



AEE 461 Design of Aircraft Structures

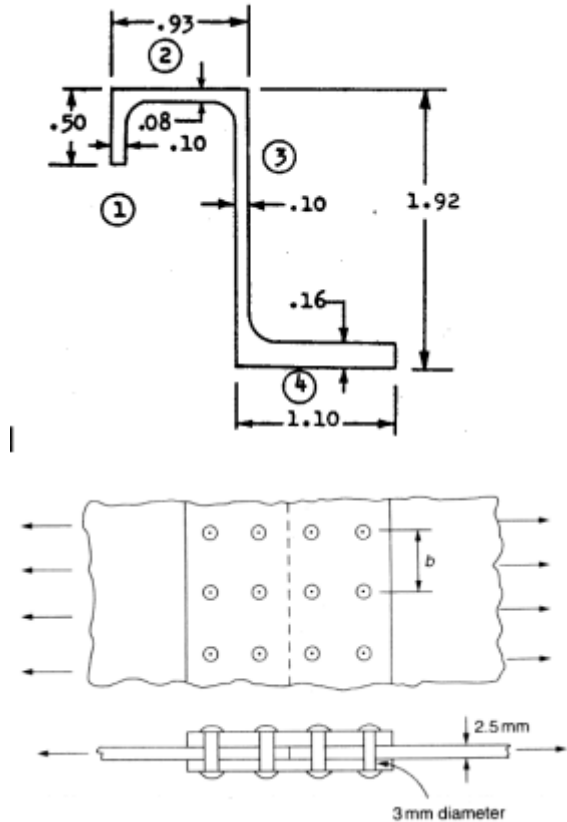
Lecturer: Murat ÇELİK

The objectives of this senior elective course are:

- 1) To introduce the student to the basic and essential elements of aircraft structural design as required by regulatory requirements for civilian aircraft design, and
- 2) To provide some of the essential design and structural assessment techniques for the development of aircraft structures.

Once completed, the student should have a basic knowledge of the requirements and be capable of developing and assessing an aircraft structural component for a civilian aircraft.

Proper aircraft structural design involves the proper integration of stress analysis, materials and assessment tools to meet regulatory requirements for civilian aircraft, in order to ensure the life and safety of aircraft and passengers. This course will introduce the student to the overall concept and procedures for aircraft design, discuss the regulations and certification requirements for the design of civilian aircraft, establish the techniques for defining aircraft loading during service, and then develop and utilize stress analysis and structural assessment techniques (on background knowledge of the student from the prerequisite courses) for the optimal design of lightweight structures as utilized in aircraft design. Structural failure modes such as component overload, buckling and crippling will be considered. These concepts and techniques are generally applicable to a broad range of aircraft components (e.g. wings, fuselage, vertical and horizontal stabilizers, etc.) so the student will be able to utilize these techniques to analyze a wide range of structural components (see figures – a) stringer extrusions, b) riveted joints, etc.)



The course consists of 4 hours of lecture per week and a 2 hours lab/tutorial period utilized for

- 1) presenting additional material (short information about MSC Patran/Nastran),
- 2) problem demonstration and
- 3) review of assigned problems and
- 4) evaluation of students on the course material (i.e. exams).

Midterm exam – Open Book (40%)

Final Exam – Closed/Open Book (60%)

(Note: Recommended problems will be assigned but not collected. Completion is essential to preparing for the exams as full solutions will not be provided.)

- Principal of Statics
- Axial and Bending Members
- Connection Analysis
- Shearing Stresses
- Shear and Tension Clip Supports
- Crippling of Compression Members
- Column Members
- Shear-Resistant Beams
- Cutouts and Hole Reinforcements
- Usage of Structural Manuals and Handbooks
- Usage of Finite Element Method

Note that structural analysis is taught for three different branches of engineering: civil, marine and aircraft.

The good aircraft-related textbook is

[1] *Jean-Claude Flabel. Practical Stress Analysis for Design Engineers. 1997*

The good aircraft-related textbook is

[2] *T.H.G. Megson. An Introduction to Aircraft Structural Analysis. 2010*

The very good and respectable book which covers practically the full range of design and strength subjects is

[3] *Bruhn. Airplane design handbook*

The very good and respectable book which covers practically the full range of design and strength subjects is

[4] *Niu. Airframe Stress Analysis and Sizing, 2nd Ed.*