Level of expectations – Fundamentals of Fluid Mechanics

Topic	Comprises, amongst others, the following tasks and problem statements:

Physics of Fluids	• Terms and definitions
	   o Physical states, flow quantities, boundary conditions
	   o Viscosity, density, gravity
	• Reactions and numbers:
	   o Forces, stresses, pressure
	   o Characteristic numbers and similarity rules

Statics of Fluids	• Hydrostatic basic equation • Pressure forces • Buoyancy

Kinematics and Kinetics of Fluids	• Description of flows:
	   o Lagrange
	   o Euler
	• Filament theory of incompressible flows (without losses):
	   o Continuity equation
	   o Bernoulli equation
	• Filament theory of incompressible flows (with losses):
	   o Energy input / output
	   o Pipe flows
	• Momentum equation:
	   o Derivation
	   o Applications, reaction force
	• Basics of viscous flows:
	   o Laminar and turbulent flow
	   o Plate and pipe flow characteristics
	   o Drag

Basic Equations of Fluid Mechanics	• Navier-Stokes Equations • Simplifications
Compressibility	• Equation of states • Mach number and disturbance propagation • Shocks • Outflow characteristics
Vortex Flows	• Helmholtz vortex theorems , circulation • Biot-Savart law • Stokes law
Numerical Simulation	• Requirements • Methods - Overview

Selected References:

1. Kundu, P. K. and Cohen, I. M.: Fluid Mechanics. Elsevier, Amsterdam,
2. Munson, B. R., Young, D. F., and Okiishi, T. H.: Fundamentals of Fluid Mechnics. John Wiley & Sons.
3. Spurk, J. H. and Aksel, N.: Fluid Mechanics. Springer.