Middle East Technical University
Department of Aerospace Engineering

AE172: Introduction to Aircraft Performance - Spring 2010

Instructor: Asst. Prof. Dr. A. Türker Kutay, Office: AE 208, (312) 210-4268, kutay@metu.edu.tr

Assistant: To be determined

Section Schedules:

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<th>Time</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
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Course Objective: To familiarize students with basic elements of aircraft and aircraft performance.

Computer Usage: It is important that the entire class keeps in touch not just during lectures, but anytime whenever there is something to be shared. The course website at [http://www.ae.metu.edu.tr/~ae172](http://www.ae.metu.edu.tr/~ae172) will be the main source of information related to this course. The METU-Online system will also be used to communicate information to the class. The instructions will be posted on the website. You need to check the course website and your e-mails frequently to stay up to date. Homework assignments in general will not require use of computer directly, but you are encouraged to use computer whenever you can to better present your work (figures, graphs, etc.).

Communication: The success of the course depends on involvement of the students. It is very important that you understand every topic covered in the class. If something doesn’t make sense, do not hesitate to ask before we move on to the next topic, no matter how simple you may think your question is. Believe me; if you didn’t understand something, the chances are that the majority of the class didn’t understand it either. Ask questions in the class, come see me after the class, post a question on METU-Online, or send an e-mail. Responses to individual questions will be shared with the entire class either through e-mail or METU-Online unless it is a personal issue. It is extremely important that you stay in touch with the class through the website. Feedback from students is also very important. Send an e-mail to the instructor, or use the website or METU-Online to express your opinions related to the course.

References: We live in the information age. There is virtually unlimited amount of information on the internet on just about anything. Everyone has a different background and a different way of learning. A reference that works for someone may not work for you. Therefore you are encouraged to search for your own references for any topic you wish to explore further. And if you find a reference that explains a topic really well please share it with the class. Do not be afraid to share information with others. You can’t lose knowledge by sharing it, you can only gain more!

Lecture Topics:

1. Elements of Aircraft (A/C)
   - Historical note on flight (self study)
   - Elements of A/C and their functions: fuselage, engine, wing, horizontal and vertical stabilizers, control elements, landing gear, instruments, etc.
2. Forces and Moments Acting on an A/C
   - Generation of aerodynamic forces and moments in the vertical plane: lift, drag, and pitching moment.
   - Influence of camber, thickness, finite wing, etc.
   - Aerodynamic coefficients
3. Aircraft Performance
   - What is understood by performance
   - Various motions of A/C related to performance assessment in vertical and horizontal plane
   - Standard atmosphere: temperature, pressure and density variations with altitude; speed of sound; Mach number
   - Equations of motion: coordinate systems; Newton's second law of motion; equilibrium, trim, stability
4. Horizontal Flight
   - Non-accelerated horizontal flight, cruise; equation of motion; thrust required, thrust available; power required, power available; propeller A/C, jet A/C; altitude effects
5. Climb Performance
   - Rate of climb; time to climb; absolute ceiling, service ceiling; accelerated climb; energy method
6. Gliding and Descent Performance
7. Landing Performance
8. Range and Endurance
   - Formulations for propeller and jet A/Cs
9. Envelopes
   - Flight envelope
   - Maneuvering envelope, V-n diagram

Homework: Homework assignments will be given approximately every two weeks.

Make-up exam: There will be one make-up after the finals that will cover the entire course for those who missed an exam with a valid excuse with proof. Try not to miss the exams.

Grading: Grading will be based on homework (20%), two mid-terms (40%), and a final (40%).