Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Nuclear Physics	FZK453	7. Semester	2 + 2	3.0	8.0

Prerequisites	None
Language of Instruction	Turkish
Course Level	Bacheclor's Degree (First Cycle)
Course Type	Elective
Mode of delivery	Face to face
Course Coordinator	Assoc. Prof. Dr. Emine Dilara AYDIN
Instructors	Assoc. Prof. Dr. Emine Dilara AYDIN
Assistants	
Course Objectives	This course aims to teach the basic concepts of the nuclear physics.
Course Content	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.
Course Learning Outcomes	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.

Quick Access

Physics
- Qualification Awarded
- Level of Qualification
- Qualification Requirements and Regulations
- Specific Admission Requirements
- Recognition of Prior Learning
- Profile of the Program
- Program Key Learning Outcomes
- Occupational Profile of Graduates
- Access to Further Studies
- Course Structure & Credits
- Exam Regulations & Assessment & Grading
- Graduation Requirements
- Mode of Study
- Programme Director(or Equivalent)
- Evaluation Questionnaire
- TYYÇ

Course Information
- Course Information
- Weekly Course Content
- Resources
- Assessment
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Introduction to nuclear physics	Oral lecture, questions-answers, homework	
2. Week	Radiactivity and radiactive decay	Oral lecture, questions-answers, homework	
3. Week	Radiactivity and radiactive decay	Oral lecture, questions-answers, homework	
4. Week	Radiactive series and radiaiton units	Oral lecture, questions-answers, homework	
5. Week	Nuclear reactions	Oral lecture, questions-answers, homework	
6. Week	Nuclear reactions	Oral lecture, questions-answers, homework	
7. Week	Cross sections, reaction rate and mean free path	Oral lecture, questions-answers, homework	
8. Week	Mid-term Exam		
9. Week	Properties of nuclei	Oral lecture, questions-answers, homework	
10. Week	Properties of nuclei	Oral lecture, questions-answers, homework	
11. Week	Alfa decay	Oral lecture, questions-answers, homework	
12. Week	Beta decay and gamma radiation	Oral lecture, questions-answers, homework	
13. Week	Neutron physics and fission	Oral lecture, questions-answers, homework	
14. Week	Neutron physics and fission	Oral lecture, questions-answers, homework	
15. Week	Nuclear reactors	Oral lecture, questions-answers, homework	
16. Week	Final Exam		

RESOURCES

Recommended Sources
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.

ASSESSMENT

Measurement and Evaluation Methods and Techniques		
Mid-term Exam, Attendance, Problem Solving, Quiz, Final Exam		
In-Term Studies	**Quantity**	**Percentage**
Mid Term Exam 1	1	40
Total	1	40
End-Term Studies	**Quantity**	**Percentage**
Final Exam	1	60
Total	1	60
Contribution Of In-Term Studies To Overall Grade		40
End-Term Studies		60
Total		100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4	DK5	DK6	DK7	DK8
PY1	3	4	3	3	4	4	3	3	4
PY2	3	3	3	4	3	4	3	3	3
PY3	3	4	3	3	3	3	2	3	4
PY4	4	5	3	4	4	3	4	5	5
PY5	3	4	3	3	3	4	3	4	3
PY6	3	3	3	3	4	3	3	3	4
PY7	1	1	1	2	2	1	1	1	1
PY8	1	1	2	2	1	1	2	1	1
PY9	3	3	4	3	4	3	3	3	3
PY10	3	3	4	4	3	3	3	3	3
PY11	1	2	1	1	1	2	2	1	1
PY12	1	2	1	1	2	1	1	1	1
PY13	3	4	4	3	3	3	4	3	3
PY14	1	2	2	1	1	1	1	1	2
PY15	3	3	4	3	3	4	4	3	3

*DK = Course's Contrubution.

	0	1	2	3	4	5
Level of contribution	None	Very Low	Low	Fair	High	Very High

.

ECTS CREDITS AND COURSE WORKLOAD

Event	Quantity	Duration (Hour)	Total Workload (Hour)
Class Hours (14 weeks)	14	4	56
Final Exam Preparation	1	15	15

Mid Term Exam Preparation	1	15	15
Further Study	14	5	70
Quiz 1	4	2	8
Mid Term Exam 1	1	2	2
Assignment 1	4	2	8
Final Exam	1	2	2
Preliminary Study	14	2	28
		Total Workload	204
		Total Workload / 25.5 (s)	8.00
		ECTS Credit of the Course	8