Department	03 Mechanical, Automotive and Aeronautical Engineering
Course title	**Thermodynamics and Heat Transfer**
Hours per week (SWS)	6
Number of ECTS credits	6
Course objective	This module conveys the methodical and technical qualifications for the thermodynamic analysis of technical systems. Building on knowledge from basic modules, basic knowledge of the behavior of liquid and gaseous substances, their changes in state and the associated energy conversion processes are developed.
Prerequisites	Mathematics I/II, Mechanics I/II (Statics, Strength of Materials)
Recommended reading	Cerbe, G.; Wilhelms, G.: Technische Thermodynamik. Theoretische Grundlagen und praktische Anwendungen. Hanser. Langeheinecke, K.; Jany, P.; Thieleke, G.: Thermodynamik für Ingenieure. Springer Vieweg. Baehr, H.D.; Kabelac, S.: Thermodynamik. Springer. Böckh, P. v; Wetzel, T.: Wärmeübertragung. Grundlagen und Praxis. Springer. Herwig, H.; Moschallski, A.: Wärmeübertragung. Springer Vieweg. VDI-Gesellschaft Verfahrenstechnik und Chemieingenieurwesen (Hrsg.): VDI-Wärmeatlas. Springer. Cengel, Y.A.; Boles, M.A.: Thermodynamics. An Engineering Approach. Mc Graw Hill. National Institute of Standards and Technology: Reference Fluid Thermodynamic and Transport Properties – REFPROP. User's Guide. Arbeitsunterlagen, Übungsaufgaben, Prüfungen vergangener Semester.
Teaching methods	Course lecture
Assessment methods	Exam according to the legal framework of the degree program in which this course is offered. Approved aides for the examination will be published by means of the examination announcement
Language of instruction	English
Name of lecturer	Patrick Lemieux
Email	plemieux@calpoly.edu
Link	
Course content	• Basics of thermodynamics and heat transfer: system, state, state variables, equilibrium, change of state, process • First law: forms of energy, closed and open, stationary systems, important applications • Behavior of ideal gases: thermal and caloric equations of state, mixtures, simple changes of state • Second main clause: formulations and statements, entropy and entropy balance, applications, processes in apparatus and machines • Cycle processes with ideal gases: Basics, Carnot process, constant space and constant pressure process, Joule process • Multi-phase systems of pure substances: state area of all three phases, phase changes (especially liquid - gaseous) • Changes of state with vapors • Clausius-Rankine and refrigeration machine process • Basics of stationary heat conduction • Basics of convective heat transfer (forced and free convection) • Basics of thermal radiation and simple heat exchange situations • Heat transfer to simple geometries • Independent implementation of basic experiments on material behavior, the energy balance and the application of material value programs
Remarks	