

Fundamentals of combustion – what do we assume that you know from before?

- a check list

This course is based on our courses TEP4125 Thermodynamics 2 and TEP4130 Heat and mass transfer. Some knowledge of Chemistry and Fluid mechanics is also anticipated. Students that have studied other places may find that the courses taken cover part of our courses, but usually not in full. The following list gives some key words indicating what we expect known.

- equation of state for ideal gases
- mole fractions, mass fractions, partial pressure, concentration, molar mass (aka molar weight, molecular weight) for mixtures of ideal gases
- how to calculate and use enthalpy and internal energy for mixtures of ideal gases
- general and special balances of mass and energy
- enthalpy of formation, heating values, combustion (reaction) enthalpy
- balances of mass, species and elements of reactions
- equivalence ratio, excess-air ratio (“lambda”)
- adiabatic flame temperature
- equilibrium criteria, composition, Gibbs functions (aka. free energy)

- equations of motion (continuity, momentum) as partial differential equations
- relation between partial differential equations and control-volume equations
- phenomenological laws: Fick’s law (mass), Fourier’s law (heat), Newtonian stress (viscous stress)
- boundary layers, velocity profiles
- heat transfer coefficients
- non-dimensional groups (Reynolds number, Stanton number, Prandtl number, etc.)

Although some (not all) of these terms are unknown, there is hope for survival. You will benefit from reading about – and doing some exercises – on the not-so-familiar topics. If none of these terms sounds familiar, you have a lot to catch up.

If you have been reading these topics in another language (or another tradition than mechanical engineering), it may be convenient to look up the terms in a textbook (e.g, Moran and Shapiro: “Fundamentals of engineering thermodynamics”; White: “Fluid mechanics”; Turns: “An introduction to combustion”) to see if you recognize the quantities and concepts with other names.

P.S: - let us know if you found this list helpful/scaring/encouraging/useless....
- Improvement potentials?