KARTA PRZEDMIOTU

Nazwa przedmiotu: *Thermal Technology*

Nazwa w języku polskim: Termodynamika Techniczna

Nazwa w jęz. angielskim:

Dane dotyczące przedmiotu:

Jednostka oferująca przedmiot: Wydział Inżynierii Środowiska i Energetyki

Przedmiot dla jednostki: Politechnika Śląska

Domyślny typ protokołu dla przedmiotu:
ZAL
Język wykładowy:
English
Strona WWW:
To be preprared
Skrócony opis:
Basics of thermal technology with the skills performing basic calculations in this area
Opis:

Lecture
Basic quantities and units: SI system, mass, quantity and flux of substances, pressure (absolute, manometric, static), work, heat, energy, power, temperature, specific quantities, density, viscosity, internal energy, enthalpy, entropy, component contributions.
Thermodynamic rules and laws, the principle of conservation of substances.
First law of thermodynamics - the law of conservation of energy: general formulation, special cases, methods of energy transfer, system energy, type I PM, absolute, technical and useful work, driving power of pumps, heat input, stream energy - enthalpy, dynamic pressure, First Law for a closed system, balance of the flow machine, internal and mechanical efficiency.
Types of thermal devices and their efficiency (effectiveness): heat engine, cooler (chiller), heat pump (heat pump).
Perfect and semi-perfect gases: definitions, thermal equation of state (Clapeyron's law), caloric equations of state, specific heat capacities, adiabatic exponent, energy equipartition law, calculation of enthalpy and entropy, tank loading.
Gas precessess: isotherm, isobar, isochoric, polytropic, reversible adiabate, irreversible transformations - choking, mixing (diffusion), irreversible adiabate.
Thermodynamic cycles: definition and types, (T, s) coordinate system, characteristic fields in p, V and T, S diagrams, Carnot cycle and its efficiency (efficiency), Brayton, Stirling, Joule, Otto cycle diagrams, Diesel and Seiliger-Sabathe.
Water steam thermodynamics: Gibbs phase rule, p, T diagram, isobaric process of H_2O evaporation, saturation pressure and temperature, degree of dryness, evaporation enthalpy, steam tables, steam diagrams - p, v, T, s, h, s, determination of volume, enthalpy and specific entropy for liquid water, wet saturated steam and superheated steam, adiabatic transformation and choking of steam.
Steam power plants and combined heat and power plants: diagram of a coal-fired power plant, Clausius-Rankine cycle - the course of changes in the T, s and h, s system, efficiency of the C-R cycle, steam power plant and coal power plant, possibilities increasing the efficiency of the C-R cycle and steam power plant, combined heat and power plants with back-pressure and condensing-bleed turbines.
Combustion of coal and hydrocarbon fuels: basic concepts, fuel composition, combustion air demand, excess air ratio, dry and wet exhaust gas composition, fuel chemical energy - heat value
Second law of thermodynamics: exemplary detailed formulations, general phrases - the principle of entropy increase, type II PM, definitions of exergy, thermal exergy, Gouy-Stodola law.
Moist gases: thermal and caloric equation, enthalpy-degree of moisture diagram, isobaric transformation of moist gas, cooling tower, air conditioning.
Chillers and heat pumps: Linde cycle, refrigerants, pressure-enthalpy logarithm graph, multi-stage chiller cycles, absorption chillers.
Steam power plants: ways of increasing the efficiency of Clausius Rankin cycle, nuclear power plants, heat and power plants.
Reciprocating internal combustion engines, Otto and Diesel cycles and their efficiency. Gas turbine engines: circulation Baritone with regeneration, Ericssen cycle, turbojet engines.
Classes
Solving calculus problems illustrating the material covered in the lectures and the skills using tables, charts and auxiliary computer programs.

Literatura:
Cengel Y.A, Boles M.A. Thermodynamics. An Engineering Approach, 5ed McGraw Hill. 2007
Efekty uczenia się:

 K2A_W01: Detailed and extended issues in the field of mathematics, physics and chemistry, as well as biology and biology molecular, biochemistry, computer science, environmental protection and other related areas of science

necessary for modeling, planning, optimizing and characterizing industrial processes
biotechnology and experimental planning and research results development
experimental.

K2A_U08: Analyze and solve problems related to biotechnology and bioprocess engineering,
using for this purpose theoretical, analytical, simulation and experimental methods.

K2A_U10: Use mathematical and statistical methods to describe natural phenomena and analyze
data.

Metody i kryteria oceniania:

written or oral exam

Punkty przedmiotu w cyklach:

Typ punktów	Liczba	Cykl. pocz.	Cykl końc.
Europejski system transferu punktów (ECTS)			

Podpis   `