Thermodynamics

1st Law of Thermodynamics	$du = dq - dw$
TDS Equation 1	$Tds = du + pdv$
TDS Equation 2	$Tds = dh - vdp$
Enthalpy	$h = u + pv$

Ideal Gas

Ideal Gas Equation	$pv = RT$
Constant Volume	$c_v = (\partial u/\partial T)_v$
	$du = c_v(T)dT$
Constant Pressure	$c_p = (\partial h/\partial T)_p$
	$dh = c_p(T)dT$
Thermal coefficients	$c_v = c_p - R$
	$\gamma = k = \frac{c_p}{c_v}$
Specific Enthalpy of Gases	$h = u + pv = u(T) + RT = h(T)$
	$\Rightarrow$ does not depend on pressure

Ideal Gas – Isentropic Conditions

$$\frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{\frac{\gamma-1}{\gamma}} \qquad \frac{T_2}{T_1} = \left(\frac{v_1}{v_2}\right)^{\gamma-1}$$
$$\frac{p_2}{p_1} = \left(\frac{v_1}{v_2}\right)^{\gamma}$$

Turbines and Compressors

Isentr. turbine efficiency	$\eta_{\text{turbine}} = \frac{h_{in}-h_{out}}{h_{in}-h_{out,s}}$
Isentr. compressor efficiency	$\eta_{\text{compressor}} = \frac{h_{out,s}-h_{in}}{h_{out}-h_{in}}$
Heat pump "Leistungsziffer"	$\varepsilon_{WP} = \frac{\dot{Q}_{out}}{\dot{W}_{komp}}$

General

- You should know t-s diagrams by heart and be able to draw it.
- Ottoprozess: Gleichraumprozess, Diesel: Gleichdruckprozess.