



## **Course Syllabus: AENG-2000 Introduction to Aeronautics and Astronautics**

*Credits:* 3(AENG).

*Prerequisite:* MATH142 and PHYS161

*Core requirement:* AENG

5:30 pm - 6:45 pm TR PRH 7

### **Introduction:**

Humanity has been attracted to flight since time immemorial. Bellerophon the Valiant captured a Pegasus, a flying horse, Icarus and Daedalus made wings of wax to escape the maze of Minos, king Kaj Kaoos of Persia attached eagles to his throne to fly around his kingdom. With these myths in mind and the sight of birds and insects escaping the burden of gravity humanity endeavoured to harness the apparent miracle of flight.

They did, and afterwards they escaped also the atmosphere, reached other celestial bodies, surpassing natural design itself. In this course we will learn the physical phenomena that allow flight, the characteristics of the atmosphere and the mechanical behaviour of aircraft and spacecraft.

### **Instructor:**

The instructor for this course will be Hector Barrio Crespo. He completed both his B.S. and M.Sc. in Aerospace Engineering at Saint Louis University and also holds an MBA from IE Business School. He has worked as an engineer for Airbus Military, ITP and General Dynamics.

### **Course Objectives:**

The basic objectives of this course are:

- 1- Understand the principles flight.
- 2- Understand the evolution aircraft/spacecraft design philosophies.
- 3- Understand the behaviour of aircraft at different flight regimes.
- 4- Practice aircraft design and performance evaluation.



## **Learning Outcomes:**

The outcome of this course will be:

- 1- You will be able to identify the different parts of an aircraft, the different modes in which these parts can be configured and their effect on the mission of the aircraft.
- 2- You will be able to explain the fundamental physical principles of flight
- 3- You will understand the effects of important flow regime parameters such as Reynolds Number and Mach number.
- 4- You will understand the composition of the atmosphere and how it affects flight.
- 5- You will be able to perform a full aircraft performance assessment
- 6- You will understand the basic principles of space operations and how the space environment affects spaceflight
- 7- You will have a basic understanding on how the aerospace industry is configured, what challenges it faces and you will acquire tools to understand your relation to it.

## **Course Outline:**

- Session 1: Introduction & the Atmosphere
- Session 2: Aircraft Taxonomy
- Session 3: Aircraft Taxonomy
- Session 4: Air In Motion & Bernoulli's equation
- Session 5: Aircraft Performance (Angle of attack,  $C_D$ ,  $C_L$ )
- Session 6: Airfoil and Wing Theory
- Session 7: Basics of Stability and Control
- Session 8: High Lift Systems
- Session 9: Effects of Viscosity and Compressibility
- Session 10: Space Environment and Spacecraft
- Session 11: The Aerospace Industry Business
- Session 12: Supersonic flight – Project Presentations
- Session 13: Aerodynamics theory
- Session 14: Introduction to Aerospace Operations
- Midterm Exam: To be confirmed on October 15<sup>th</sup> during class period
- Final Exam: December 18<sup>th</sup> – 15:30

## **Recommended Textbooks:**

Fundamentals of Flight (Second Edition) by Richard S. Shevell Prentice Hall (1989)



## **Grading System:**

Projects/Homework 25%  
Exams 60%  
Class Participation 15%

Participation in the class discussions is highly encouraged, positive additions that helps understand the topic and/or arising alternative views will be welcome. Engineering is partly based in accumulation of knowledge and the only way for this to happen is sharing your thoughts with others.

There will be one midterm exam and one final exam covering the full content of the course. The grading system will be open to change depending on the performance of the class, additional exams and/or quizzes could be introduced to test specific knowledge areas.

The letter grading scale will be the following:

<b>A</b>	<b>90-100%</b>
<b>A-</b>	<b>87-89%</b>
<b>B+</b>	<b>84-86%</b>
<b>B</b>	<b>80-83%</b>
<b>B-</b>	<b>77-79%</b>
<b>C+</b>	<b>74-76%</b>
<b>C</b>	<b>70-73%</b>
<b>C-</b>	<b>66-69%</b>
<b>D</b>	<b>60-65%</b>
<b>F</b>	<b>&lt; 60%</b>

\*Note that late submissions will be penalized with an automatic 15% grade reduction and additional 10% per day late.

## **Office Hours**

The office hours will on Tuesdays and Thursdays from 18:45 to 19:45 and by appointment. You can contact me at [barrioh@slu.edu](mailto:barrioh@slu.edu) or call 680301847.

## **Academic Honesty**

The University is a community of learning, whose effectiveness requires an environment of mutual trust and integrity, such as would be expected at a Jesuit, Catholic institution. As members of this community, students, faculty, and staff members share the responsibility to maintain this environment. Academic dishonesty violates it. Although not all forms of academic dishonesty can be listed here, it can be said in general that soliciting, receiving, or providing any unauthorized assistance in the completion of any work submitted toward academic credit is dishonest. It not only violates the mutual trust necessary between faculty and students but also undermines the validity of the University's evaluation of students and takes unfair advantage of fellow students. Further, it is the responsibility of any student who observes such dishonest conduct to call it to the attention of a faculty member or administrator. Examples of academic dishonesty would be copying from another student, copying from a book or class notes during a closed-book exam, submitting materials authored by or editorially revised by another person but presented as the student's own work,



copying a passage or text directly from a published source without appropriately citing or recognizing that source, taking a test or doing an assignment or other academic work for another student, tampering with another student's work, securing or supplying in advance a copy of an examination without the knowledge or consent of the instructor, and colluding with another student or students to engage in an act of academic dishonesty.

Where there is clear indication of such dishonesty, a faculty member or administrator has the responsibility to apply appropriate sanctions. Investigations of violations will be conducted in accord with standards and procedures of the school or college through which the course or research is offered. Recommendations of sanctions to be imposed will be made to the dean of the school or college in which the student is enrolled. Possible sanctions for a violation of academic integrity include, but are not limited to, disciplinary probation, suspension, and dismissal from the University. The complete SLU Academic Honesty Policy can be found at the following link:  
[http://spain.slu.edu/academics/academic\\_advising/docs/Academic\\_integrity.pdf](http://spain.slu.edu/academics/academic_advising/docs/Academic_integrity.pdf)

## **Policies**

1. Students are encouraged to participate in class discussion and to ask questions.
2. All email communication will occur via official SLU email. No external email accounts are allowed.
3. Students are responsible for all lecture material, handouts, homework and assigned reading. All the materials will be made available through Blackboard Learn. All announcements will be performed through Blackboard learn, check the announcements sections often.
4. As per university policy it is mandatory to attend all classes and to be on time. Any excuses have to be approved by student life. Unexcused absences to three sessions will result in automatic failure (AF) of the course.
5. Assignments have to be submitted in digital format. No paper copies will be accepted as assignment submission. If the format of the assignment does not allow for native electronic generation the assignment shall be scanned or photographed and submitted electronically.

## **Accommodation Statement:**

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to [http://spain.slu.edu/academics/learning\\_resources.html](http://spain.slu.edu/academics/learning_resources.html).

Students who believe that, due to a disability, they could benefit from academic accommodations are encouraged to contact Disability Services at +34 915 54 58 58,



ext. 204, send an e-mail to [counselingcenter-madrid@slu.edu](mailto:counselingcenter-madrid@slu.edu), or to visit the Counseling Office (San Ignacio Hall). Confidentiality will be observed in all inquiries. Course instructors support student accommodation requests when an approved letter from Disability Services has been received and when students discuss these accommodations with the instructor after receipt of the approved letter.