UC San Diego

SUMMER SESSION

MAE 104 - Aerodynamics
Summer Session II - 2015

Instructor:

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Course description:

We will introduce basic relations describing the flow field around wings and bodies at subsonic and supersonic speed. In particular, we will study thin airfoil and wing theories. We will also study internal aerodynamics of jet engine inlets and nozzles. We will then apply these principles to the design of high-speed airplanes.

Prerequisites:

Open to MC 25, MC 27, MC 28 and SE 27 only and grades of C- or better in MAE 101A and 101B, or consent of instructor.

Lectures:

Monday, Tuesday, Wednesday and Thursday from 9:30 to 10:50 AM.
Warren Lecture Hall (WLH) Room 2110.

The Monday, Tuesday and Wednesday lectures will mainly consist on theory.
The Thursday lectures will be dedicated to problem solving.

Office hours:

Monday from 11:30 AM to 12:30 PM.
Location: SME 348.

Textbook:

"*Fundamentals of Aerodynamics*", by John D. Anderson, Jr. Fifth Edition.
Previous editions are OK.
No need to purchase: may rent, borrow from the library or friend, etc.

Course website:

maecourses.ucsd.edu/MAE104/SU_2015/

Course Objectives:

1. Fundamental principles: aerodynamic variables, aerodynamic forces and flow similarities, conservation of mass, momentum and energy in fluid flow, vorticity and circulation (review of MAE 101A and MAE 101B). Chapters 1 and 2 in book.
2. Fundamentals of inviscid incompressible flow: stream function and velocity potential. Governing equations for irrotational, incompressible flows. Elementary solutions (point sources/sinks, point vortices, doublets, etc.). Chapter 3 in book.
3. Incompressible flows over airfoils: the Kutta-Joukowski theorem and the generation of lift. Kelvin circulation theorem. Classical thin airfoil theory, symmetric airfoil, cambered airfoil. Lifting flow over arbitrary shape bodies, the vortex panel method. Chapter 4 in book.
4. Incompressible flows over finite span wings: downwash and induced drag, Prandtls classical lifting-line theory. Lifting-surface theory. Chapter 5 in book.
5. Compressible aerodynamics. Compressible flows over airfoils: Linearized potential. Internal aerodynamics: nozzle flows. Chapter 11 in book.

Homework:

There will be 4 homeworks worth 20% of the grade.
Homeworks will be posted online on Tuesdays, and will be collected **in class** the following Tuesday.
The solutions will be posted online right after Tuesday's lecture.
No partial credit for late submissions.

Exams:

There will be one midterm worth 20% and a final exam worth 40% of the grade.

Midterm: Wednesday, August 19th from 9:30 to 10:50 AM in WLH Room 2110.
Final exam: Friday, September 4th from 8:00 to 11:00 AM in a location to be announced.

Close-book exams. Equation sheets will be provided. Programmable calculators, cell phones, tablets, smartwatches, computers, laptops, etc. are **not** allowed.
Due to schedule conflicts with other courses, an alternative final exam or a reschedule will be decided during the first lecture. There will be **no** makeup for the midterm.

In-class participation:

Participation in class will be worth 20% of the grade.
Absences, late arrivals, sleeping in class, etc. will negatively impact your participation grade.

Grade Distribution:

Final exam	40%
Midterm	20%
Homeworks	20%
In-class participation	20%

Grading policy:

Homeworks and exams must be your own work. Discussions between students are encouraged for the homeworks but **not** for the exams. However, it is **not** allowed to copy from others (friends, solution manuals, books, and an all-inclusive etc). Any copying as defined above will be grounds for an F grade. See UCSD policy on integrity of scholarship.

Tentative course schedule:

Monday	Tuesday	Wednesday	Thursday	Friday
Aug 3rd Lecture 1. Office hours.	**4th** Lecture 2. HW 1 uploaded.	**5th** Lecture 3.	**6th** Probl. session 1.	**7th**
10th Lecture 4. Office hours.	**11th** Lecture 5. HW 1 due. HW 2 uploaded. Sol. for HW 1 uploaded.	**12th** Lecture 6.	**13th** Probl. session 2.	**14th**
17th Lecture 7. Office hours.	**18th** Lecture 8. HW 2 due. HW 3 uploaded. Sol. for HW 2 uploaded.	**19th** **Midterm.**	**20th** Probl. session 3.	**21st**
24th Lecture 9. Office hours.	**25th** Lecture 10. HW 3 due. HW 4 uploaded. Sol. for HW 3 uploaded.	**26th** Lecture 11.	**27th** Probl. session 4.	**28th**
31st Lecture 12. Office hours.	**Sep 1st** Lecture 13. HW 4 due. Sol. for HW 4 uploaded.	**2nd** Lecture 14.	**3rd** Probl. session 5.	**4th** **Final exam.**