

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babes-Bolyai University
1.2 Faculty	Mathematics and Computer Science
1.3 Department	Mathematics
1.4 Field of study	Mathematics
1.5 Study cycle	Master
1.6 Study programme / Qualification	Applied Mathematics

2. Information regarding the discipline

2.1 Name of the discipline	Observational Astronomy						
2.2 Course coordinator	Conf. Dr. Cristina Blaga						
2.3 Seminar coordinator	Conf. Dr. Cristina Blaga						
2.4. Year of study	2	2.5 Semester	4	2.6. Type of evaluation	Exam	2.7 Type of discipline	optional

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1/0
3.4 Total hours in the curriculum	36	Of which: 3.5 course	24	3.6 seminar/laboratory	12/0
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					58
Additional documentation (in libraries, on electronic platforms, field documentation)					50
Preparation for seminars/labs, homework, papers, portfolios and essays					50
Tutorship					4
Evaluations					2
Other activities:					0
3.7 Total individual study hours					164
3.8 Total hours per semester					200
3.9 Number of ECTS credits					8

4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> Basic knowledge of Astronomy
4.2. competencies	<ul style="list-style-type: none">

5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none">
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> Acces to the astronomical instruments from the Astronomical Observatory of the BBU.

6. Specific competencies acquired

Professional competencies	<p>The ability to understand and handle concepts, results and advanced mathematical theories.</p> <p>The ability to do research, to work independently or in teams to conduct studies or solve complex problems.</p>
Transversal competencies	<p>The ability to express themselves in scientific language and to draft reports and scientific papers.</p> <p>The ability to model and analyze the mathematical processes to other sciences, in economics and engineering.</p>

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	<ul style="list-style-type: none"> Acquiring knowledge necessary for understanding the principles and methods of observational astronomy.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> Assimilation of modern methods in which the radiation of celestial bodies is recorded and processed.

8. Content

8.1 Course	Teaching methods	Remarks
1. The nature of light. Light as an electromagnetic wave. Speed of light, refractive index of the medium.	The lecture, description, exemplification using multimedia	
2. Fundamentals of geometrical optics. Light reflection and refraction. Optical Systems. The path of a lightray through an optical system.	The lecture, description, exemplification using multimedia	
3. Spherical diopter. Equation of conjugate points through a spherical diopter. Mirrors.	The lecture, description, exemplification using multimedia	
4. Lenses. Formula of thin lens. Optical prism. Eyepieces. Abberations of optical systems: geometric (spherical aberration, astigmatism, field curvature, coma), color and light diffraction (effect on image formation through an optical instrument)	The lecture, description, exemplification using multimedia	
5. . Optical instruments used in astronomy (refracting and reflecting telescopes). Types of reflecting telescopes (Newton, Cassegrain, Maxutov, coude).	The lecture, description, exemplification using multimedia	
6. Instrumental mounts (equatorial and horizontal). The current generation of refracting and reflecting telescopes. Large Telescopes. Hubble Space Telescope. Future	The lecture, description, exemplification using multimedia	

telescopes.		
7. Astronomical spectroscopy. Spectrometers (with prism and diffraction gratings).	The lecture, description, exemplification using multimedia	
8. . Observations in other spectral wavelengths. Gamma and X rays Astronomy. Infrared and ultraviolet Astronomy.	The lecture, description, exemplification using multimedia	
9. Radioastronomy. Radio telescopes. Noise. Radiointerferometry.	The lecture, description, exemplification using multimedia	
10. Astronomy of other forms of energy. Cosmic rays. Neutrinos. Gravitational radiation.	The lecture, description, exemplification using multimedia	
11. Detectors of radiation in visual domain (eye, photographic plate, photocell, photomultiplier, pulse counter, CCD camera). Photometric filters.	The lecture, description, exemplification using multimedia	
12. Photometric stellar magnitude and systems commonly used in Astronomy (photometric international system, standard system UBV).	The lecture, description, exemplification using multimedia	

Bibliography

1. BIRNEY S.D.: Observational Astronomy, Cambridge University Press, 1991.
2. LENA P., LEBRUN F., MIGNARD F.: Observational Astrophysics, Springer, 1996.
3. POP V., BLAGA C.: Astronomie observationala, Editura Risoprint, Cluj-Napoca, 2005.
4. STERKEN C., MANFROID J.: Astronomical Photometry, Kluwer Academic Publishers, 1992.
5. URECHE V.: Universul, Astrofizica, vol. II, Editura Dacia, Cluj-Napoca, 1985.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Seminar (2 hours) Application of the law of refraction of light in Astronomy: astronomical refraction.	Description, explanation, conversation, individual study and / or team.	
2. Seminar (2 hours) Imaging a bright spot through an optical system. Applications of thin lens formulas and optical prism. Problems.	Description, explanation, conversation, individual study and / or team.	
3. Seminar (2 hours) Small astronomical instruments used in navigation. Sextant and theodolite.	Description, explanation, conversation, individual study and / or team.	
4. Seminar (2 hours) Coude telescope from our Astronomical Observatory. How to use it to identify a celestial body with given equatorial celestial coordinates.	Description, explanation, conversation, individual study and / or team.	
5. Seminar (2 hours) Presentation of the CCD camera from the Astronomical Observatory. Components, operating principle, practical use.	Description, explanation, conversation,	

	individual study and / or team.	
6. Seminar (2 hours) Applications of the stellar magnitudes, distance units, observational facts.	Description, explanation, conversation, individual study and / or team.	
Bibliography 1. KITCHIN C.R.: Astrophysical Techniques, Adam Hilger, 1991. 2. KITCHIN C.R.: Optical Astronomical Spectroscopy, Institute of Physics Publishing, 1995. 3. MARTINEZ P.: The Observers Guide to Astronomy, vol 1-2, Cambridge University Press, 1994. 4. MICZAIKA G.R., SINTON W.M.: Tools of the Astronomer, Harvard University Press, 1961.		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The knowledge acquired in this discipline helps us understand how electromagnetic radiation coming from celestial bodies is recorded and interpreted. The principles of these methods are applied to electromagnetic radiation produced by terrestrial sources, too.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of the concepts introduced and their use in solving problems	Written examination (theory and problems)	50%
10.5 Seminar/lab activities	The application of concepts learned in theoretical or practical problem	Continuous evaluation of student participation in teaching activities	50%
10.6 Minimum performance standards			
➤ The students must solve correctly and in due time the homework. At the examination they must show that they understood the concepts introduced and can work with them.			

Date

30th of April 2015

Signature of course coordinator

Conf. Dr. Cristina Blaga

Signature of seminar coordinator

Conf. Dr. Cristina Blaga

Date of approval

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Signature of the head of department

Prof. Dr. Octavian Agratini