Fizik Bölümü / PHYSICS /

Course Code	Course Name	Teorical	Practice	Laboratory	Credits	ECTS
FZK-4004	Nuclear Physics	2.00	2.00	0.00	3.00	6.00

Course Detail

Course Language	:	Turkish
Qualification Degree	:	Bachelor
Course Type	:	Compulsory
Preconditions	:	Not
Objectives of the Course	:	This course aims to teach the basic concepts of the nuclear physics.
Course Contents	:	The fundamental properties of nuclei, nuclear models, compound nucleus, nuclear moments and spectra, nuclear forces, nuclear reactions and cross sections, radioactivity and nuclear stability, nuclear shell structure, nuclear collective modes, rotational states. Classical collisions and scattering problems, quantum theory of scattering, elastic and inelastic scattering, Optical model, binding energies, a, b, g decays, fission and fusion, nuclear energy and reactors, transfer reactions, multistep reactions, heavy ions, resonance and statistical theory of nuclear reactions, high energy nuclear phenomena, pion and kaon interactions with nuclei.
Recommended or Required Reading	:	Krane Kenneth S. (1988), Şarer B., Çeviri editörü (2001),Nükleer Fizik, Cilt 1-2 ve problem çözümleri, Palme Yayıncılık Yaramış, B., (1985),Nükleer Fizik, İTÜ Fen-Edebiyat Fakültesi Yayın No 7 Özkök, Ş., (1990),Nükleer Fizik Problemleri, Çağlayan Yayınevi Güven, H., (1999),Nükleer Fizik Ders Notları, İTÜ. Serway, R.A. (1995),Fen ve Mühendislik için Fizik, modern fizik ilaveli, 3. baskı, Palme yayıncılık. Beiser, A (1997),Modern Fiziğin Kavramları, Akademi.
Planned Learning Activities and Teaching Methods	:	Oral lecture, questions-answers, homework
Recommended Optional Programme Components	:	--
Instructors	:	Prof. Dr. Ayşe Küçükarslan
Instructor's Assistants	:	--
Presentation Of Course	:	Face to face

Course Outcomes

Upon the completion of this course a student :

1 After completion of this course students will be able to:obtain essential basic formulas such as nuclear charge distribution, the nuclear and semi empirical binding energy, nuclear magnetic and electric quadrupole moment, scattering cross section, activity of radioactive product and related to interactions of the charged particle and photons with materials.

2 Comprehend the applications of quantum mechanics to some essential subjects such as two particle interaction, the shell model and the wave functions of deuteron and the exchange particle.

3 Describe the properties of radiation detectors and have skills about the measurement of radiation and nuclear physics applications.

4 Have skills on the relevant measurements of energy, coincidence and time resolution measurement.

5 Solve essential problems related to Nuclear Physics.

6 Apply the Counting statistics and Poisson statistics to evaluate the uncertainties in the data and Gaussian distribution to the detector response.

7 Formulate essential relations such as the probability to penetrate the Coulomb barrier in three dimension, the beta and the gamma transition probabilities, nuclear reaction cross-section and related to the fission critical energy and fusion.

8 Have the knowledge and skills to describe the essential course topics such as angular momentum and parity in alpha and gamma decay, the reaction rate, nuclear fission and fusion.

Preconditions

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Weekly Contents

	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods
1.Week	*Introduction to nuclear physics				*Oral lecture, questions-answers, homework.
2.Week	*Radiactivity and radiactive decay				
3.Week		*Radiactivity and radiactive decay			
4.Week	*Radiactive series and radiation units	*Radiactive series and radiaiton units			
5.Week	*Nuclear reactions				
6.Week		*Nuclear reactions			
7.Week	*Cross sections, reaction rate and mean free path	*Cross sections, reaction rate and mean free path			
8.Week	*Properties of nuclei				
9.Week		*Properties of nuclei			
10.Week	*Alfa decay	*Alfa decay			
11.Week	*Beta decay and gamma radiation	*Beta decay and gamma radiation			
12.Week	*Neutron physics and fission				
13.Week		*Neutron physics and fission			
14.Week	*Nuclear reactors	*Nuclear reactors			

Assesment Methods %

1 Vize : 30.000

2 Ödev : 10.000

3 Final : 60.000

ECTS Workload

Activities	Count	Time(Hour)	Sum of Workload
Vize	1	3.00	3.00
Ödev	4	3.00	12.00
Final	1	3.00	3.00
Individual study before lecture	14	1.00	14.00
Preparation for midterm	7	2.00	14.00
Preparation for final	14	1.00	14.00
Application/Practice	7	2.00	14.00
Class Hours (14 weeks)	14	4.00	56.00
Further Study	14	2.00	28.00
Preliminary Study	14	2.00	28.00
		Total :	186.00
		Sum of Workload / 30 (Hour) :	6
		ECTS :	6.00

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	4	3	4	5	4	3	1	1	3	3	2	2	4	2	3	0	0	0	0	0	0	0	0	0
L.O. 2	3	3	3	3	3	3	1	2	4	4	1	1	4	2	4	0	0	0	0	0	0	0	0	0
L.O. 3	3	4	3	4	3	3	2	2	3	4	1	1	3	1	3	0	0	0	0	0	0	0	0	0
L.O. 4	4	3	3	4	3	4	2	1	4	3	1	2	3	1	3	0	0	0	0	0	0	0	0	0
L.O. 5	4	4	3	3	4	3	1	1	3	3	2	1	3	1	4	0	0	0	0	0	0	0	0	0
L.O. 6	3	3	2	4	3	3	1	2	3	3	2	1	3	1	4	0	0	0	0	0	0	0	0	0
L.O. 7	3	3	3	5	4	3	1	1	2	3	1	1	3	1	3	0	0	0	0	0	0	0	0	0
L.O. 8	4	3	4	5	3	4	1	1	3	3	1	1	3	2	3	0	0	0	0	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
3	3	3	4	2	2	3	4	3	2	1	3	2	4	0	0	0	0	0	0	0	0	0	0	0