

A COURSE SYLLABUS – DOCTORAL SCHOOL
regarding the qualification cycle from 2024/2025 to 2027/2028

GENERAL INFORMATION ABOUT COURSE				
Course title	OPTIONAL INTERDISCIPLINARY SUBJECT: <i>Astrophysics with elements of cosmology</i>			
Name of the unit running the course	Doctoral School at University of Rzeszów			
Type of course (<i>obligatory, optional</i>)	compulsory - optional specialist			
Year and semester of studies	year II, semester III,			
Discipline	interdisciplinary			
Language of Course	Polish /English			
Name of Course coordinator	Dr Marcin Wesółowski, Prof. UR			
Name of Course lecturer	Dr Marcin Wesółowski, Prof. UR			
Prerequisites	Possession of in-depth knowledge, skills and social competences resulting from the completion of higher education (level 7 of the Polish Qualifications Framework) and the commencement of the implementation of learning outcomes at level 8 of the Polish Qualifications Framework. Knowledge of specialist English at B2 ESKJ level.			
BRIEF DESCRIPTION OF COURSE (100-200 words)				
<p>Subject name: Astrophysics with elements of cosmology</p> <p>This course aims to consolidate existing knowledge, skills, and social competencies related to contemporary astrophysics. Using numerical modeling and mathematical and physical models, the activity of small celestial bodies, such as comets, is studied. During the lecture, PhD students will gain knowledge enabling them to analyze comet activity depending on the degree of artificial light pollution in the night sky. Furthermore, the acquired knowledge will enable them to plan future professional astronomical observations of small celestial bodies and the solar disk, while taking special precautions.</p>				
COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES				
Learning outcome	The description of the learning outcome defined for the course	Relation to the degree programme outcomes (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge (no.)	knows and understands, has knowledge			
P8S_WG1	He is familiar with current scientific achievements, including global ones, concerning the analysis of comet activity depending on the degree of artificial light pollution of the night sky, to an extent that allows for the verification of existing views in this area of research.	P8S_WG	Seminar	exam
P8S_WG2	Has extensive knowledge and is familiar with development trends, the latest discoveries and	P8S_WG	Seminar	exam /discussion

	research achievements related to astrophysics and light in the broad sense.			
P8S_WG3	He knows and understands the terminology, defines various scientific concepts in Polish and English as part of his research activities related to the world.	P8S_WG	Seminar	exam /discussion
P8S_WK1	He has knowledge of the threats to civilisation resulting from the development of technology and technology.	P8S_WK	Seminar	exam
Skills (no.)	can			
P8S_UW1	Based on their knowledge in various fields of science, they are able to identify and solve scientific research problems, define objectives, formulate hypotheses and research topics, select and improve research techniques, methods and tools, and draw conclusions based on scientific research results.	P8S_UW	Seminar	exam/discussion
P8S_UW2	They are able to use available scientific publications to diagnose and solve research problems and innovative activities, and are also able to use appropriate research tools to develop new elements of their work.	P8S_UW	Seminar	exam/discussion
P8S_UW3	Is able to critically analyse the results of scientific research, expert studies and other publications related to scientific research in astrophysics and cosmology.	P8S_UW	Seminar	exam,
P8S_UK6	They are able to communicate in a foreign language at level B2 of the Common European Framework of Reference for Languages, and are able to publicly express their own opinion on scientific topics and present the results of their own research activities.	P8S_UK	Seminar	discussion
Social competence (no.)	is ready to			
P8S_KK3	He is ready to critically evaluate scientific achievements in the	P8S_KK	Seminar	discussion

	field of physical sciences related to astrophysics and cosmology.					
Semester (no.)	Lectures	Seminar	Conversatory/ Lab classes	Internships	others	ECTS
III	-	15 hrs.	-	-	-	2

METHODS OF INSTRUCTION

- *TRADITIONAL SEMINARS;*
- *CLASSES WITH MULTIMEDIA PRESENTATIONS;*
- *DISCUSSIONS.*

COURSE CONTENT

Seminar

1. Selected topics in celestial mechanics.
2. Basic types of astronomical objects.
3. Comet activity during the quiescent sublimation phase and during outbursts.
4. Methodology for measuring the brightness of the night sky and analyzing the visibility of celestial bodies.
5. The evolution of matter in the Universe.

COURSE ASSESSMENT CRITERIA

The examination is conducted in written form after each semester of the course (semester 3).

Assessment criteria: example

- regular attendance;
- ability to lead discussions and draw constructive conclusions;
- written work (preparing a written work based on a sample scientific article, the subject of which is closely related to the issues presented during the classes and presenting a short lecture related to the written work).

Very good grade:

- attendance at least 4/5 of the total number of classes;
- substantive activity and engagement during classes,
- visible ability to lead discussions and draw constructive conclusions,
- obtaining 90-100% from the written work

Good plus grade:

- attendance at least 4/5 of the total number of classes;
- substantive activity during classes;
- satisfactory ability to lead discussions and draw conclusions;
- obtaining 81-90% of points from written work

Good grade:

- attendance at least 4/5 of the total number of classes;
- satisfactory substantive activity during classes;
- moderate ability to lead discussions and draw conclusions;
- obtaining 71-80% on the written assignment

Pass with distinction:

- attendance at least 3/5 of the total number of classes;
- moderate substantive activity during classes
- moderately poor ability to lead discussions and draw conclusions;
- obtaining 61-70% from written work

Satisfactory grade:

- attendance at least 3/5 of the total number of classes;
- low level of activity during classes
- poor ability to lead discussions and draw conclusions;

- obtaining 51-60% of points from written work

Fail grade:

- absence from more than 3/5 of the total number of classes;
- lack of activity during classes;
- lack of ability to lead discussions and draw conclusions;
- obtaining less than 60% of points from written work.

TOTAL PhD STUDENT WORKLOAD REQUIRED TO ACHIEVE THE INTENDED LEARNING OUTCOMES – NUMBER OF HOURS AND ECTS CREDITS

Activity	Number of hours
Scheduled course contact hours	15 hrs.
Other contact hours involving the teacher (consultation hours, examinations)	2 hrs.
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	36 hrs.
Total number of hours	53 hrs.
Total number of ECTS credits	2

INSTRUCTIONAL MATERIALS

Compulsory literature:	<ul style="list-style-type: none">• Artymowicz P., Astrophysics of Planetary Systems, PWN Warsaw 1995• Rybka E., General Astronomy, 7th ed., PWN, Warsaw 1983• Iwanowska W., Woszczyk A., Research Methods of Observational Astrophysics, UMK Transcript, Toruń 1987 (the transcript will be made available to students)• Kreiner J.M., Astronomy with Astrophysics, PWN, Warsaw 1988
Complementary literature:	<ul style="list-style-type: none">• Thorne, Kip S., Blandford, Roger D. (2017). Modern Classical Physics: Optics, Fluids, Plasmas, Elasticity, Relativity, and Statistical Physics. Princeton University Press, Hardcover, 1552• Shu, Frank H. (1982). The Physical Universe: An Introduction to Astronomy. University Science Books. ISBN 978-0-935702-05-7, 584• Kubiak M., Stars and Interstellar Matter, PWN, Warsaw 1994• Urania-Postepy Astronomii – selected issues of the bimonthly journal from 2000–2026.

*(1 ECTS CREDIT CORRESPONDS TO 25 - 30 HOURS OF THE TOTAL WORKLOAD OF A DOCTORAL STUDENT, NEEDED TO ACHIEVE THE ESTABLISHED EFFECTS).

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Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person