Middle East Technical University
Department of Aerospace Engineering

AEE172: Introduction to Aircraft Performance - Spring 2017

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

Assistant: To be determined

Section Schedules:

Time	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:40-9:30					
9:40-10:30					
10:40-11:30		AE-Aud (1)			
11:40-12:30		AE-Aud (1)			
12:40-13:30	AE-Aud (1)				
13:40-14:30	AE-122 (2)				
14.:40-15:30					
15:40-16:30		AE-Aud (2)			
16:40-17:30		AE-Aud (2)			

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 ODTUClass system at https://odtuclass.metu.edu.tr/ will be the main communication channel for the course. Lecture notes for the course, links to videos of lectures from 2014, and past exam questions will be posted there. Important announcements about exams, lab sessions, and Homework assignments will be posted there as well. You need to be checking your e-mails at least once a day to stay up to date with the course. Some homework assignments will require you to use a mathematical software package. There are several such packages you can use, but Matlab will be preferred. Sample Matlab programs will be provided to help you learn Matlab programming.

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, most probably 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 ODTUClass, or send an e-mail. Responses to individual questions will be shared with the entire class through ODTUClass unless it is a personal issue. It is extremely important that you stay in touch with the class through ODTUClass and e-mail. Feedback from students is also very important. Send an e-mail to the instructor, or ODTUClass to express your opinions related to the course.

Textbook: John D. Anderson, "Aircraft Performance and Design", McGraw Hill, 1999.

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 understanding. 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, 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. Range and Endurance
    - Formulations for propeller and jet A/Cs
8. Envelopes
    - Flight envelope
    - Maneuvering envelope, V-n diagram

Homework: Three to five homework assignments will be given throughout the semester.

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 (50%), and a final exam (30%).