

Study programme: Astronomy and Astrophysics – PhD Studies			
Course: Nuclear and Particle Astrophysics			
Teacher or teachers: Tijana Prodanovic			
Status: elective			
ECTS credits: 9			
Requirements: none			
Course objective: 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 nucleosynthetic processes.			
Course outcome: 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.			
Course description:			
<i>Theory</i> 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.			
<i>Exercises</i> 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.			
<i>Term Paper</i> The purpose of a term paper is for a student to gain a deeper insight into one specific topic of his choosing. The student will on his own have to search the literature which will help him write a short overview of the topic where main concepts and relevant conclusions will be given. Another important part of the Term Paper Assignment will be the making of and delivering a short in-class presentation of the topic. The goal of this is for students to improve their presenting skill as well as to familiarize all students with all chosen topic.			
Recommended literature:			
1. "Nucleosynthesis and Chemical Evolution of Galaxies", Pagel, B. E. J., Cambridge University Press, ISBN 0-521-55958-8 (1997) 2. Claus Grupen “Astroparticle Physics”, Springer, 2005, ISBN-13: 978-3540253129			
Total number of classes: 10	Theoretical classes: 4	Practical classes: 6	
Teaching methods: Lectures or ex cathedra, homework assignments, writing and presenting the term paper. Lectures will be given in the Power Point multimedia form that will be available to students after the lectures as well on the web-page specifically designed for this course. Besides past lectures, this web-page will also contain all the important information's for students attending this course. Whenever possible, in class demonstrations will also be prepared and executed, in the goal of better understanding of new concepts. Besides in lectures, the Lecturer will be available to students during designated office hours as well as via email.			
Grading system (maximum number of points: 100)			
Pre-exam requirements	points	Final exam	points
Activity in class	5	Written exam	30
Practical work		Oral exam	30

Homeworks	20		
Seminars	15		
Colloquia			