Işık University
Faculty of Arts and Sciences
Department of Physics

PHYS 474 - Spectroscopy

COURSE SYLLABUS

Course Name	Code	Semester	Theory (hour/week)	Application (hour/week)	Laboratory (hour/week)	Local Credits	ECTS
Spectroscopy	PHYS 474	Spring	**3**	0	**0**	**3**	5

Prerequisities	EE 361, PHYS 334

Course Language	English
Course Type	Elective
Course Level	First Cycle
Course Coordinator	-
Course Lecturer(s)	-
Course Assistants	-
Course Objectives	This is a one semester course that introduces the fundamental concepts of spectroscopy. By the end of the course, students should • recognize the basic principles of spectroscopy. • demonstrate a knowledge the nature of interaction of electromagnetic radiation with matter. • give examples of various spectroscopic techniques which operate over different and limited frequency ranges
Course Learning Outcomes	On successful completion of this course students will be able to 1. recognize the basic principles of spectroscopy and spectroscopic techniques. 2. discuss the interaction of electromagnetic radiation with atoms and molecules. 3. distinguish among the various spectroscopic techniques which operate over different and limited frequency ranges. 4. recognize the recent developments in spectroscopy.
Course Content	Basic principles of spectroscopy; interaction of radiation with matter; spectroscopic measurements and analysis; spin-orbit interaction; molecular structure and spectra; florescence and phosphorescence; Zeeman effect; mass spectroscopy; atomic absorption spectroscopy; electron paramagnetic spectroscopy; infrared spectroscopy; Raman spectroscopy; X-ray spectroscopy; Fourier transform spectroscopy.

WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

Week	Subject
1	Introduction to spectroscopy
2	Interaction of electromagnetic radiation with matter
3	Basic principles of spectroscopic techniques
4	Types of spectroscopy and their applications
5	Spectroscopic techniques in technical and research areas
6	Absorption spectroscopy, emission spectroscopy and scattering spectroscopy
7	Ionized radiation and detection by spectroscopy
8	Alpha, beta and gamma spectroscopy
9	Nuclear spectroscopy and applications
10	Spectroscopic techniques in solid state physics, florescence and phosphorescence
11	Atomic absorption spectroscopy, spectra of hydrogen atom
12	Mass spectroscopy, infrared spectroscopy
13	Electron paramagnetic spectroscopy
14	X-ray spectroscopy, Raman spectroscopy, Fourier transform spectroscopy
15	Review

TEXTBOOKS

Required Textbook(s)	Hollas J.M., *Modern Spectroscopy*, *4th Edition*, Wiley 2004. ISBN 978-0470844168
Recommended Readings	• William W. Parson, *Modern Optical Spectroscopy: With Exercises and Examples from Biophysics and Biochemistry*, 2nd Edition, Springer 2009. • D.L. Andrews, *Encyclopedia of Applied Spectroscopy*, Wiley-VCH 2009.

EVALUATION SYSTEM

Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	4	20
Homework Assignments	-	-
Presentation/Jury	1	20
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	2	40
Final/Oral Exam	1	20
Total	8	100

Percentage of Semester Work	7	80
Percentage of Final Work	1	20
Total	8	100

COURSE CATEGORY

ISCED GENERAL FIELD CODE	GENERAL FIELDS	ISCED MAIN AREA CODE	MAIN EDUCATIONAL AREAS	%
1	Eğitim	14	Öğretmen Yetiştirme ve Eğitim Bilimleri	0
2	Beşeri Bilimler ve Sanat	21	Sanat	0
2	Beşeri Bilimler ve Sanat	22	Beşeri Bilimler	0
3	Sosyal Bilimler, İşletme ve Hukuk	31	Sosyal ve Davranış Bilimleri	0
3	Sosyal Bilimler, İşletme ve Hukuk	32	Gazetecilik ve Enformasyon	0
3	Sosyal Bilimler, İşletme ve Hukuk	38	Hukuk	0
4	Bilim	42	Yaşam Bilimleri	0
4	**Bilim**	**44**	**Doğa Bilimleri**	**75**
4	**Bilim**	**46**	**Matematik ve İstatistik**	**15**
4	Bilim	48	Bilgisayar	0
5	**Mühendislik, Üretim ve İnşaat**	**52**	**Mühendislik**	**10**
5	Mühendislik, Üretim ve İnşaat	54	Üretim ve İşleme	0
5	Mühendislik, Üretim ve İnşaat	58	Mimarlık ve Yapı	0
6	Tarım	62	Tarım, Ormancılık, Hayvancılık ve Su Ürünleri	0
6	Tarım	64	Veterinerlik	0
7	Sağlık ve Refah	72	Sağlık	0
7	Sağlık ve Refah	76	Sosyal Hizmetler	0
8	Hizmet	81	Kişisel Hizmetler	0
8	Hizmet	84	Ulaştırma Hizmetleri	0
8	Hizmet	85	Çevre Koruma	0
8	Hizmet	86	Güvenlik Hizmetleri	0

THE RELATIONSHIP BETWEEN COURSE LEARNING OUTCOMES AND PROGRAM OUTCOMES

Number	Program Outcomes	Level of Contribution*				
		1	2	3	4	5
1	To have a comprehension of the core areas of physics, including classical and quantum mechanics, electromagnetism, statistical and thermal physics.					X
2	To have a comprehension of basic mathematics, including differential and integral calculus, linear algebra, differential equations and complex analysis.		X			
3	To have a comprehension of computer programming and chemistry.					
4	To have a comprehension of the importance and practice of good ethical standards.					X
5	To have a recognition of contemporary issues in science and its applications.					X
6	To have an ability to construct theoretical models, solve problems, design and conduct experiments, as well as to analyze and interpret data.					X
7	To have an ability to demonstrate their understanding of at least one advanced topic in theoretical or experimental physics.			X		
8	To have an ability to function on multi-disciplinary teams					
9	To have an ability to effectively communicate information in both written and verbal form					X
10	To have a recognition of the need for and an ability to engage in life-long learning.				X	
11	To have an ability to use modern physics techniques, skills, and computing tools necessary for physics practice (use laboratory and workshop equipment to generate data, prepare technical drawings, prepare technical reports, give technical presentations, take notes effectively, write computer programs, use mathematics and/or computational tools and packages to make models) .					X

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

Contribution of Course Learning Outcomes to Program Outcomes	The class contributes to the student development in terms of providing the fundamentals of spectroscopy and various spectroscopic techniques. Students should develop problem solving abilities and enhance critical thinking and improve their written communication skills.

ECTS / WORKLOAD TABLE

Activities	Number	Duration (Hour)	Workload (Hour)
Course Hours (Including Exam Week: 16 x Total Hours)	15	3	45
Laboratory	-	-	-
Application	-	-	-
Special Course Internship (Work Placement)	-	-	-
Field Work	-	-	-
Study Hours Out of Class	15	1.6	24
Presentations / Seminar	1	1	24
Project	-	-	-
Homework Assignments	-	-	-
Quizzes	4	0.5	4
Midterms / Oral Exams	2	9	18
Final / Oral Exam	1	2	10
		Total Workload	**125**
		Total Workload/25	**5**