# Composite Materials

Syllabus Number 2D303
Basic Major Subjects
Elective Requisites 2 credit

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1. Course Description

Recently,airplane and space plane were constructed by composite materials such as carbon fiber reinforced plastic. It is important to understand theory and basic knowledge of composite materials for aerospace engineer. Following topics will be lectured.
1. Structure and manufacturing process of fiber reinforced plastics
2. Properties of matrix materials
3. Mechanical properties of composites: rule of mixture and fracture
4. Laminate theory and optimum design
This course will be gain knowledge and method related to DP2.

2. Course Objectives

What are composite materials? Composite theory based on the elasticity theory will be presented, followed by an overview of carbon fiber and plastics. The goal of this course is to understand the adequate design concept of composite materials and to be able to calculate their properties.

3. Grading Policy

Fiber and matrix materials will be lectured. Calculation of mechanical properties of composites will be essential.
Final examination (80%) and assignments 20%). Lecture note will be shown in LMS.

4. Textbook and Reference

Reference
Koukuuki zairyo (Aerospace materials) Society of Japan Aerospace Engineering ISBN-13:978-490215154
Y.Sioya Koukuutyuzairyougaku (Aerospace materials) The University Tokyo Press. ISBN-13-062803-8

5. Requirements(Assignments)

Requirements: Chemistry 1, Chemistry 2 and Solid mechanics 1. Assignments will be shown in LMS

6. Note

Lecture will be divided into two parts, the first part will be presented by Dr. Yanagihara and the second part will be presented by Dr. Hashimoto.

7. Schedule

[1] Fabrication process of polymer (1) :chain reaction and addition polymerization
[2] Fabrication process of polymer (2) :sequential reaction and condensation polymerization
[3] Properties of polymer (1): melting point and glass transfer temperature
[4] Properties of polymer (2): heat resistant and toughness
[5] Composite (1): matrix materials
[6] Composite (2): FRP, FRM and FRC
[7] Composite (3): applications
[8] Anisotrpic elasticity theory
[9] Rule of mixture
[10] Fracture theory
[11] Laminate theory (1): elastic constant of angle theta inclined composite
[12] Laminate theory (2): elastic constant of cross laminate composite
[13] Optimum design of composite (solid rocket)
[14] Composite materials for airplane and space plane
[15] Final examination and summaries