

Module Name	Principles of Refrigeration and Air Conditioning and Heat Pumps
Module Number	Eul-RES-E-GLKuK
Responsible Lecturer	Prof. Christiane Thomas christiane.thomas@tu-dresden.de
Qualification Objectives	Students master the fundamentals of refrigeration and heat pump technology with regard to system technology and key components, as well as the natural and synthetic refrigerants used in these systems. Students are familiar with the characteristics and application areas of vapor compression, sorption, and cold gas machines, as well as alternative methods of cooling and heat generation. They are also proficient in the energetic balancing of these systems. Furthermore, students understand the fundamentals of air conditioning technology, including the basic aspects of thermal physiological and hygienic parameters, the design of air conditioning systems, the thermodynamic relationships of the Mollier h,x-diagram with a particular focus on humidification and dehumidification, the significant state changes relevant to air conditioning, and the balancing of air conditioning systems in the temperature range of 6°C to 18°C.
Contents	The module contents include cooling load calculation, calculation of stationary system behavior, characteristics of significant system components, characterization and specific features of various refrigerants, and the energetic balancing of the overall system. Additional topics include sorption systems, cold gas machines, and alternative methods of cooling and heat generation. The module also covers the thermodynamic fundamentals of moist air mixtures, the basics of human thermal physiology, the fundamentals of determining air exchange rates based on stationary and non-stationary CO ₂ and pollutant balances, the basics of air humidification and dehumidification, air distribution in buildings, and the energetic balancing for evaluating air conditioning systems. Furthermore, the module includes the balancing of various basic types of air conditioning systems, such as single-channel, dual-channel, and air-water air conditioning systems, as well as a detailed description of their components. The module is rounded off with knowledge of air conditioning processes based on renewable energy sources (DEC air conditioning systems).
Teaching and Learning Forms	4 hours per week of lectures, 1 hour per week of exercises, and self-study. The language of instruction for lectures and exercises is German.
Prerequisites for Participation	The competencies to be acquired in the modules Physics, Thermodynamics Basics, and Heat Transfer are required.
Usability	The module is an elective module from the elective orientation area in accordance with § 6 paragraph 3 SO and § 33 paragraph 3 PO in the main study phase of the diploma program in Renewable Energy Systems. It creates the prerequisites for the modules that list this module in the field "Prerequisites for Participation." The module cannot be selected if the module "Fundamentals of Refrigeration, Air Conditioning, and Heat Pumps" has already been chosen.
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 180 minutes. Bonus achievements for the written exam include e-assessments with a total workload of 10 hours.
Credit Points and Grades	5 credit points can be earned through the module. The module grade corresponds to the grade of the examination performance.
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.

