Heat Transfer

Syllabus Number 2A312
Special Subjects
Elective 2 credit
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1. Course Description

We will examine heat, heat conduction including steady-state and unsteady-state conduction, heat transfer by forced convection and natural convection, thermal radiation, and radiation heat transfer.

2. Course Objectives

The theory of heat transfer is an essential topic, as it addresses how to efficiently transmit heat and, conversely, how to restrict heat transfer. A large number of aerodynamic engineering topics involve heat transfer: aerodynamic heating during high-speed flight, cooling of the turbine blades of jet engines, cooling of rocket nozzles, and thermal control in satellites and space probes, to name just a few. Students will learn the fundamental concepts of heat transfer by studying its basic forms – conduction, convection and radiation.

3. Grading Policy

Evaluate based on the results of intermediate tests and regular tests. Each evaluation rate is
Intermediate test 30%
Periodic test 70%
We will also provide a feedback through the practice of sample problem that is held in the latter part of lecture hours.

4. Textbook and Reference

Textbook
Toshio Aihara, "Espresso Heat Transfer Engineering", Shokabo, ISBN-13: 978-4785360238

5. Requirements(Assignments)

In addition to taking notes, please read the textbook repeatedly until you can have a physical image. Please clarify what you do not understand, and make efforts to reduce the unknown spots by using reference books and questions.
Reference book: Journal of the Japan Society of Mechanical Engineers, JSME Text Series "Heat Transfer Engineering"

6. Note

7. Schedule

[1]	Fundamentals of heat transfer studies (heat and temperature, internal energy, second law of thermodynamics, basic form of heat transfer)
[2]	Heat conduction (Fourier's law, thermal conductivity)
[3]	Heat conduction equation, thermal conductivity, temperature conductivity, thermal conductivity measurement method
[4]	Steady state heat-conduction (one-dimensional thermal conduction, multilayer flat plate, radial flow heat conduction of cylinder and sphere)
[5]	Steady state heat-conduction (thermal resistance, heat passage rate)
[6]	Steady state heat-conduction (expansion heat transfer surface, fin)
[7]	Steady state heat-conduction (two-dimensional thermal conduction, Fourier series, shape factor)
[8]	Unsteady-state conduction (one-dimensional transient heat conduction, Hyssler diagram)
[9]	Forced convection heat transfer (laminar flow forced convection heat transfer, turbulent forced convection heat transfer)
[10]	Natural convection heat transfer (laminar natural convection heat transfer)
[11]	Intermediate examination
[12]	Radiation heat transfer (blackbody radiation, radiation intensity)
[13]	Radiation heat transfer (thermal radiation of real objects, gray body)
[14]	Radiation heat transfer (radiation exchange in enclossures composed of black surfaces)
[15]	Radiation heat transfer (gray system radiative heat transfer)