

Anexa nr. 2
SUBJECT CONTENT
1. Informations about program

1.1 Institution	West University of Timisoara
1.2 Faculty	Faculty of Physics
1.3 Department	Physics Department
1.4 Domain for university master studies	Exact science - Physics
1.5 Level of study	Master
1.6 Study directions	Astrophysics, elementary particles and computational physics

2. Informations about discipline

2.1 Subject matter	Scientific Research Internship AP2402						
2.2 Course	Prof.univ.dr. Dumitru Vulcanov						
2.3 Seminar							
2.4 Laboratory	Prof.univ.dr. Dumitru Vulcanov						
2.5 Year of study	II	2.6 Semester	II	2.7 Type of evaluation	V	2.8 Subject category	Ob

3. The total estimated time (hours of teaching activities on semester)

3.1 Number of teaching hours on week	4	from which course	-	seminar	-	laboratory	4
3.2. Number of hours on semester	56	from which course	-	seminar	-	laboratory	56
3.3. Time distribution:							Ore
Study of course notes, tutorials, bibliography and other notes							30
Supplementary study in library, on media etc.							30
Preparation of seminars / laboratory, homework, reports, portofolio and essay							30
Tutoring							10
Exams							4
Other activities.....							20
3.4 Total hours of individual study	120						
3.5 Total hours on semester ¹	176						
3.6 Credits	8						



4. Preconditions (where appropriate)

4.1 of curriculum	All lectures of master program in the first 2 years
4.2 of competences	Computer manipulation skills and algebraica programming in Maple

5. Specific competences

Professional competences	<ul style="list-style-type: none"> • Basic knowledge (fundamental concepts of General Relativity and Cosmology) . • Deep understanding (of basic notions, of physical parameters in order to understand the complex calculations from General Relativity and Cosmology) . • Physical interpretation of the calculations results and their applications. • Capacity of analyze and synthesize (realization of synthesis and comparisons). • Capacity to plan and organize theoretical applications . • Bibliography investigation . • Knowledge of foreign languages (English) .
Transversal competences	<ul style="list-style-type: none"> • effective use of information sources and training assistance (Internet portals, specialized software, data bases, online courses, etc..) both in romanian and in a foreign languag(english)

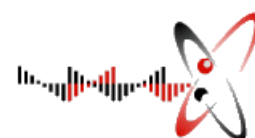


6. Objectives (reieșind din grila competențelor specifice acumulate)

7.1 Main objectiv	<ul style="list-style-type: none"> Acquiring basic knowledge about General Relativity and Cosmology Understanding of the fundamental principles of General Relativity and modern Cosmology To get familiar and to understand notions such as curved space-time, gravitational field, stress-energy tensor, etc
7.2 Specific objectives	<ul style="list-style-type: none"> Basic notions needed to construct the cosmological models Developing the skills needed to perform complex calculations in General Relativity and Cosmology

7. Table of contents – Main activities

Main activities	Activities description	Nr. Of hours
1. High performance computing in general relativity	Numerical relativity	4
	Algebraic programming and computer algebra	4
	Computational astrophysics	6
2. Scientific programs in ROSA and ESA activities	Description of ROSA and ESA programs and activities	10
	Main ESA space missions within fundamental science - astronomy and astrophysics	10
	STAR – Space Technology Advances in Romania	5
3. Fundamental research in astrophysics and theoretical physics in Romania	Academic environment - universities	5
	Research institutes – IFINHH, ISS, etc.	5
	International collaborations – EPS, BPS and SEENET-MTP	5
Some of the above activities will be done in collaboration with ROSA, ATLAS- Romania, etc.	Online web sessions will be organized using Google Meet or other similar platforms	



Minimal bibliography

1. MTW- Gravitation, Freeman, 1973
 2. B.F. Schutz – A first course in general relativity, Cambridge univ. press, 2000
 - 3.M. Alcubierre – Introduction to Numerical Relativity. Cambridge Univ. Press, 2010
 4. <http://numrel.aei.mpg.de>
 5. <http://rosa.ro> and <http://esa.eu>
 6. Materials and proposed home works for individual study
- Are found on dedicated web pages at: <https://physics.uvt.ro/~vulcan>

9. Evaluation

Activity	Evaluation criteria	Evaluation methods	Percentage of final mark
9.1 Main activities	answers at exams (final evaluation)	Oral – during the semester (VP)	50%
9.2 Laboratory	Problems /Home works	written	50%
9.4 Minimum performance standards			
correct formulation of the proposed subject without demonstrations			

Data completării:

Semnătura titularului de curs:

Semnătura titularului de seminar




19.01.2022

Prof.univ.dr. Dumitru VULCANOV

Prof.univ.dr. Dumitru VULCANOV

Semnătura directorului de departament

Conf.univ.dr. Catalin MARIN