

CARLETON UNIVERSITY - Department of Mechanical & Aerospace Engineering

Course Outline

AERO 3700 - Aerospace Materials and Manufacturing Methods

Text Books:

1. Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 7th Edition
 2. Callister & Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition
- Rental/purchase options and links posted on Culearn.

Web Site: Brightspace (pre-recorded lectures, pdf notes, assignments, announcements, and extra reading materials)

Lectures: 1.5 hours/week (12 weeks, Wed. attendance required)

Tutorial: 1 hour/week starting week 2 (5 tutorials, 1 assignment and 4 quizzes). See Brightspace for the dates for quizzes

Subjects:

- Week 1 Introduction (Recorded lecture Par 1, assignment 1 in lieu of quiz 1)
- Week 2 - 3 Review of material's mechanical properties and failure mechanisms; case studies (Part 2(1)+2(2), assignment 2 and quiz 2)
- Week 4 -5 Lightweight materials for aero-structural applications (Part 3(1), 3(2) and (3(3), assignment 3 and quiz 3)
 - o Aluminum alloys
 - o Titanium alloys
 - o Polymers
 - o Composite materials and structural composites
 - o Fabrication of sheet metal, polymer and composite components
- Week 6-7 Materials for gas turbine and high temperature applications (Part 4 (1) and 4(2), assignment 4 and quiz 4)
 - o Stainless steels and superalloys
 - o Ceramic materials
 - o High temperature composite materials
 - o Fabrication methods: casting, forging, and powder metallurgy
- Week 8-9 Ashby's method for material selections (Part 5, assignment 5 and quiz 5)
 - o Material performance indices
 - o Material selection charts
 - o Case studies
- Week 10-11 Special manufacturing technologies (Part 6(1), 6(2) and 6(3), assignment 6, no quiz 6)
 - o Machining
 - o Heat treating
 - o Welding
 - o Surface finishing
- Week 12 Final review and sample exam questions

Section	Materials Science and Engineering, 10 th ed. (Callister and Rethwisch)	Fundamental of Modern Manufacturing 7 th ed. (Groover)
Part 1 (introduction)	-	-
Part 2	Chapters 6 and 8	-
Part 3	Chapters 11, 14, 15 and 16	Chapters 13, 14, 17, 18, 19
Part 4	Chapters 12 and 13	Chapters 10, 11, 15, 16
Part 5	-	-
Part 6	-	Chapters 25 and 26

Marking Scheme: Quiz and assignment: 40 % (5 quizzes, 8% each)

Attendance of PA: 5%

Final exam: 55 % (e-proctoring)

(The final examination is for evaluation purposes only and will not be returned to the students)

- *E-Proctoring: Please note that tests and examinations in this course will use a remote proctoring service provided by Scheduling and Examination Services. You can find more information at <https://carleton.ca/ses/e-proctoring/>.*

The minimum computing requirements for this service are as follows:

Hardware: Desktop, or Laptop

OS: Windows 10, Mac OS 10.14, Linux Ubuntu 18.04

Internet Browser: Google Chrome, Mozilla Firefox, Apple Safari, or Microsoft Edge

Internet Connection (High-Speed Internet Connection Recommended)

Webcam (HD resolution recommended)

Note: Tablets, Chromebooks and Smartphones are not supported at this time. Windows-based tablets are not supported at this time.

Instructor: Prof. Xiao Huang
 Contact: xiao.huang@carleton.ca

Learning objectives:

Knowledge base (CEAB graduate attribute 1)

- All subjects included in the course topics

Problem analysis (CEAB graduate attribute 2)

- Ability to make assumptions to solve problems in the assignments
- Analyze failure mechanisms based on evidences provided.

Communication (CEAB graduate attribute 7)

- Study course notes, textbooks and posted research papers

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

Academic Accommodations for Students with Disabilities: The **Paul Menton Centre** for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and **no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable)**. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at <http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/>

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www2.carleton.ca/equity/>

Materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).