MEC E 569 – Mechanics and Design for Composite Materials

Syllabus – Fall 2013

Lectures: Wednesdays, 5:00 – 8:00 pm in room ETLE2-002

Instructor: Pierre Mertiny, Ph.D., Dipl.-Ing., P.Eng.

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Office Hours: Wednesday 3:00-4:00 pm or by appointment

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Homepage: The course website, where lecture notes and other course materials will be posted, can be accessed at https://eclass.srv.ualberta.ca/ using your CCID and password.


Prerequisites: MEC E 380 or equivalent, assessed by course instructor

Examinations: Examinations are ‘closed book’ (formula sheet provided)
Midterm exam: Oct 16, 6:30-8:00pm, ETL E2-002
Final exam: Dec. 4, 5:00-8:00pm, ETL E2-002
Note that an example exam in available on the Department website at http://www.mece.engineering.ualberta.ca/en/Undergraduate/CourseLinks.aspx

Project due date: Dec. 13, electronic version in PDF format

Mark Distribution: Assignments (4) 10%
Midterm exam 20%
Final exam 50%
Project 20%
The final mark will be assessed according to University policies.

Assignments: Due at the beginning of class, one week after the completion of each chapter in the lecture notes

Course Objective: Acquire knowledge on advanced composite materials, stress/strain/failure analysis, and basic design methods for laminated composite structures

Course Outline: 1. Introduction to composite materials: classifications, applications, terminology, manufacturing methods
2. Macro-mechanics of a lamina: anisotropic Hookes’ law, stress-strain relation for an angle lamina, strength failure theories (failure criteria) of lamina
3. Micro-mechanical analysis of a lamina: prediction of mechanical properties of composites based on properties of their constituents (fiber and matrix) including stiffness, strength and coefficients of thermal and moisture expansion

4. Analysis of laminates (Classical Laminated Plate Theory): Global stress-strain relation for laminates based on the individual properties of their laminae and their lay-up, stresses and strains in individual laminae, hygrothermal effects in laminates

5. Failure analysis of laminates: damage mechanisms, progressive failure analysis for a laminate

6. Design of laminated composite structures: laminated beam, laminated plate, other design issues

A design project will be included in the course.

A composite design software (PROMAL) will be used throughout the course in assignments and in the design project.

University policies:
Policy about course outlines can be found in §23.4(2) of the University Calendar. The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior (available on the University Governance website at: http://www.uofaweb.ualberta.ca/governance/studentappeals.cfm) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.