



Department of

Mechanical Engineering

Mercer University

Syllabus for MAE 544
Flight Structures
Fall Semester 2016
Meeting Days TTh 10:50 –12:05
Room EGC 210

Instructor: Dr. Richard Kunz, Associate Professor
Department of Mechanical Engineering

Office: Suite 105F, School of Engineering

Hours: Most afternoons 2:00 – 5:00
and by appointment

Phone: 301-4061

Email: kunz_rk@mercer.edu

Website: http://faculty.mercer.edu/kunz_rk/

Textbook:

Required:

- *An Introduction to Aircraft Structural Analysis*, T.H.G. Megson, 2nd ed., Elsevier, 2014, ISBN: 978-0-08-098201-4

Reference:

- *Aircraft Structures for Engineering Students*, T.H.G. Megson, 5th ed., Elsevier, 2013. ISBN: 978-0-08-096905-3
- *Fundamentals of Aircraft Structural Analysis*, H. D. Curtis, McGraw-Hill, 1997. ISBN-13: 978-0-256-19260-5; ISBN-10: 0-256-19260-X
- **Analysis of Aircraft Structures: An Introduction*, B. K. Donaldson, 2nd ed., Cambridge, 2008. ISBN: 978-0-521-86583-8
- *Aircraft Structures*, D. J. Peery, McGraw-Hill, 1950. 2nd ed., D. J. Peery and J. J. Azar, McGraw-Hill, 1982.
- *Analysis and Design of Flight Vehicle Structures*, E. F. Bruhn, Jacobs, 1973.
- **Mechanics of Aircraft Structures*, C. T. Sun, Wiley, 1998.
- **Understanding Aircraft Structures*, J. Cutler, Oxford, 1988
- *Introduction to Flight*, J. D. Anderson, Jr., 6th ed., McGraw-Hill, 2008. ISBN: 978-0-07-352939-4
- *Aircraft Performance and Design*, J. D. Anderson, Jr., McGraw-Hill, 1999. ISBN: 0-07-001971-1

*Available in Tarver Library

Catalog Description:

Loads, fatigue, minimum weight design, stress analysis of semi-monocoque structures, and design of members in tension, bending, and torsion.

Course Objectives:

Introduce fundamental concepts in the analysis and design of aircraft structures, with specific focus on:

- Functions of and loads on aircraft structural components
- Structural configurations of wings and fuselages
- Considerations of basic principles of solid mechanics and elasticity as applied specifically to thin-walled structures under tension, compression, shear, bending, and torsion

Provide the necessary background to apply the general principles of solid mechanics and structural analysis to specific aircraft structural components

Prerequisite:

MAE 320: Solid Mechanics II, or equivalent

Grading:

Homework	15%
Tests (2)	20% each
Project	15%
Final Exam	30%

Course Standards:

1. **Homework** will generally be assigned weekly and will be due at the beginning of class one week after the date assigned.
2. **Reading** assignments will be posted at each class meeting. You are expected to read the listed sections before the next class to prepare for the material to be covered.
3. **Tests:** There will be two 75-minute tests during the semester. Problems will be similar to the homework and problems worked in class. All tests will be open notes and open book. A calculator is recommended. No make-up tests will be given without a documented excuse. **Tentative** test dates are given below. Dates of tests will be confirmed no less than one week in advance.
4. **Project:** There will be an individual term project that will be assigned approximately midway through the course. It will be due at the last class meeting.
5. **Final Exam:** There will be a comprehensive final exam. It will be open notes and open book. It will consist of problems similar to those on the tests.
6. The final exam will be given **Monday, 12 December, 9:00 a.m. – 12:00 noon**

Additional Information:

1. Please feel free to arrange a meeting with me at any point that you feel you need it. If you would like to see me, come to my office during posted office hours, catch me after class to schedule a time, call, email, or stop by my office.
2. The **honor code** provisions as outlined in the *Catalog* and in the student handbook, *The Lair*, and on the web at <http://www2.mercer.edu/HonorCouncil/default.htm> apply to everyone and to all work handed in. By turning in a paper to the instructor, each student certifies that he/she has neither given nor received unauthorized aid in its completion. Plagiarism is a violation of the honor code and is prohibited. When in doubt, please ask to avoid potentially embarrassing situations.

3. Please turn off mobile phones before entering the classroom.
4. Electronic communication is an important adjunct to face-to-face communication, including from professor to students, students to professor, and students to students. You must have regular access to your Mercer e-mail. If you do not have an active e-mail address on the first day of class, please secure one.
5. Students requiring accommodations or modifications for a disability should inform the instructor at the close of the first class meeting or as soon as possible. The instructor will refer you to the ACCESS and Accommodation Office to document your disability, determine eligibility for accommodations under the ADA/Section 504 and to request a Faculty Accommodation Form. Disability accommodations or status will not be indicated on academic transcripts. In order to receive accommodations in a class, students with sensory, learning, psychological, physical or medical disabilities must provide their instructor with a Faculty Accommodation Form to sign. Students must return the signed form to the ACCESS Coordinator. A new form must be requested each semester. Students with a history of a disability perceived as having a disability or with a current disability who does not wish to use academic accommodations are also strongly encouraged to register with the ACCESS and Accommodation Office and request a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Director and ADA/504 Coordinator, at 301-2778 or visit the ACCESS and Accommodation Office website at <http://www.mercer.edu/disabilityservices>

Tentative Course Coverage

	Chapter
Principles of Stressed Skin Construction	
Materials	10
Aircraft Structural Components	11
Airworthiness and Airframe Loads	12, 13
Fundamentals of Structural Analysis	
Review of Basic Principles of Solid Mechanics.....	1
Mechanics of Structures.....	
Bending, Shear and Torsion of Thin-Walled Beams	
Bending of Open- and Closed-Section Thin-Walled Beams	15
Shear of Beams	16
Torsion of Beams	17
Combined Open- and Closed-Section Beams	18
Structural Idealization.....	19
Stress Analysis of Aircraft Components	
Wing Spars and Box Beams.....	20
Fuselages	21
Wings.....	22
Fuselage Frames and Wing Ribs	23
Structural Instability	
Columns.....	8
Thin Plates.....	9

Test Dates (Tentative)

Test 1	Thursday, Sept. 29
Test 2	Thursday, Nov. 17
Final	Mon., Dec. 12 9:00 am – 12:00 pm