

## **AME 485 - Aerospace Structures I**

**Units:** 3

**Term—Day—Time:** Fall 2017, Wednesday, 400PM-620PM

**Location:** TBD

**Instructor:** Dr. Vinay K. Goyal

**Office:** TBD

**Office Hours:** After Class, and Virtual

**Contact Info:** [vinay.k.goyal@gmail.com](mailto:vinay.k.goyal@gmail.com), Class Forum, 310-650-4605 (cell)

**Teaching Assistant:** TBD

**Office: Office Hours:**

**Contact Info:**

### **Course Description**

Introduction to the analysis and testing of aerospace structures -- aircraft and launch vehicles. Design criteria, structures standards per FAA regulations, AIAA, SMC, and ASME. Lessons learned from aircraft and launch vehicle failures. Design loads and failure criteria of aerospace structures. Design, qualification, and workmanship verification of aerospace structures. Analysis for assessing buckling and crippling, welds, and analysis of connections (rivets, bolts, lugs, fittings, welds) and thin-walled structures.

### **Learning Objectives**

The fundamental concepts in the analysis and design of aircraft structures including the assessment of:

- (1) Introduction to aircraft and launch vehicle hardware
- (2) Strength of joints, wings, frames, bolts, welds
- (4) Buckling and crippling
- (5) Design factors of safety, certification, and practical considerations

**Prerequisite(s):** AME 204

**Co-Requisite (s):** None

**Concurrent Enrollment:** None

**Recommended Preparation:** None

### **Course Notes**

Copies of lecture slides and other class information will be posted online.

### **Technological Proficiency and Hardware/Software Required**

Excel and a math code of choice.

### **Required Readings and Supplementary Materials**

Primary Textbook: Textbook will be provided: Aircraft Structures, Goyal (pdf file)

1. Aircraft Structures for Engineering Students (3rd Edition), T H.G. Megson, 1999.

2. Aircraft Structures, Peery, David J., Dover Publications, 1950
3. Airframe Structural Design: Practical Design Information and Data on Aircraft Structures, Niu, Michael Chun-Yung, Adaso/Adastr Engineering Center 1999
4. Airframe Stress Analysis and Sizing , Niu, Michael Chun-Yung, Adaso/Adastr Engineering Center, 1999
5. Composite Materials for Aircraft Structures (2nd Edition), Baker, Alan; Publisher American Institute of Aeronautics and Astronautics, 2004

**Description and Assessment of Assignments**

Homework will be assigned approximately weekly and will be due at the beginning of class one week after the date assigned.

**Grading Breakdown**

10 Problem Sets – 100%

**Assignment Submission Policy**

Homework will be submitted in-class. Late assignments will not be accepted. Exams will be take-home.

**Additional Policies**

Attendance to all lectures expected. All lectures will use overhead projector.

**Course Schedule: A Weekly Breakdown**

	<b>Topics/Daily Activities</b>	<b>Readings and Homework</b>	<b>Deliverable/Due Dates</b>
<b>Week 1</b>	Introductory Remarks, Seminar on Aircraft and Launch Vehicles	Problem Set 1, Chapter 1	
<b>Week 2</b>	Stress, Strain, Constitutive Law	Problem Set 2, Chapter 1	Problem Set 1
<b>Week 3</b>	Composites, Failure Criteria for Metals and Composites	Problem Set 3, Chapter 2	Problem Set 2
<b>Week 4</b>	Aircraft and Launch Vehicle Failures, Lessons Learned	Problem Set 4, Chapter 2	Problem Set 3
<b>Week 5</b>	Aircraft and Launch Vehicle Loads I	Problem Set 5, Chapter 3	Problem Set 4
<b>Week 6</b>	Aircraft and Launch Vehicle Loads II	Chapter 3	Problem Set 5
<b>Week 7</b>	FAA, AIAA, ASME Requirements &	Handouts	

	Standards	to be Provided	
<b>Week 8</b>	Design, Qualification Test, and Workmanship Verification of Flight Structures	Handouts to be Provided, Problem Set 6	
<b>Week 9</b>	Design, Qualification Test, and Workmanship Verification of Flight Structures	Problem Set 7, Chapter 4	Problem Set 6
<b>Week 10</b>	Buckling and Crippling	Problem Set 8, Chapter 5 and Handouts	Problem Set 7
<b>Week 11</b>	Stress Concentrations I	Problem Set 9, Handouts to be Provided	Problem Set 8
<b>Week 12</b>	Stress Concentrations II	Problem Set 10, Chapter 6	Problem Set 9
<b>Week 13</b>	Welds	Handouts	Problem Set 10
<b>Week 14</b>	Thanksgiving Break	Handouts	
<b>Week 15</b>	Thin Walled Structures	Chapter 7	

## Statement on Academic Conduct and Support Systems

### Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://adminopsnet.usc.edu/department/department-public-safety>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

### Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.