Module name	**Thermodynamics Basics**
Module number	EuI-RES-C-GLTD
Lecturer in charge	Prof. Cornelia Breitkopf cornelia.breitkopf@tu-dresden.de
Objectives	After completing the module, students will be familiar with the thermodynamic vocabulary, understand the definitions of thermodynamic systems and elementary thermodynamic variables and are able to formulate practical problems using the basic thermodynamic variables. They understand thermodynamic state variables and can calculate them using various equations of state. They know the model assumptions of the equations of state. Students understand the concepts of processes and process variables, thermodynamic systems and changes of state and are able to thermodynamically assess energy conversions in technical processes. Students can make this assessment on the basis of a system abstraction by combining characteristic tools of thermodynamics such as balancing, equation 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 will be able to evaluate the efficiency of different process controls 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. Students are able to deal with topics relating to the sustainability of energy conversion processes from an economic, ecological, social and gender perspective.
Contents	The module covers basic knowledge of the properties of thermodynamic systems; state variables, such as thermal and caloric state variables; process variables work and heat; changes of state, such as isochoric, isobaric, isothermal, isentropic, polytropic. Further content includes applications to ideal gases, gas mixtures, real gases and pure real substances. Furthermore, mass, energy and entropy balances are discussed as 1st and 2nd law and the exergy concept is introduced. Ideal and real processes are dealt with using selected examples. Simple right-hand and left-hand circular processes with practical relevance are presented. The three pillars of sustainability are discussed.
Modes of teaching and learning	2 hours per week lectures, 2 hours per week exercises, 1 hour per week tutorials and self-study.
Prerequisites	The skills to be acquired in the module **Introduction to Analysis and Algebra** and **Physics** are required.

Usability	The module is a compulsory module in the basic studies of the degree programme Renewable Energy Systems. It creates the prerequisites for the modules that list that module in the "Prerequisites" field.
Requirements for the award of credit points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written exam of 120 minutes. A bonus to the written exam is the completion of 20 hours of e-Assessments.
Credit points and grades	5 credit points can be obtained by the module. The module grade is the grade of the examination.
Frequency	The module is offered every winter semester.
Workload	The total effort is 150 hours.
Duration	The module takes one semester.