

**Dipartimento di Matematica**  
**Anno accademico 2022/2023**

**General Physics I (part 2) [ 145033 ]**

No class division

**Corso di studio** Mathematics  
**Ordinamento** Mathematics  
**Percorso** standard

**Docenti:** SUNNY VAGNOZZI (Tit.), PIER LUIGI CUDAZZO

**Numero ore:** 56

**Periodo:** Second semester

**Crediti:** 6

**Settori:** FIS/03

**Course objectives and learning outcomes**

<p>This course is devoted to introducing the foundations of classical thermodynamics. The aim is to allow the acquisition of general knowledge in this field of physics, as well as the ability and competences required to set up with rigor and efficiency the solution of exercises and problems applied to various situations of interest, including concrete and technological scenarios. Participating to and attending lectures and exercises sessions as assiduously as possible will allow to: (1) familiarize with the scientific method in the study of physics; (2) understand the foundations, principles, laws and simple applications of classical thermodynamics; (3) set up, deal with, discuss, solve, and deepen the study of problems and exercises within thermodynamics at various levels of difficulty. The topics treated will allow the gradual acquisition of an increasingly broad and complete view of the world of physical studies which in the subsequent courses, through the exposure to analytical approaches to mechanics, classical electromagnetism, and statistical mechanics will lead to the study of modern physics.</p>

**Entrance requirements**

<p>The course does not require any particular prior knowledge with regard to thermodynamics. Knowledge and reasonable experience with regard to basic algebra and calculus are useful. Being able to carry out derivatives, simple integrals and, obviously, mathematical computations at the high school level is very useful, albeit not essential. Those who may be in difficulty on these topics can resort to assisted study in mathematics, available as a support.</p>

**Contents**

<p>The second module of the course will cover the following topics. Thermodynamic quantities: temperature, zeroth law of thermodynamics, gas thermometers; thermodynamic processes; First law of thermodynamics: phase diagrams; equation of state of ideal gases; heat and work, mechanical equivalent of heat; first law of thermodynamics and internal energy; specific heat; Second law of thermodynamics: thermal machines; Carnot cycle; second law of thermodynamics; Carnot's theorem; absolute temperature; Clausius theorem; thermodynamic definition of entropy; Microscopic interpretation: kinetic theory of gases; statistical interpretation of entropy; introduction to the basic laws of heat transfer processes.</p>

**Teaching and learning methods and activities**

<p>The course lasts 56 hours (corresponding to 6 CFU), 8 of which devoted to exercise sessions, distributed in blocks of two hours twice a week. Lectures will be at the blackboard, with the help of slides where needed.</p>

**Tests and assessment criteria**

The exam consists of a written test and an oral examination, regarding aspects of both classical mechanics and thermodynamics covered during the course (both the first and second half). Passing the written test is mandatory to sign up for any subsequent oral exam (the result of the written test does not lose validity in time). It is possible to improve a written test replacing it with a subsequent instance thereof (invalidating the previous test). During the exam period January-February it will be possible to sit an intermediate written test concerning exclusively the classical mechanics part covered in the first part of the course. Those who pass this test will have to take and pass a test covering only the thermodynamics aspects in the summer. Detailed information on the preparation and test itself will be discussed in class and posted on

<https://stefanooss59.com/didattica-education/materiale-per-i-corsi-universitari/fisica-generale-i-2022-23/>

### **Bibliography /study materials**

Reference textbook:

M.W. Zemansky, Calore e termodinamica, Vol 1 (Zanichelli)  
Other useful textbooks:  
S. Focardi, I. Massa, A. Uguzzoni, Fisica Generale: Meccanica e termodinamica (Casa Ed. Ambrosiana)  
P. Mazzoldi, M. Nigro, C. Voci, Elementi di Fisica: meccanica e termodinamica (Edises)  
C. Mencuccini e V. Silvestrini, Fisica: meccanica e termodinamica, (Casa Ed. Ambrosiana)  
E. Fermi, Termodinamica (Bollati Boringhieri)  
J. Walker, Halliday & Resnick, Fondamenti di Fisica (meccanica, onde, termodinamica) (Ambrosiana)  
G. Dalba e P. Fornasini, Esercizi di Fisica: meccanica e termodinamica (Springer)

### **Other information**

Students enrolled in the “corso di Laurea in Matematica” are allowed to attend the second module of the course, on the second semester. What is written above also applies to their case, except that the contents of the lectures and the exams are limited to those of the second semester.

*Stampa del 09/12/2022*