Hanze

Course: Thermodynamics credits: 5

Course code	WBVP23TD
Name	Thermodynamics
Study year	2026-2027
ECTS credits	5
Language	English
Coordinator	T. Munuswamy
Modes of delivery	Education
Assessments	Thermodynamics - Written, organised by STAD examinations

Learning outcomes

The student:

- explains the 1st and 2nd laws of thermodynamics for closed and open systems to converting heat into work in internal combustion engines
- understands the various gas laws and equations of state and apply them to solve problems of gas mixtures in estimating enthalpy, entropy, specific heat and internal energy
- calculates the effect of changes to the engine on the thermodynamic efficiency and power and relates these calculations to the P-V diagram
- draws a circuit process of a given cooling/heating configuration and can derive states, state magnitudes and phase transitions from a log p-h diagram
- can calculate through different system configurations such as: cascade, multi-stage compression, multiple evaporators/condensers, flash tank, and intercooler
- knows how to calculate and improve the COP of a given system
- describes the working principles of adsorption cooling

Content

Thermodynamics is a 5.0 EC course deals with the equations of state, the first law of thermodynamics, second law of thermodynamics, p-V diagrams, ideal gas (Boyle-Gay-Lussac). This further deals with physical principles behind energy conversions in machines, and provides the foundation for calculations on power and efficiency. We will study the machines where a continuous gas flow running through it, which can be viewed only as an open system. Particularly in components such as pumps, turbines and nozzles, and to systems such as gas turbines (this could be applied in aircraft, helicopters, power plants). The course furthermore focuses on applying the above mentioned thermodynamic principles in analyzing and assessing compression/absorption cooling cycles and heat pumps. Compression/absorption cooling is widely used in various branches like the food industry, (industrial) refrigerators and freezers, HVAC, liquefying natural gas, etc. Heat pumps are mainly used as a sustainable way for heating residential houses, buildings, office spaces, but also in industry. The students will be able to perform (simple) design calculations and determine the efficiency of the systems by means of the coefficient of performance. Lastly students will be able to critically analyze these systems and provide advice on methods for efficiency improvement

Included in programme(s)

Mechanical Engineering VWO a 3-year variant

School(s)

Engineering, Life Sciences & ICT

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