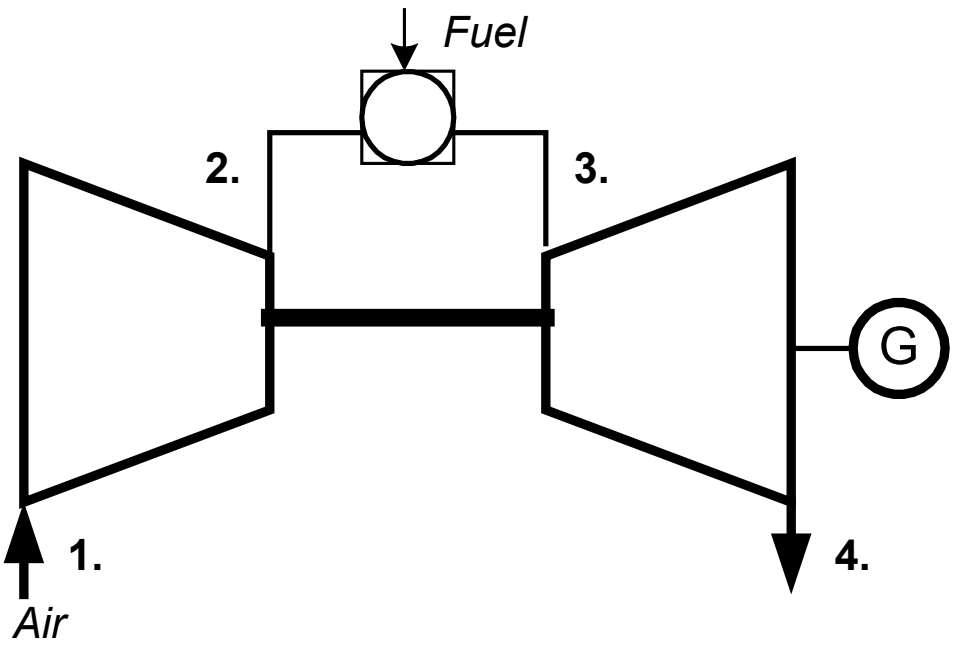
SPG course MJ2405

Exercise 2: Simple Gas Turbine Cycle

Calculate the electrical efficiency of the simple open-cycle, single-shaft gas turbine consisting of a compressor, combustor, and expander.

Given Data:

Fuel ➔ Light Fuel Oil (LFO)	LHV_{LFO} = 42.3 MJ/kg
Ambient conditions	p_1 = 1 bar ; T_1 = 20ºC
Compressor pressure ratio, π_C	$\pi_C = p_2/p_1 = 10$
Inlet temperature turbine	t_3 = 1000ºC
Isentropic efficiency, compressor	$\eta_{SK} = 0.83$
Isentropic efficiency, turbine	$\eta_{ST} = 0.88$
Pressure loss, combustor	2%
Generator efficiency	$\eta_G = 0.98$
Mechanical efficiency	$\eta_m = 0.98$



We can solve the turbine for 1 kg/s air mass flow, using the specific fuel consumption parameter $\beta = m_{fuel} / m_{air}$

See the applicable equations in the help file and the entire solution guide in CANVAS!