

EN1920

Aerodynamics and Energy Science Laboratory

Professor: Laurent Zimmer

Language of instruction: French or English – **Number of hours:** 30 – **ECTS:** 2

Prerequisites: Basic knowledge of fluid mechanics and heat transfer

Period: S5 November to December IN15DXP, FEP5DXP
 S6 between February and June IN16DXP, SEP6DXP

Course Objectives

Train engineers and scientists in experimental working methodology: problem definition, bibliographical work, comparison between experiment and theory, discussion of results, identification of perspectives, oral and written presentation.

Specific experimental investigations may be done following students' interest.

On completion of the course, students should be able to

identify and formulate a scientific problem and study it experimentally.

Course Contents

Organization of the work performed by the students over the 4-day course:

- ◇ Day 1: Students choose a topic from the list below. After some training with the available setup, the students will define themselves the physical phenomena to study, perform the literature survey and define the experiments to assess the theory they are interested in. They will propose the experimental setup with the help of a laboratory technician and a laboratory assistant. Finally, they will define the experimental procedure and the objectives and validate their investigations.
- ◇ Days 2 and 3: Execution of the experimental set-up with the help of the technical team. Experiments. Results analysis.
- ◇ Day 4: Oral presentation (15 minutes). Questions and discussion (15 minutes).
- ◇ Homework: preparation of a scientific poster.

Experimental setups offered:

- ◇ Wind tunnel experiments (4 wind tunnels)
- ◇ Measurements of index of refraction gradients using an interferometry technique
- ◇ Measurements of index of refraction gradients using a Schlieren technique
- ◇ Temperature measurements with thermocouples in thermal fins
- ◇ Emission or absorption spectroscopy

Course Organization

Labwork: 24 hr, Exam: 6 hr

Resources

The head of the course is helped by two technicians et lab-assistant. They will manufacture the different pieces required for each project. Each lab-assistant (either research engineer from CNRS or PhD students at EM2C lab) cares about two groups of students. Their role is to check the scientific coherence of the project, help students obtain and analysing the results.

Evaluation

Grading is obtained with the following

- experimental work : 40%

- oral presentation : 20%
- written document (scientific poster) : 20%
- overall behavior : 20%