# Aerospace Combustion

Syllabus Number 2A308
Basic Major Subjects
Elective Requisites 2 credit

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1. Course Description

Mankind gets most of energy from the combustion of fuel. Combustion is a complex phenomenon relating with chemical reaction, heat transfer and mass flow. This course presents combustion in aerospace engineering based on chemical thermodynamics and fluid dynamics. Heat and adiabatic flame temperature calculations using JANNAF database will be exercised. Furthermore, explosion, premixed flame and diffusion flame will be discussed.

2. Course Objectives

Combustion is a complex chemical reaction. The goal of this course is to understand the combustion phenomenon applying quantitatively to chemical-thermodynamics and to be able to calculate the heat of reaction. Combustion is to be understood from the points of chemical equilibrium, heat transfer and mass flow. Furthermore, explosion, premixed flame and diffusion flame will be studied.

3. Grading Policy

Final examination (70%),mid-term examination (30%)

4. Textbook and Reference

Textbook
W.C. Strahle AN INTRODUCTION TO COMBUSTION Gordon & Breach Science Publisher (1998) ISBN:2-88124-608-7
Reference
Y.Mizutani Combustion Engineering Mirikita Pub.co. ISBN4-627-67021-4

5. Requirements(Assignments)

Chemistry 1 must be finished. Lecture note and related papers will be shown up in LMS. Student must pre-study scientific terms.

6. Note

JANAAF thermodynamic data base will be presented.

7. Schedule

[1] Chemical thermodynamics1: Chemical reaction of combustion

[2] Chemical thermodynamics2: Heat of reaction, Heat of formation

[3] Chemical thermodynamics3: First law of thermodynamics, JANNAF table

[4] Chemical thermodynamics4: Adiabatic flame temperature

[5] Chemical thermodynamics5: Equivalence ratio, Second law of thermodynamics

[6] Chemical thermodynamics6: Free energy, equilibrium constant

[7] Chemical thermodynamics7: Shift of equilibrium

[8] Mid-term examination and summaries

[9] Chemical kinetics1: Reaction rate

[10] Chemical kinetics2: Rate controlling process, explosion limit

[11] Premixed flame1: Ramkin Hugoniot relations

[12] Premixed flame2: Detonation, deflagration

[13] Premixed flame3: Heat theory and flame structure

[14] Diffusion flame1: Diffusion of fuel, air and reaction products, estimation of flame length

[15] Final examination and summaries