

## Secondary Area of Specialization: Astrophysics

Identification number	Workload	Credits	Term of studying	Frequency of occurrence	Duration
MN-P-PN-Astro	360 h	12 CP	1 <sup>st</sup> and 2 <sup>nd</sup> semester	Details are provided online in the table "Course Offerings".	2 semesters
<b>1</b>	<b>Type of lessons</b> a) Lecture b) Problem class c) Exam	<b>Contact times</b> depending on the individual choice  1 h	<b>Self-study times</b> depending on the individual choice  24 h	<b>Intended group size</b>  15–20 students per problem class	
<b>2</b>	<b>Aims of the module and acquired skills</b> <p>The students will gain the ability to apply fundamental concepts of physics to describe astrophysical phenomena and will obtain an overview of the experimental foundations of our knowledge about the cosmos. The courses will enable them to understand the fundamental principles of the universe and its history. The courses also give an introduction to topics of active research in astrophysics and thus prepare the students towards their own research activity within the master thesis.</p>				
<b>3</b>	<b>Contents of the module</b> <p>The module is subdivided into a core course, specialized courses and the advanced seminar:</p> <ol style="list-style-type: none"> <li>1. Core course <ul style="list-style-type: none"> <li>• Advanced Astrophysics (4+2 HPW, 9 CP)</li> </ul> </li> <li>2. Specialized courses <ul style="list-style-type: none"> <li>• Active Galaxies (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Astrochemistry (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Data Analysis (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Experimental Methods in Astrophysics (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Galaxy Dynamics (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Fourier-Transform and its Applications (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Hydrodynamics (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• The Physics of the Interstellar Medium (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Star Formation (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Optical/Infrared Interferometry (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Methods of Molecular Astrophysics (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Observational Methods in Infrared Astronomy (2+1 HPW, 4.5 CP) / (2 HPW, 3 CP)</li> <li>• Observational Cosmology (Bonn, 2+1 HPW, 4 CP) / (2 HPW, 3 CP)</li> <li>• Radiointerferometry: Methods and Science (Bonn, 2+2 HPW, 6 CP)</li> <li>• and others, including fitting courses from Bonn University, if approved by the module coordinator</li> </ul> </li> <li>3. Advanced Seminar in Astrophysics (2 HPW, 3 CP)</li> </ol> <p>The contents of the specialized courses can be found in the "kommentiertes Vorlesungsverzeichnis" and in the lecture descriptions online.</p>				

4	<p><b>Teaching/Learning methods</b></p> <p>Besides the teaching in lectures, the self-study based on books and lecture notes plays an important role. The students work individually on problem sets. In discussions with others and in the problem classes, they learn to solve challenging problems in a team and to present their approaches and results.</p>
5	<p><b>Requirements for participation</b></p> <p>Atomic Physics, Astrophysics and Quantum Mechanics at the level of the bachelor courses in physics</p>
6	<p><b>Type of module examinations</b></p> <p>The module is passed by passing an oral examination covering the topics of all attended courses. To be admitted to the exam, students must actively participate in the problem sessions (including the solution of homework problems). The grade given for the module is equal to the grade of the oral examination.</p>
7	<p><b>Requisites for the allocation of credits</b></p> <p>The Secondary AoS Astrophysics is composed of:</p> <ol style="list-style-type: none"> <li>1. Core Course Advanced Astrophysics (Lectures and Exercises)</li> <li>2. Specialized courses (Lectures and Exercises) in Astrophysics or an Advanced Seminar in Astrophysics</li> </ol>
8	<p><b>Compatibility with other Curricula and Soft Skills</b></p> <p>As elective subject in other M.Sc. programs.</p> <p>Scientific reading and presentation skills, in particular oral presentations. Computer aided analysis of scientific data.</p>
9	<p><b>Significance of the module mark for the overall grade</b></p> <p>The weight of the module is <math>12/111 \approx 10.8\%</math>.</p>
10	<p><b>Module coordinator</b></p> <p>P. Schilke</p>
11	<p><b>Additional information</b></p> <p>Detailed information on the occurrence and the course contents are provided online and in the "kommentiertes Vorlesungsverzeichnis".</p> <p>Version: 05.06.2015 HK</p>