

Electric and Electronic Engineering for Aerospace

Syllabus Number

2C206

Special Subjects

Elective 2 credit

TSURUTA YOSHIHIRO

1. Course Description

Electric and electronic engineering are used in every field of technology. The operation of modern aircraft and spacecraft relies on accurate measurement and control technologies based on electric and electronic engineering.

This course consists of lectures in the classroom with exercises dealing with practical problems. Operational amplifiers, diodes and transistors, and electronic circuits are mainly learned in the course. Students are expected to acquire the knowledge and techniques related to DP2.

2. Course Objectives

Important contents to be learned in this course are:

1. various characteristics of AC circuits: frequency response and time-domain response
2. basics and applications of operational amplifiers
3. principles and characteristics of diodes and transistors .
4. electric or electronic devices for unmanned aerial vehicles .

The objective of the course is to learn and understand the above contents and to be able to apply these to basic applications.

3. Grading Policy

Grading policy is based on the results of final examination (80%) and on exercise answers at each class (20%).

4. Textbook and Reference

Textbook

Tetsuro Yabu (藪 哲郎) Electric and electronic circuits -- easiest to understand in the world (世界一わかりやすい電気・電子回路) Koudansha, ISBN978-4-06-156573-9 (講談社)

Reference

none

5. Requirements(Assignments)

The course requires basic knowledge and understanding of mathematics, especially in derivatives, integrals, triangular functions and complex numbers.

6. Note

Modern aircraft and spacecraft cannot fly without electric and electronic technologies. Every student of aerospace engineering is required to acquire basic knowledge and understanding on this field.

7. Schedule

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| [1] | Review on basics of electricity (1): direct current (DC) circuit, Ohm's law, Kirchhoff's rules |
| [2] | Review on basics of electricity (2): alternating current (AC) circuit, inductance, capacitance, impedance |
| [3] | Frequency characteristics of RC circuits: low-pass filter, high-pass filter |
| [4] | Transient characteristics of electrical circuits: steady-state solution, transient solution, time constant |
| [5] | Addition and reduction of DC component, transformers to change AC voltage |
| [6] | Operational amplifiers (1): basic characteristics, inverting/non-inverting amplifier, |
| [7] | Operational amplifiers (2): additive/differential/integrating circuit |
| [8] | P-type/N-type semiconductor, principles and characteristics of diode |
| [9] | Rectifier circuit: half-wave/full/wave rectifier |
| [10] | Principles and characteristics of P-N junction transistors, switching circuit with transistor |
| [11] | Amplifier circuit with transistor, output characteristics, load curve |
| [12] | Principles and characteristics of field-effect transistor (FET) |
| [13] | Structures and principles of DC/AC electrical motors |
| [14] | Electric or electronic devices for radio-controlled (RC) aircraft and unmanned aerial vehicles |
| [15] | Review and exercises, examination |