COURSE DATA

DATA SUBJECT

Code: 34251
Name: Thermodynamics laboratory
Cycle: Undergraduate Studies
ECTS Credits: 5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Facultat de Física	2	First quarter, Second quarter
1928 - Double Degree Program Physics-Mathematics	Facultat de Ciències Matemàtiques	2	Second quarter, First quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	2	First quarter, Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1105 - Degree in Physics	Experimental physics laboratory	COMPULSORY
1928 - Double Degree Program Physics-Mathematics	Segundo Curso (Obligatorio)	COMPULSORY
1929 - Double Degree Program in Physics and Chemistry	Segundo Curso (Obligatorio)	COMPULSORY

COORDINATION

GILABERT NAVARRO MARIA DESAMPARADOS

CAMPOS TABERNER MANUEL

SUMMARY

The Thermodynamics Laboratory (5 ECTS), is a core course of the second year of the: (i) Degree in Physics (first quarter of the year), (ii) Double Degree in Physics and Chemistry (first quarter of the year), and (iii) Double Degree in Physics and Mathematics (second quarter of the year). The subject is conceptually related to Thermodynamics, which is also a second year subject, and illustrates experimentally the thermodynamics phenomena described in this theoretical course. The Laboratory of Thermodynamics can only be attended either simultaneously or subsequently to the Thermodynamics course.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

It is recommended that the students are familiar with the contents of the course Iniciación a la Física Experimental.

COMPETENCES / LEARNING OUTCOMES

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Ability to collect and interpret relevant data in order to make judgements.

Basic & applied Research: acquire an understanding of the nature and ways of physics research and of how physics research is applicable to many fields other than physics, e.g. engineering; be able to design experimental and/or theoretical procedures for: (i) solving current problems in academic or industrial research; (ii) improving the existing results.

Communication Skills (written and oral): Being able to communicate information, ideas, problems and solutions through argumentation and reasoning which are characteristic of the scientific activity, using basic concepts and tools of physics.

Foreign Language skills: Have improved command of English (or other foreign languages of interest) through: use of the basic literature, written and oral communication (scientific and technical English), participation in courses, study abroad via exchange programmes, and recognition of credits at foreign universities or research centres.

Have become familiar with most important experimental methods and be able to perform experiments independently, estimate uncertainties, as well as to describe, analyse and critically evaluate experimental data according to the physical models involved. Know how to use basic instrumentation.

Knowledge and understanding of the fundamentals of physics in theoretical and experimental aspects, and the mathematical background needed for its formulation.

Learning ability: be able to enter new fields through independent study, in physics and science and technology in general.

Literature Search: be able to search for and use physical and other technical literature, as well as any other sources of information relevant to research work and technical project development.

Physics general culture: Be familiar with the most important areas of physics and with those approaches which span many areas in physics, or connections of physics with other sciences.

Prob. solving and computer skills: be able to perform calculations independently, even when a small PC or a large computer is needed, including the development of software programmes.

Problem solving: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems .

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

To know how to apply the knowledge acquired to professional activity, to know how to solve problems and develop and defend arguments, relying on this knowledge.

DESCRIPTION OF CONTENTS

1. Laboratory demonstrations

Calibration of a thermocouple
Expansion coefficient
Adiabatic coefficients of gases
Thermoelectricity: Peltier module
Heat flux in metal bars
Thermal radiation
Cryoscopy
Liquid-vapor equilibrium of water
Eutectic point
Liquid-vapor equilibrium in binary mixtures
Thermodynamics of reversible batteries
Curie temperature of the Monel alloy
Liquid-vapor critical point of SF6 (a)
Liquid-vapor critical point of SF6 (b)
Evaporation rate
Temperature sensors
Observing the L-V interface of SF6 near the critical temperature

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	0,00
Laboratory	50,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	30,00
Independent study and work	25,00
Preparation of lessons	0,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**75,00**

TEACHING METHODOLOGY

Most lab sessions are practical. The lab experiments are selected by the professor and incorporated to the student weekly schedule. All experiments include a guide explaining the procedures. The student must read this guide before doing the experiment.

The lab sessions are conducted with 16 students (distributed in 8 pairs) per professor.

Each group can use, at the discretion of their teacher, a laboratory notebook in which they can write down, in each session, details related to the practice: assembly diagrams and information on the material used, data acquisition, data treatment (including tables, graphs, calculation of errors, comments, etc.). In general, the students can write down in this notebook any detail that seems relevant and that helps them understand the practice. This notebook can be used to prepare the evaluation.

Students are expected to fully complete the demonstration during the laboratory session. Upon request, students should deliver the notebook to the professor before leaving for continuous monitoring of the lab work. The notebook will be inspected and returned at the beginning of the next session.

Finally, the professor may insert a preliminary theoretical lecture introducing the Thermodynamics lab. The contents of this lecture usually include the operation rules of this laboratory as well as brief reviews of basic concepts concerning the scientific language, data acquisition, and experimental errors.

EVALUATION

Attendance at the laboratory is mandatory. The overall evaluation score is obtained according to:

- a continuous assessment (lab notebook / reports) (40%)

- final (written / practical) examination (40%)

- oral presentation (20%)

All the above options may include individual and/or collective (small groups of two students) evaluations, as established by the professor. It is not required a minimum score to count the continuous assessment in the overall evaluation score.

The oral presentation is a public, interactive session with the other students. Both technical and communication skills can be assessed and evaluated.

The continuous assessment score as well as that from the oral presentation will be saved for the second call (which only consists in a written or practical examination).

REFERENCES

Basic

- Guions de Pràctiques del Laboratori de Termodinàmica (disponibles en "https://www.uv.es/uvweb/departament-fisica-tierra-termodinamica/ca/laboratoris/termodinamica-vicente-gandia-/guions-practiques-1285872701520.html" i l'Aula Virtual) i guions i/o documentació que facilite el professorat.
- MANZANARES, J.A., GILABERT, M.A., MAFÉ, S., FERRER, C., MARTÍNEZ, D., BALLESTER, F., SAAVEDRA, G. GONZÁLEZ, P., CROS, A. (coord.) (2010). Guía de laboratorio para el primer ciclo del Grado en Física, Universitat de València.
- THOMPSON, A.; TAYLOR, B. N., Guide for the Use of the International System of Units (SI), NIST Special Publication 811, 2008.

Additional

- LIDE, D.R. (2001). Handbook of Chemistry and Physics. 82nd ed. CRC Press, Inc. London.
- RAZNJEVIC, K. (1995): Handbook of Thermodynamic Tables. Begell House, New York.
- SÁNCHEZ DEL RIO, C (1989): Análisis de errores. Eudema, Madrid 1989.
- TAYLOR, J R. (1997) An Introduction to Error Analysis. 2nd ed., University Science Books, Sausalito, California.