COURSE: Heat Transfer			
ACADEMIC YEAR: 2018-2019			
TYPE OF EDUCATIONAL ACTIVITY: Basic			
TEACHER: Enrico Nino			
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phone: 0971205144		mobile (optional):	
Language: Italian			
ECTS: 6	n. of hours: 54	Campus: Potenza School of Engineering Program:	Semester: First

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The Heat Transfer Course is aimed at the students of the Mechanical Engineering Master Course with the aim of providing the main concepts on which the energy exchange is based on heat. The following approach is the phenomenological one with subsequent analytical formulation. In particular, the study, starting from the three fundamental mechanisms of heat exchange, will evolve into the study of application to complex systems such as compact heat exchangers.

At the end of the course the student will be able to understand and understand the interaction between systems in different temperature conditions and their time evolution.

The student will be able to quantify the thermal energy exchanged between systems in the presence of temperature gradients.

The student will be able to dimension and propose an autonomous change in processes related to the exchange of thermal energy.

PRE-REQUIREMENTS

There are no special prerequisites for students who have graduated in Mechanical Engineering

SYLLABUS

Introduction: Conduction heat transfer; convection heat transfer; Radiation heat transfer.

Fourier equation in planar infinite walls and radial systems. The overall heat transfer coefficient. Critical thickness of insulation. Walls and cylinders with heat source. Fins.

General equation of heat transfer: Fourier, Poisson, Laplace equations.

Steady-state conduction in multiply dimensions.

Unsteady-state conduction.

Principle of convection. Boundary laminar and turbulent layer. Heat transfer in laminar tube flow.

Empirical and practical relation for forced convection heat transfer. Empirical relations for pipe and tube flow. Flows across cylinders and spheres.

Natural convection systems. Free convection heat transfer in a vertical flat plane. Empirical relations for free convection. Free convection for horizontal planes and cylinders. Free convection in enclosed spaces.

Condensation and boiling heat transfer. Film condensation inside horizontal tubes. Boiling heat transfer. Heat pipes.

Radiation heat transfer. Physical mechanism. Radiation shape factor. Heat exchange between nonblackbodies. Infinite parallel planes. Gas radiation. Radiation network. Radiation exchange with transmitting, reflecting and absorbing media.

Heat exchanger. The overall heat transfer coefficient. Fouling factor. The log mean temperature difference. Effectiveness NTU method. Compact heat exchangers.

TEACHING METHODS

The course includes 54 hours of instructional lessons and exercises. In particular, there are about 32 hours of classroom lessons and about 22 hours of numerical classroom exercises.

EVALUATION METHODS

The objective of the exam is to check the level of achievement of the above-mentioned training objectives.
The exam is divided into a written test, consisting of two exercises to be performed in one hour's time, and an oral exam. The oral test provides for discussion of any problems encountered in carrying out written tests and in-depth studies on the main issues of applied thermodynamics and heat transfer

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Principi di trasmissione del calore. F. Kreith. LIGUORI
- Elementi di trasmissione del calore. G. Guglielmini, C. Pisoni. MASSON
- Trasmissione del calore. C. Bonacina, A. Cavallini, L. Mattarolo. CLEUP
- Notes from lessons

INTERACTION WITH STUDENTS

At the beginning of the course the objectives, the program and the verification method will be described. The e-mail address and how to contact the teacher will be provided.
Reception hours: Wednesdays from 4:00 pm to 6:00 pm at the teacher's office.
In addition to the weekly reception time, the teacher is available for clarification at the end of each lesson.

EXAMINATION SESSIONS (FORECAST)[1]

19/10/2018; 16/11/2018; 18/01/2019; 22/02/2019; 22/03/2019; 12/04/2019; 17/05/2019; 21/06/2019; 19/07/2019.

SEMINARS BY EXTERNAL EXPERTS YES □ NO X

FURTHER INFORMATION

[1]