UNIVERSITY OF SOUTHERN MAINE  
Department of Engineering  
MEE 352/552 – Analysis and Design of Composite Structures  
Syllabus, Fall 2018  

Lecture, Lab, and Computer Simulation:  
*Time*: Mondays 8:00-10:05 am Wednesdays 8:00-9:15 am  
*Location*: 164 JMC (lectures), 184 JMC (lab), or 270 JMC (simulations)  

**Instructor**: Prof. Mehrdaad Ghorashi, Ph.D., P.E.  

**Office Hours**: Mondays and Wednesdays 1:30-2:30; otherwise by appointment. 133 John Mitchell Center, USM, Gorham Campus. Email: mehrdaad.ghorashi@maine.edu, Phone: (207) 780-5166.  

**Course Description**:  
Advantages and limitations of composite materials, fibers and matrices, anisotropic, orthotropic and transversely isotropic materials, fabrication processes of composites, axial deformation and bending of sandwich beams and reinforced concrete, elastic behavior and strength of unidirectional lamina, elastic constants of a lamina along an arbitrary direction, elastic behavior of multidirectional laminate, failure criteria of laminates, joining and assembly, case studies, mechanical test methods, experimental determination of engineering constants of composites, computer-aided analysis and design of composite structures. Mechanical Engineering elective. Prerequisites: MEE 251, EGN 248. Lecture 3 hrs., Lab 1 hr. (Fall, even year.) Cr 3.  

**Pre-requisites**: MEE 251 and MAT 248  

**Textbook**:  

**Educational DVDs**:  
Used to provide additional visual understanding of the manufacturing of composite materials and structures  

**Topics**:  
1. Introduction, basic concepts, advantages and limitations of composite materials  
2. Brief review of strength of materials  
3. Applications of composite materials in various industries: aerospace, automobile and naval  
4. Fabrication processes of composites  
5. Beams and columns made of several materials—example: reinforced concrete  
6. Elastic behavior of unidirectional lamina  
7. Elastic constants of a lamina along an arbitrary direction  
8. Strength of a composite lamina
9. Sandwich beams and structures
10. Elastic behavior of multidirectional laminates and the stacking order effect
   (symmetric, balanced, and cross-ply laminates)
11. Failure analysis of multidirectional laminates
12. Brief review of experimental methods for determination of the engineering
    properties of composite materials
13. Computer-aided analysis and design (CAD) of composite structures using
    SolidWorks

Grading:
1. Assignments: 20%
2. Term Project Presentations: (Monday, December 10, 8:00-10:05 am) 164 JMC
   For the undergraduate level course: Manufacture of a composite part, manufacturing
   report, and presentation: 20%  
   For the graduate level course: The term project may include some self-study. The
   outcome of the graduate level term project is expected to be the draft version of a
   paper that can be submitted for publication to a journal or a conference with the
   student as the lead author: Paper and presentation: 20%
3. Exam 1: 15% (Monday, September 24, 8:00-10:05 am) 164 JMC
4. Exam 2: 20% (Monday, October 29, 8:00-10:05 am) 164 JMC
5. Final Exam: 25% (Wednesday, December 19, 8:00-10:00 am) 164 JMC

Other Important Points:
1. Assignments are due at the beginning of class on the due date. No late work will be
   accepted. No assignment or project report will be accepted by email. While students
   are encouraged to work together in solving problems, copying solutions is prohibited.
2. Attendance in all lectures and activities is required. Attendance in lab sessions will be
   taken.

Academic Support for Students with Disabilities: The University is committed to
providing students with documented disabilities equal access to all university programs
and services. If you think you have a disability and would like to request
accommodations, you must register with the Disability Services Center. Timely
notification is essential. The Disability Services Center can be reached by calling 207-
780-4706 or by email at dsc-usm@maine.edu. If you have already received a faculty
accommodation letter from the Disability Services Center, please provide me with that
information as soon as possible. Please make a private appointment so that we can review
your accommodations.