

# Experiments Engineering1

in

# Aerospace

Syllabus Number

2F305

Basic Major Subjects

Requisites 3 credit

YAMADA, Satoshi

## 1. Course Description

This course deals with the laboratory course of aerospace engineering and includes following topics.

1. Fluid dynamics and Aerodynamics
2. Jet engine and combustion
3. Simulation and signal control
4. Materials and structure evaluations
5. Space science
6. Project base learning

Group experiences consisting of a small number of students in the laboratory are very effective to learn how to handle instruments and to communicate with instructor. Experimental reports must be handed in and evaluated by instructor after the experiments. Originality in the discussion part of the report and the sufficient literature survey are the most important discipline in this lab course.

## 2. Course Objectives

By end of the laboratory course, students should be able to express the fundamental skills and knowledge of the aerospace engineering field to become a successful engineer. Students should be able to develop the skills necessary to work in a group, how to write technical reports, how to make scientific presentations effectively, and how to solve the real problems. In every experiments, students must write reports which deal with the objective, theory, experimental procedure, results, discussion, and conclusions. The goals of this course are to develop the scientific skills for the graduation research.

## 3. Grading Policy

Your overall grade in this course will be calculated according to the average of every five experiments whose score will be decided based on the quality of students experimental performance in the lab 50% and laboratory reports 50%. To pass, students must earn at least 60 points out of 100 in every experiments.

## 4. Textbook and Reference

Textbook

Text book

‘Instructions of Experiments in Aerospace Engineering 1 and 2, 2021’ will be distributed.

## 5. Requirements(Assignments)

Student must pre-study the textbook of next experiments (1hr). After experiments, experimental data and memorandum must be summarized immediately. Since data analysis and discussion parts are the most important in the report writing, Student should generate original report according to the basic form utilizing the reference books in the university library (3 hrs).

## 6. Note

Attendance is essential. Student should inform his/her absence to instructor in advance. Students will be divided into 7 groups and complete one experiments in two weeks according to the schedule. Experimental report must be handed in within six days after finishing it. Evaluations of report will be done after one week.

## 7. Schedule

Guidance of Experiments in Aerospace Engineering: Detail explanations of schedule and rule of laboratory course.

Experiment 1 Aerodynamic experiments using wind tunnel 1 Observations of flow of air

Experiment 1 Aerodynamic experiments using wind tunnel 2 Analysis of individual forces

Experiment 2 Jet engine operation 1 Basic theory and thermodynamical analysis

Experiment 2 Jet engine operation 2 analysis of jet propulsion

Experiment 3 Mechanical properties of aerospace materials 1 Tension tests

Experiment 3 Mechanical properties of aerospace materials 2 Hardness tests of duralumin for examining age hardening effects

Experiment 4 Combustion experiments 1 Analysis of pre-mixed flame

Experiment 4 Combustion experiments 2 Non-destructive examinations of aerospace materials

Experiment 9 X-ray Diffraction and SEM observations: Analysis of X-ray diffraction pattern from pure metal

Experiment 9 X-ray Diffraction and SEM observations: identification of unknown materials using X-ray diffraction, SEM-EDS analysis

Experiment 10 Project Base Learning (PBL) 1 ‘Design of long flight airplane’ Literature survey and original concept

Experiment 10 Project Base Learning (PBL) 2 Design of original airplane

Experiment 10 Project Base Learning (PBL) 3 Design evaluation

Experiment 10 Project Base Learning (PBL) 4 Construction of original airplane