# AE 323 – APPLIED AEROSPACE STRUCTURES
# Fall 2023

**Instructor:** Prof. Xin Ning
Room #TBA Talbot Lab (the office across 327 Talbot)
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**Class Hours:** Monday, Wednesday, Friday 9:00 am–9:50 am,
106B8 Engineering Hall

**Teaching Assistants:** Michael Zakoworotny
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**Office Hours:** **XN:** TBA
**MZ:** TBA

**Course Website:** UIUC Canvas: https://canvas.illinois.edu/courses/40437
Homework problems and solutions, the powerpoint slides used in class, and sample exams and solutions will be posted here.

**Recommended Textbook:** Analysis of Aircraft Structures
Bruce K. Donaldson, Cambridge University Press, 2008
Print ISBN: 978-0-521-86583-8
Available online via UIUC Library via Cambridge Core (UIUC IP)
(There is also a 1993 edition from McGraw-Hill)

**Exams:** Two 50-minute midterm in-class exams (tentatively scheduled during weeks 8 and 12) and a final exam (date time TBA) will be held. All exams will be **closed book and closed notes** and the material covered in each exam is **cumulative** from the beginning of the semester. An equation sheet will be provided in each exam, unless otherwise noted. Except for calculators, no electronic devices are allowed in the exams.

**Homework:** There are eight homework assignments in total. Completed homework will be submitted online through Canvas (upload your solutions as single PDF – Do Not Upload images such as jpg files or separate files). Although the homework does contribute to the overall grade (see below), the homework exercises should mainly be viewed as a learning tool to help you understand the material. It is impossible to master the material in the course without being in a position to solve a large proportion of these problems. In that sense, your success in the course will depend highly upon your completing these exercises. Your chances of success in the exams will increase drastically if you do the homework on a regular basis.

**Symbolic Math Software:** In the solution of the boundary value problems encountered in the course, you may choose to use a symbolic math software such as Mathematica or Matlab.

**Graphical output:** Some of the assignments will include a graphical representation of the solution (e.g., the spatial variation of the beam deflection). Feel free to use any software to that effect (although Matlab is probably the easiest one to use). But always remember to clearly label (even by hand) the axes and to provide a curve legend if necessary.

**Grading:**

| | |
|---|---|
| Homework: | 50% |
| Midterm exam #1: (**Tentatively** in weeks 8) | 15% |
| Midterm exam #2: (**Tentatively** in weeks 12) | 15% |
| Final exam: (**Date location TBA**) | 20% |

Final grades will be allocated using the above percentages. A plus/minus scale will be used. Tentative scale is shown below.

| Grade [%] | Letter Grade |
|---|---|
| 93-100 | A+ |
| 88-92 | A |
| 84-87 | A- |
| 80-83 | B+ |
| 75-79 | B |

| Grade [%] | Letter Grade |
|---|---|
| 70-74 | B- |
| 65-69 | C+ |
| 60-64 | C |
| 55-59 | D |
| 0-54 | F |

**Objectives:** This course is designed to introduce students to the fundamental concepts of engineering theory of bending, torsion and extension of aircraft structures and to allow students to solve Boundary Value Problems of such structures subjected to a variety of boundary conditions. The specific objectives of this course are for the students to:

(a) be able to solve for stress, strain and displacement fields in beam bending problems,
(b) be able to solve thick and thin walled, single and multi-cell torsion problems,
(c) obtain an introduction into the field of aeroelasticity,
(d) understand the use of energy methods and their equivalence with equilibrium methods,
(e) become familiar with elastic column instability (buckling) problems.

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