Module Name
Hydrodynamics – from water droplets to Supernovae

Type of Module	**Module Code**
Advanced Module	AM-Hydro

Identification Number	**Workload**	**Credit Points**	**Term**	**Offered Every**	**Start**	**Duration**
MN-CS-Hydro	180 Hours	6 CP	1. – 3. Semester	SuSe	Summer Term Only	1 Semester

1	**Course Types**	**Contact Time**	**Private Study**	**Planned Group Size**
	a) Lecture	30 h	60 h	Students
	b) Problem Class	30 h	60 h	

2 Module Objectives and Skills to be Acquired

Understanding of fundamental concepts of gas hydrodynamics and basic computational implementations to simulate fluid flows.

3 Module Content

The lecture introduces the basic aspects of Hydrodynamics:
Equations of ideal fluids, sound and potential waves, viscous fluids, hydrodynamical instabilities (e.g. Kelvin-Helmholtz-instability), convection, turbulence.
Basic numerical methods used in fluid hydrodynamics will be discussed, e.g. Riemann solvers.

The selected examples and exercises will mostly be related to astrophysical problems, like Supernova explosions, or turbulence in the interstellar medium.

4 Teaching Methods

Lectures and Exercises

5 Prerequisites (for the Module)

Formally: none

Regarding the content: Good bachelor level knowledge of theoretical physics and astrophysics

6 Type of Examination

One oral examination at the end of the module

7 Credits Awarded

The module is passed by passing a oral examination. The grade given for the module is equal to the grade of the oral examination.

8 Compatibility with other Curricula

The module is part of the Master of Science in Physics.

9 Proportion of Final Grade

6/114

10 Module Coordinator

Prof. Dr. Stefanie Walch-Gassner

11	**Further Information** **Recommended literature:** Greiner & Stock – Theoretische Physik 2 – Hydrodynamik (Europa Lehrmittel Verlag, 1991) Landau & Lifschitz – Band 6 – Hydrodynamik (Deutsch, 2007) L.D. Landau & E.M. Lifshitz: Fluid mechanics (Pergamon Press, 2nd edition, 1987) A.R. Choudhuri: The physics of fluids and plasmas (Cambridge University Press, 1998) Bodenheimer, Laughlin, Rozyczka, Yorke – Numerical methods in astrophysics (Taylor & Francis, 2006)