

# Astrophysics and Molecular Physics

Module No.: MN-P-SP-Astro, MN-P-SP-Mol, MN-P-PN-Astro, MN-P-PN-Mol, MN-P-WaMa

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## Course: Astrochemistry

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Category	Type	Language	Teaching Hours	CP	Semester
Specialized Course	Lecture	English	2+1	4.5	SuSe
Specialized Course	Lecture	English	2	3	SuSe

### Requirements for participation:

Atomic Physics, Molecular Physics and Quantum Mechanics at the level of the bachelor courses in physics, Molecular Physics I

### Type of module examinations:

One oral examination at the end of the module

### Duration of the course:

1 semester

### Aims of the course:

The lecture introduces to astrochemistry of various astrophysical environments. Fundamental processes, such as molecular collisions, fragmentations, and chemical reactions, are explained, and implications for astrophysical observations by means of high resolution spectroscopy are treated.

### Contents of the course:

- Detection of Molecules in Space
- Elementary Chemical Processes
- Chemical Networks
- Grain Formation (Condensation)
- Properties of Grains and Ice
- Grain Chemistry
- Diffuse Clouds, Shocks, Dark Clouds, Star Forming Regions

### Recommended literature:

- A. Tielens "The Physics and Chemistry of the Interstellar Medium" Cambridge University Press, 2005  
S. Kwok "Physics and Chemistry of the Interstellar Medium" University Science Books, 2006  
D. Rehder "Chemistry in Space, From Interstellar Matter to the Origin of Life" Wiley-VCH, Weinheim, 2010  
J. Lequeux "The interstellar Medium" Springer, 2004  
A. Shaw "Astrochemistry" Wiley, 2006  
D. Whittet "Dust in the Galactic Environment", Taylor and Francis, 2<sup>nd</sup> edition, 2002  
S. Yamamoto "Introduction to Astrochemistry", Springer, 2017