

AEROSPACE ENGINEERING LECTURE NOTES

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Introduction

This text is a subjective, personal, non-exhaustive and not ambitious synthesis of what I've learned, and more important than anything: were to find stuff about the AE field.

The first part is about the fundamentals and tools required for advancing and don't get completely lost. The second part is an application of those fundamentals and tools (a.k.a. engineering). The third and last part is about crazy stuff.

I made this because I'm a terrible note taker, and I can visualize a future me wanting some information from the past, and wasting a ton of time in finding it. So this is for you, future me.

Enjoy.

Part I

FUNDAMENTALS

This is where we just see lectures and more lectures about things that we think we will never use in our days about Earth. But what if we're wrong?

Chapter I

Prerequisites

"Dammit, I forgot my briefcase."

annoyed dog at the airport

First of all, before any theory, equation or anything, you must know this. I'm assuming you understand English, have a computer and access to the internet.

You must like **AE**, like most things in life, if you don't truly like it, it doesn't last, or it doesn't end well.

Everything here doesn't appear from day to night, it's an everyday effort (and a endless pursue), so take your time and work on this with calm and in your own velocity.

At last, some times we can forget some elementary things, so here some links so you can catch-up on this.

Khan Academy - perfect for any math level (even fore undergraduate)

I.I Culture

If you don't know, like most human-made things, humanity has create histories and a sub-culture about aerospace that envelopes technology, war, beauty, and everything that makes a good novel.

Get on this is good for you, it will make a better professional, a better academic, and a better person. But I cannot guide you in this path, this is on you.

1.2 Search Engines

Search Engines are the most powerful tool that internet can provide us. Get to know how to use them, how to search and find what you want.

1.3 Bibliography

Books historically are a difficult thing to find, but things got a little different now-days. Here some links to find books, papers and articles.

Library Genesis - Every book you can imagine

Sci-Hub - Any published paper

1.4 Social Skills

Even that we like flying machines, we're still humans, and most important this is engineering, this is about and for people. You must learn how to communicate properly (with your colleagues, professors, and anyone), being clear, concise and respectful in the most occasions.

One of the most important skills on a engineer is to be able to work with other professionals from different areas, the world is plural, we must have a global view and a shallow wide knowledge about the world we current live in.

Chapter 2

Mathematics

2.1 Calculus

2.1.1 Limits

2.1.2 Derivatives

2.1.3 Integrals

2.1.4 Series and Sums

2.1.5 Theorems

2.2 Linear Algebra

2.2.1 Vectors

2.2.2 Matrices

2.2.3 Operators and Properties

2.2.4 Tensors

2.3 Geometry

2.3.1 Analytical Geometry

2.3.2 Non-Euclidean Geometry

2.4 Ordinary Differential Equations

2.5 Partial Differential Equations

Chapter 3

Physics

3.1 Mechanics

3.2 Optics

3.3 Electromagnetism

3.4 Thermophysics

Chapter 4

Statistics

4.1 Fundamentals

Chapter 5

Chemistry

Fuck, I hate chemistry.

me

5.1 Fundamentals

I really don't know what I can say about chem. Probably that I just hate it.

Chapter 6

Computation

<tec tec tec> ... <Google Search> ...
<tec tec tec>

Some computer guy

6.1 Logic

6.2 Algorithms

6.3 Computer Programming

Part II

ENGINEERING

When things are starting to get funny, and
you start to get mad.

Chapter 7

Solid Mechanics

7.1 Material Science

7.2 Material Mechanics

7.3 Structure Dynamics

7.4 Composite Materials

Chapter 8

Thermal Mechanics

8.1 Thermodynamics

8.2 Mass and Heat Transfer

Chapter 9

Fluid Mechanics

9.1 Fundamentals

9.2 Subsonic Aerodynamics

9.3 Supersonic Aerodynamics

Chapter 10

Flight Mechanics

10.1 Rigid-body Model

10.2 Stability and Control

10.3 Loads

Chapter II

Orbital Mechanics

II.1 Fundamentals

Chapter 12

Mechanical Engineering Stuff

12.1 Mechanical Drawing

12.2 Metrology

12.3 Industrial Processes

12.4 Machine elements

12.5 Mechanical Project

Chapter 13

Aeronautical Engineering Stuff

13.1 Aircraft Structures

13.2 Aircraft Propulsion

13.3 Aircraft Maintenance

13.4 Aircraft Project

13.5 Rotorcraft Principles

Chapter 14

Astronautical Engineering Stuff

14.1 Rocket Propulsion

14.2 Spacecraft Project

Chapter 15

Electrical Engineering Stuff

15.1 Circuit Analysis

15.2 Electronics

Chapter 6

Control Engineering Stuff

6.1 Dynamic System Modeling

6.2 Control Theory

Chapter 17

Numerical Methods and Stuff

17.1 Discretization Methods

17.2 Solving Differential Equations

Part III

ADVANCED TOPICS

At this point things transposed the norm barrier and are getting insane. But, really, quite useful.

Chapter 18

Aeroelasticity

18.1 Flexible-body Model

18.2 Unsteady Aerodynamics

18.3 Aeroelastic Stability

