



Necessary fields of knowledge in physics and mathematics for an application for M.Sc. Integrated Climate System Sciences

The list below is a compilation of basic knowledge in Math and Physics required for the Master's program "Integrated Climate System Sciences" at the University of Hamburg. In case you are not skilled in the listed fields of knowledge, we strongly recommend you to fill these gaps before starting the course of studies here in Hamburg. There will hardly be any time to catch up with these deficits during the semester.

Category I: Must know

MATHEMATICS

- algebra
- geometry
- differential and integral calculus (limits, functions, derivatives, integrals)
- vector, tensor and multivariable calculus
- probability and applied statistics (mean, median, bias, correlation)
- infinite series (Fourier series, Taylor series)
- matrices and vectors

PHYSICS

- fundamentals of mechanics
- wave kinematics (dispersion, reflection, refraction)
- basic thermodynamics

Category II: Should know

MATHEMATICS

- discrete mathematics (numerics)
- dynamical systems
- elements of time series analysis

PHYSICS

- physical properties of water, ice and air
- general circulation of atmosphere and ocean
- electromagnetic radiation
- basic hydrodynamics (conservation laws, main balances, vorticity)



Category III: Nice to know

MATHEMATICS

- partial differential equations

PHYSICS

- boundary layer theory
- quasigeostrophic theory (barotropic and baroclinic instability)
- atmospheric thermodynamics
- radiation in the atmosphere
- cloud and precipitation physics
- atmospheric and oceanic optics