Işık University
Faculty of Arts and Sciences
Department of Physics

PHYS 212 - Modern Physics

COURSE SYLLABUS

Course Name	Code	Semester	Theory (hour/week)	Application (hour/week)	Laboratory (hour/week)	Local Credits	ECTS
Modern Physics	PHYS 212	Spring	**3**	0	**0**	**3**	7

Prerequisities	None

Course Language	English
Course Type	Required
Course Level	First Cycle
Course Coordinator	-
Course Lecturer(s)	-
Course Assistants	-
Course Objectives	This is an introductory physics course on special theory of relativity, and quantum mechanics and its applications in atomic, nuclear and solid state physics. By the end of the course, students should • recognize early quantum theories and special theory of relativity, and explain the historical development of these concepts . • apply the theory of quantum mechanics to solve a variety of problems in atomic, nuclear and solid state physics. • discuss how modern physics, which was devoloped in the 20th century, is relevant to the world around them.
Course Learning Outcomes	On successful completion of this course students will be able to 1. demonstrate a conceptual understanding of the fundamentals of special relativity, wave-particle duality, quantum theory and the modern developments in cosmology and elementary particles. 2. recognize how the fundamental physical laws can be applied to solve a variety of problems. 3. analyze the properties of matter from the point of view of quantum theory. 4. describe how the concept of wave function arises in quantum theory. 5. describe Schrödinger's equations and its elementary applications. 6. explain the structure of atoms and galaxies. 7. discuss how physics is relevant to the world around them.
Course Content	Wave properties of matter, introduction to quantum theory, the quantum numbers, atomic transitions, statistical mechanics; band theory and solids, nuclear models.

WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

Week	Subject
1	Special theory of relativity
2	Momentum and energy in relativity
3	Early Models of the Atom
4	Early Models of the Atom
5	Historical origins of quantum theory
6	Quantum Mechanics
7	Quantum Mechanics
8	Quantum Mechanics of Atoms
9	Molecules and Solids
10	Molecules and Solids
11	Nuclear Physics and Radioactivity
12	Nuclear Energy, Effects and Uses of Radiation
13	Elementary Particles
14	Astrophysics and Cosmology
15	Review

TEXTBOOKS

Required Textbook(s)	Douglas C. Giancoli, *Physics for Scientists and Engineers with Modern Physics,* Prentice Hall, New Jersey, 2009 (4th Edition).
Recommended Readings	• Arthur Beiser, *Concepts of Modern Physics,* McGraw-Hill, New York 1987, 4th Ed., • George Gamov, *Thirty Years that Shook Physics*, Doubleday, New York 1966, • Steven Weinberg, *The First Three Minutes,* Basic Books, New York 1993, • Brian Greene, *The Elegant Universe*, Vintage, New York 2000, • Stephen Hawking, *The Universe in a Nutshell,* Bantam, New York 2001.

EVALUATION SYSTEM

Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	4	8
Homework Assignments	10	14
Presentation/Jury	-	-
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	2	52
Final/Oral Exam	1	26
Total	16	100

Percentage of Semester Work	15	74
Percentage of Final Work	1	26
Total	16	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**	**5**
4	**Bilim**	**44**	**Doğa Bilimleri**	**85**
4	**Bilim**	**46**	**Matematik ve İstatistik**	**10**
4	Bilim	48	Bilgisayar	0
5	Mühendislik, Üretim ve İnşaat	52	Mühendislik	0
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) .					

*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 building a solid foundation in the fields of special theory of relativity, and quantum mechanics and its applications in atomic, nuclear and solid state physics for further study in physical sciences. 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	3	45
Presentations / Seminar	-	-	-
Project	-	-	-
Homework Assignments	10	4	40
Quizzes	5	2	10
Midterms / Oral Exams	2	10	20
Final / Oral Exam	1	15	15
		Total Workload	**175**
		Total Workload/25	**7**