

Module Name	Thermodynamics Basics
Module Number	Eul-RES-C-GLTD
Responsible Lecturer	Prof. Cornelia Breitzkopf cornelia.breitzkopf@tu-dresden.de
Qualification Objectives	Students master thermodynamic terminology, understand the definitions of thermodynamic systems and fundamental thermodynamic quantities, and are capable of formulating practical problems using basic thermodynamic quantities. They understand thermodynamic state variables and can calculate them using various equations of state. They are familiar with the model assumptions of the equations of state. Students understand the concepts of processes and process variables, thermodynamic systems, and state changes, and are able to evaluate energy transformations in technical processes from a thermodynamic perspective. This evaluation can be performed based on system abstraction by combining characteristic tools of thermodynamics such as balancing, equations of state, and material models. Furthermore, they are able to apply the first and second laws of thermodynamics to various technical problems. In particular, they can assess the efficiency of different process designs and independently apply both the first and second laws of thermodynamics to thermodynamic processes. Students are familiar with practical examples and can identify, understand, and analyze thermodynamic issues for ideal and real processes in practice. They are also capable of addressing topics related to the sustainability of energy conversion processes under economic, ecological, as well as social and gender-equitable aspects.
Contents	The module covers fundamental knowledge of the properties of thermodynamic systems; state variables such as thermal and caloric state variables; process variables such as work and heat; and state changes such as isochoric, isobaric, isothermal, isentropic, and polytropic processes. Additional topics include applications to ideal gases, gas mixtures, real gases, and pure real substances. Mass, energy, and entropy balances (first and second laws of thermodynamics) are discussed, and the exergy concept is introduced. Ideal and real processes are examined using selected examples. Simple, practically relevant clockwise and counterclockwise cycles are presented. The three pillars of sustainability are also discussed.
Teaching and Learning Forms	2 hours per week of lectures, 2 hours per week of exercises, 1 hour per week of tutorials, and self-study.
Prerequisites for Participation	The competencies to be acquired in the modules Introduction to Analysis and Algebra as well as Physics are required.
Usability	The module is a compulsory module in the diploma program Renewable Energy Systems. It creates the prerequisites for the modules that list this module in the field "Prerequisites for Participation."
Prerequisites for the Award of Credit Points	Credit points are awarded when the module examination is passed. The module examination consists of a written exam lasting 120 minutes. A bonus for the written exam can be earned by completing e-assessments with a workload of 20 hours.
Credit Points and Grades	5 credit points can be earned through the module. The module grade corresponds to the grade of the written exam.
Frequency of the Module	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the Module	The module lasts one semester.