar Stresses

7. EXPERIMENTAL METHODS: Tension, compression, shear, bending, fracture and fatigue testing methods.

8. PERFORMANCE: Fatigue and Impact, Environmental Effects, Fracture Behavior, and Damage Tolerance

9. DESIGN: Design/Application Examples

Course Assessments (Evaluations)

Midterm: 20%

Final (Take Home): 20%

Design Project: 20%

Homeworks: 40% (Equal value to all HWs.)

All submissions are to be made via Canvas only. Do not email or hand-in printed copies.

Late submission policies:

Submission timings are as posted on canvas.

- With an email sent before the deadline, asking for a grace period of no longer than 48 hours
- *no penalty (first time only) - 5% from the second time.*

With 7 Days - 10% off the grade obtained -

Within 14 days - 20% off

After 14 days - before the start of the last class - 50% off.

- **Makeup Mid-term exam:** Generally, no makeup exams will be administered after the exam scheduled times.
If you are unable to attend exam times for a valid reason on the scheduled date, you will need to take the test before the regularly scheduled time. Email me and I will arrange a time 24-48 hours prior to the exam time.
- **Be warned that Canvas can be tricky if you leave the submission of your work to the last possible minute.**

ACADEMIC INTEGRITY STATEMENTS

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound by the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics (Links to an external site.).

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the

same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the [Bylaws of the Honor System \(Links to an external site.\)](#) document, located on the Honor Board website.

EXAM ROOM CONDITIONS

The following procedures apply to quizzes and exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Room Conditions on the quiz or exam.

1. Students may use the following devices during quizzes and/or any electronic devices that are not mentioned in the list below are not permitted.

| Device | Permitted? | |
|---------------|------------|----|
| | Yes | No |
| Laptops | | X |
| Cell Phones | | X |
| Tablets | | X |
| Smart Watches | | X |
| Google Glass | | X |
| Calculators | X | |

A device may be permitted if your book is on the device or if the examination is being administered remotely online and the device is necessary for accessing the exam materials. Academic integrity policies apply.

2. Students may use the following materials during quizzes and/or any materials that are not mentioned in the list below are not permitted.

| Material | Permitted? | |
|-------------------|------------|----|
| | Yes | No |
| Handwritten Notes | X | |
| Conditions: | | |
| Typed Notes | X | |
| Conditions: | | |
| Textbooks | X | |
| Conditions: | | |
| Readings | X | |
| Conditions: | | |
| Other (specify) | | X |

3. Students are not allowed to work with or talk to other students during quizzes and/or exams.

Specific Parameters: Unless, of course, it is an emergency.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities

offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services>. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone (201) 216-3748.

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.