AE/ChBE/ME/MSE 4793 COMPOSITE MATERIALS AND PROCESSES

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TA: available, to be updated each semester

Goal: Understand composite material and processing requirements for optimizing composite performance.

Learning objectives:

1. Understand property enhancement mechanisms in composites.
2. Understand capabilities and limitations of existing materials and processes.
3. Understand the characteristics of fibers, fabrics and matrix materials, and their effect on composites processing and properties.
4. Understand the characteristics and limitations of different manufacturing methods.
5. Develop a capability for selecting materials and processes to best suit specific applications.

REQUIRED TEXTBOOK* + REFERENCE BOOK: (direct links on Canvas)

Textbook: "COMPOSITES MANUFACTURING: Materials, Product, and Process Engineering", by S.K. Mazumdar, CRC Press, ISBN 0-8493-0585-3 1. 2001.

Reference Book: "Fundamentals of Composites Manufacturing: Materials, Methods, and Applications (2nd Ed)", A. Brent Strong, ISBN 13: 978-087263854-9, 2008.

Topics and Reading Assignments

Topic	*Reading Assignment**
Introduction, Applications, Properties	Ch. 1, HD, Ref 1,23
Reinforcement Mechanisms, Mechanical Properties	HD, Ref 11
Reinforcements: Fibers, Particles and Whiskers	2.2, HD, Ref 8
Matrix Materials: Thermoset, Thermoplastic, Ceramic, Metal	2.3, HD, Ref 2-7
Textile Preforms	2.4-2.8, HD, Ref 9
Interface	HD, Ref 2
Selection, Product Development, Design for Manufacturing	Chs. 3, 4 & 5
Manufacturing fundamentals	6.1-6.5
Polymer Matrix Composites: Manufacturing & Properties	6.6-6.9, HD, Ref 13-19
Metal and Ceramic Matrix Composites	HD, Ref 7
Other topics: e.g., nano composites, green composites, etc	
Cost estimation	Ch. 11, Ref 22

* Ch. x & x.y = chapter & section x.y in Textbook. Ref z = section z in ref. book, HD=handout

TERM PROJECT: Case studies on composites applications by student teams (3- 4 members) to study and present how a composite with tailored properties and for a specific application is designed and manufactured. You'll need to submit a report and give a presentation via a YouTube video. Selected videos will be viewed in class. Projects are graded by your peers (classmates). See project instructions to come.

HOMEWORK: Problems will be assigned and graded. *Grading is mostly for effort & approach*. You'll receive "key points (ie, brief answers)" for the HWs; please compare with your own answer. We'll discuss some of the questions in class as well. Students are encouraged to study together but each must complete homework by herself/himself – copying is not permitted. **Homework must be type-written but may contain hand drawing** (e.g., draw on paper, take a photo, embed image).

EXAMS: There will be several several exams, details will be provided for each offering

AI: Anwsers prepared by AI is not permitted for HW & exams – no point will be earned if the Cavas system identifies a submission as generated by AI or too close to some sources in its database.

GRADING	Exams	(75%)
	Project	(15%)
	Homework	(10%)
	Attendance	(0 to -5%) (up to -10% if missing more than "a few" lectures without approval)

TurningPoint may be used for "Qizzes": Please setup your TurningPoint devices for in-class "Quizzes". The purpose is to engage in interactive discussion. Although your grades are recorded in Canvas, they do not directly enter into class grades. (Though not the main purpose, such grades do count as attendance record).

ACADEMIC INTEGRITY: Instructor expects all students in this class to respect the Georgia Tech honor code and behave in a professional manner when it comes to academic integrity. Engineers have a responsibility to the public who ultimately will use the products of their intellectual creations. Trust is very important in the engineering profession and it begins well before we enter the workplace. Any students violating the honor code will be turned over to the office of Academic Integrity, Dean of Students to investigate the incident(s) .

Particular items to be aware of include

- Students are encouraged to study together but each student must complete HW independently (copying not allowed).
- Students are to neither receive nor give help to others for exams.
- Any student suspected of academic misconduct will be referred to the Georgia Tech Office of Student Integrity.
- Behaviors that are not compatible with a positive classroom environment are not permitted.

<u>A note on class attendance/examinations:</u>

Students are expected to **attend the classes.** Poor attendance could impact your grade by 5% (or more that 5% if missing more than "a few" lectures). If you encounter some "excuseable" events, please contact Dean of Students for accommodation.