Fizik Bölümü / PHYSICS /

Course Code	Course Name	Teorical	Practice	Laboratory	Credits	ECTS
FZK-4017	Relativity and Cosmology	2.00	2.00	0.00	3.00	7.00

Course Detail

Course Language	:	Turkish
Qualification Degree	:	Bachelor
Course Type	:	Optional
Preconditions	:	Not
Objectives of the Course	:	Einstein's theory of relativity, the concept of space-time, the relationship between mass and space-time, gravitation and space time. To have knowledge about the theories of gravitation.
Course Contents	:	Special relativity. Introduction to differential geometry. Einstein equations and their simple applications, introduction to cosmology, inflation theory, black holes.
Recommended or Required Reading	:	1. Relativity, Gravitation and Cosmology, Ta-Pei Chenk, Oxford Press (2005) 2. Cosmology in scalar-tensor gravity, Faraoni, Valerio (2004). Boston: Kluwer. 3. f(R) theories of gravity, T.P. Sotiriou and V. Faraoni, arXiv:0805.1726, (May 2008)
Planned Learning Activities and Teaching Methods	:	Oral presentation, practice, homework.
Recommended Optional Programme Components	:	It is recommended that the student has previously taken modern physics courses.
Instructors	:	Assoc. Prof. Dr. Melis Ulu Doğru
Instructor's Assistants	:	Related assistant assigned by the Physics Department
Presentation Of Course	:	Oral presentation, practice, homework.

Course Outcomes

Upon the completion of this course a student :

1 Define homogeneous and isotropic spaces.

2 Comprehends the process from Newtonian mechanics to Einstein's theory of relativity.

3 Students will be able to define the metric in the basic structure.

4 Learns the concept of flat space and curved space.

5 Learn the theory of Einstein and its classical approach to the theory, its applications to black holes.

6 Knows the relationship between expanding space, cosmological constant and dark energy.

Preconditions

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Weekly Contents

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods
1.Week	*Metric definition of space time, Introduction	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
2.Week	*Special Relativity and flat space time	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
3.Week	*Newton gravitational potential, gravitational mass	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
4.Week	*Metric definition of curved space time, geodesics.	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
5.Week	*Geometry and gravity	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
6.Week	*Space time around a global star, Schwarzschild space time.	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
7.Week	*Schwarzschild Black Holes	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
8.Week	*General Review, midterm exam	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
9.Week	*Cosmology; Homogeneous and isotropic spaces	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
10.Week	*Friedmann-Roberson-Walker Metric	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
11.Week	*Expanding universe, Friedmann equations	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
12.Week	*Inflation and accelerated universe, cosmological constant	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
13.Week	*Anisotropy of cosmic microwave background radiation	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.
14.Week	*Gravitation theories; Brans-Dicke theory overview.	*Experiments related to the theoretical subject of the related week will be discussed and problem solutions will be made.	*Dersin Laboratuarı yoktur.	*Weekly pre-work can be done from the proposed sources.	*Oral presentation, practice, homework.

Assesment Methods %

2 Final : 60.000

3 Vize : 40.000

ECTS Workload

Activities	Count	Time(Hour)	Sum of Workload
Vize	1	2.00	2.00
Ödev	7	3.00	21.00
Final	1	2.00	2.00
Attending lectures	14	4.00	56.00
Individual study before lecture	14	1.00	14.00
Individual study after lecture	14	2.00	28.00
Preparation for midterm	3	5.00	15.00
Preparation for final	4	5.00	20.00
Further Study	14	3.00	42.00

Activities	Count	Time(Hour)	Sum of Workload
		Total :	200.00
		Sum of Workload / 30 (Hour) :	7
		ECTS :	7.00

Program And OutcomeRelation

	P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14	P.O. 15	P.O. 16	P.O. 17	P.O. 18	P.O. 19	P.O. 20	P.O. 21	P.O. 22	P.O. 23	P.O. 24
L.O. 1	5	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	5	0	0	0	0	0	0
L.O. 2	0	4	4	0	0	0	0	4	5	0	0	0	0	4	4	4	0	0	0	0	4	5	0	0
L.O. 3	0	0	0	4	4	0	3	0	0	4	3	0	0	0	0	3	3	4	0	2	0	0	4	3
L.O. 4	0	0	0	0	0	3	0	0	5	0	0	4	0	3	0	0	0	0	0	0	0	0	0	0
L.O. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2	0	4	4	0
L.O. 6	0	0	0	0	0	0	0	0	0	2	0	0	3	0	3	0	0	3	5	0	0	0	0	0

Ders/Program Çıktıları İlişkisi

P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14	P.O. 15	P.O. 16	P.O. 17	P.O. 18	P.O. 19	P.O. 20	P.O. 21	P.O. 22	P.O. 23	P.O. 24	P.O. 2
2	4	5	4	3	4	3	3	4	4	4	4	3	5	4	2	4	3	3	4	3	3	5	3	3