INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

DPT GENIE MECANIQUE
INSA Campus LyonTech - DPT GENIE MECANIQUE - bât. J. FERRAND
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Fluid and Thermal Mechanics

Heat transfer

IDENTIFICATION

CODE : GM-4-S1-EC-COTTH
ECTS : 2.0

HOURS

Lectures :	14.0 h
Seminars :	24.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	46.0 h
Personal work :	16.0 h
Total :	62.0 h

ASSESSMENT METHOD

Final examination.

TEACHING AIDS

Lecture notes will be provided.

TEACHING LANGUAGE

French

CONTACT

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AIMS

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* Knowledge:
mechanismes of heat transfer, heat conduction, analytical solution, thermal resistances, forced convection, natural convection, heat transfer correlations, radiation, thermophysical properties.

* Abilities:
- Analyze a heat transfer problem and identify the main physical processes involved
- Decompose and solve a thermal conduction problem
- Understand and estimate the heat transfer rate by forced or natural convection
- Understand and estimate the radiatif heat transfer rate in simple cases
- Solve a coupled heat transfer problem

This course will allow students to understand the basic phenomena of heat transfer, analyze practical problems involving heat transfer and develop simple models in basic geometries and flow configurations.

CONTENT

Basic concepts of heat transfer. Conduction: description of physical phenomena, Fourier law, heat conduction equation, initial and boundary conditions. Steady state conduction: 1D analytical solutions, analogy and thermal resistance, heat fins. Unsteady conduction: lumped capacity model, analytical solutions in semi-finite and finite solids, multi-directional conduction by product of solutions. Thermal convection in single-phase fluids: physical phenomena, Newtons heat law, classification of convection problems, external forced convection, boundary layer, internal forced convection in ducts, natural convection. Thermal radiation: physical phenomena and fundamental laws, black body radiation, emission and reception of real bodies, opaque diffuse-gray surfaces, practical example of radiative heat transfer between two surfaces.

BIBLIOGRAPHY

[1] J.-F. Sacadura, Transferts thermiques. Initiation et approfondissement, Tec & Doc Lavoisier, Paris, 2015.
[2] A. Bejan, Heat Transfer, Wiley, N.Y., 1985.
[3] M. N. Ozisik, Basic Heat Transfer, Mc Graw Hill, N.Y., 1985.
[4] F. P. Incropera, D. P. DeWitt, Fundamentals of Heat and Mass Transfer , Wiley, N.Y., 2002.