Course Unit Descriptor

Study Programme: Master Academic Studies in Physics

Course Unit Title: Nuclear and Particle Astrophysics

Course Unit Code: M18NČA

Name of Lecturer(s): Full Professor Tijana Prodanovic

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 9

Prerequisites: None

Course Aims:

Nucleosynthesis and particle astrophysics investigate the origin of chemical elements in the universe due to different processes at play: big bang nucleosynthesis, stellar nucleosynthesis, cosmic-ray nucleosynthesis. The goal of this course is to teach the students about the processes that have contributed and still contribute to the synthesis of chemical elements, as well as to teach them about the methods used in scientific research which allow us to, based on measured abundances, make conclusions about nucleo-synthetic processes.

Learning Outcomes:

After the successful completion of the course “Nucleosynthesis and particle astrophysics" the students will have learned about the theory behind the fundamental processes involved in nucleosynthesis of chemical elements as well as about the methods that are used to test these theories, and thus will be trained to, based on measured abundances, make conclusions about the origin of chemical elements and processes at play.

Syllabus:

Theory

Overview of thermonuclear reactions and rates; measuring chemical abundances; big-bang nucleosynthesis and the origin of light elements; cosmic abundances - observations and problems; introduction to stellar evolution and synthesis of chemical elements; neutron capture processes; cosmic-ray nucleosynthesis; introduction to galactic chemical evolution.

Practice

In the goal of active learning, a lot of attention will be given to practical work both during lectures and in the form of homework assignments and term paper. Students will be encouraged to by using real data make conclusions about origin of elements and chemical evolution, as well as to solve problems during lectures that will later help them successfully complete homework assignments and a written exam.

Required Reading:

1. B.E.J. Pagel, Nucleosynthesis and Chemical Evolution of Galaxies, Cambridge University Press, 1997, ISB N 0-521-55958-8.

2. H.V. Klapdor-Kleingrothaus, K. Zuber, Particle Astrophysics, Taylor & Fracis, 1997, ISB N 10:0750304030.

Weekly Contact Hours:	**Lectures:** 4	**Practical work:** 3

Teaching Methods:

Lectures, practical work and seminars.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	30
Practical work	20	oral exam	30
Preliminary exam(s)		…….	
Seminar(s)	15		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.