İZMİR UNIVERSITY OF ECONOMICS

Faculty of Arts and Sciences
Physics
PHYS 406 - Detector Physics

COURSE INTRODUCTION AND APPLICATION INFORMATION

Course Name	Detector Physics

Code	Semester	Theory (hour/week)	Application/Laboratory (hour/week)	Local Credits	ECTS
PHYS 406	Fall/Spring	2	2	3	5

Prerequisites	None
Course Language	English
Course Type	Elective
Course Level	First Cycle
Mode of Delivery	Online
	* Problem Solving * Q&A * Lecture / Presentation
Course Coordinator	-
Course Lecturer(s)	* Prof. Dr. Abbas Kenan ÇİFTÇİ
Course Assistants	* Araş. Gör. Dr. Hülya KARAASLAN

Course Objectives	This course will give an introduction to radiation and particle detectors, and their use in experimental physics and in different application areas.
Course Learning Outcomes	The students who succeeded in this course; * describe the fundamental physical processes for the detection of radiation and particles. * explain the working principles and characteristics of different types of detectors. * assess the applicability of different types of detectors and detector systems in physical events.

	* report on measurements performed with different types of detector. * perform data analysis to interpret the results of the experiment.
Course Description	This course covers the topics of basic physical processes for the detection of radiation and particles, the principle and characteristics of different detector types, detection systems in atomic, nuclear and particle physics, quantum optics as well as in medicine, accelerator physics and other fields, signal processing, measurement methodology and performance metrics.

Course Category	Core Courses	
	Major Area Courses	X
	Supportive Courses	
	Media and Managment Skills Courses	
	Transferable Skill Courses	

WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

Week16	Subjects	Related Materials
1	Interactions of particles with matter	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 1, 1-31. ISBN: 9780511534966
2	Interactions of radiation with matter	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 1, 31-51. ISBN: 9780511534966
3	Characteristic properties of detectors	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 2, 56-69. ISBN: 9780511534966
4	Main physical phenomena used for particle detection and basic counter types	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 5, 90-122. ISBN: 9780511534966

5	Main physical phenomena used for particle detection and basic counter types	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 5, 122-151. ISBN: 9780511534966
6	Track detectors	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 7, 186-223. ISBN: 9780511534966
7	Calorimetry, Midterm exam 1	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 8, 230-267. ISBN: 9780511534966
8	Particle identification	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 9, 273-302. ISBN: 9780511534966
9	Neutrino detectors	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 10, 307-324. ISBN: 9780511534966
10	Momentum measurement and muon detection	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 11, 327-344. ISBN: 9780511534966
11	Example of a general-purpose detector: ATLAS	ATLAS web sitesi: https://atlas.cern/
12	Data analysis, Midterm exam 2	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 15, 436-452. ISBN: 9780511534966
13	Data analysis	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 15, 452-462. ISBN: 9780511534966

14	Applications of particle detectors outside particle physics	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). Chapter 16, 466-503. ISBN: 9780511534966
15	Semester Review	
16	Final Exam	

SOURCES

Course Notes / Textbooks	Claus Grupen and Boris Shwartz, Particle Detectors, 2nd ed. (Cambridge University Press, 2008). ISBN: 9780511534966
Suggested Readings/Materials	Christian W.Fabjan and James E.Pilcher, Instrumentation in Elementary Particle Physics (World Scientific,1988). ISBN: 9789971505851

EVALUATION SYSTEM

Semester Activities	Number	Percentage of Grade
Participation	1	10
Laboratory / Application	-	-
Field Work	-	-
Quiz/Studio Critic	-	-
Portfoilo	-	-
Homework Assignment	-	-
Presentation/Jury	-	-
Project	-	-
Seminar/Workshop	-	-
Oral Exam	-	-
Midterm	2	40
Final	1	50
Total	4	100

WEIGHTING OF SEMESTER ACTIVITIES ON THE FINAL GRADE	**3**	**50**
WEIGHTING OF END-OF-SEMESTER ACTIVITIES ON THE FINAL GRADE	**1**	**50**
Total	4	100

ECTS / WORKLOAD TABLE

Semester Activities	Number	Duration (Hours)	Total Workload
Course Hours (Including Exam Week: 16 x Total Hours)	16	2	32
Laboratory / Application Hours	16	2	32
Study Hours Out of Class	14	2	28
Field Work	-	-	-
Quiz / Studio Critique	-	-	-
Portfolio	-	-	-
Homework / Assignment	-	-	-
Presentation / Jury	-	-	-
Project	-	-	-
Seminar / Workshop	-	-	-
Oral Exam	-	-	-
Midterm	2	17	34
Final	1	24	24
		Total Workload	**150**

THE RELATIONSHIP BETWEEN COURSE LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

#	Program Qualifications / Outcomes	* Level of Contribution				
		1	2	3	4	5
1	To be able master and use fundamental phenomenological and applied physical laws and applications,			X		
2	To be able to identify the problems, analyze them and produce solutions based on scientific method,			X		
3	To be able to collect necessary knowledge, able to model and self-improve in almost any area where physics is applicable and able to criticize and reestablish his/her developed models and solutions,			X		
4	To be able to communicate his/her theoretical and technical knowledge both in detail to the experts and in a simple and understandable manner to the non-experts comfortably,					
5	To be familiar with software used in area of physics extensively and able to actively use at least one of the advanced level programs in European Computer Usage License,					
6	To be able to develop and apply projects in accordance with sensitivities of society and behave according to societies, scientific and ethical values in every stage of the project that he/she is part in,					
7	To be able to evaluate every all stages effectively bestowed with universal knowledge and consciousness and has the necessary consciousness in the subject of quality governance,					
8	To be able to master abstract ideas, to be able to connect with concreate events and carry out solutions, devising experiments and collecting data, to be able to analyze and comment the results,			X		
9	To be able to refresh his/her gained knowledge and capabilities lifelong, have the consciousness to learn in his/her whole life,					
10	To be able to conduct a study both solo and in a group, to be effective actively in every all stages of independent study, join in decision making stage, able to plan and conduct using time effectively.					
11	To be able to collect data in the areas of Physics and communicate with colleagues in a foreign language ("European Language Portfolio Global Scale", Level B1).					
12	To be able to speak a second foreign at a medium level of fluency efficiently					
13	To be able to relate the knowledge accumulated throughout the human history to their field of expertise.					

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest