İZMİR UNIVERSITY OF ECONOMICS

Faculty of Arts and Sciences
Physics
PHYS 314 - Theory of Special Relativity

COURSE INTRODUCTION AND APPLICATION INFORMATION

Course Name	**Theory of Special Relativity**

Code	Semester	Theory (hour/week)	Application/Laboratory (hour/week)	Local Credits	ECTS
PHYS 314	Fall/Spring	2	2	3	5

Prerequisites	None
Course Language	English
Course Type	Elective
Course Level	First Cycle
Mode of Delivery	Online
	* Discussion * Problem Solving * Lecture / Presentation
Course Coordinator	* Prof. Dr. Abbas Kenan ÇİFTÇİ
Course Lecturer(s)	* Dr. Öğr. Üyesi Fabrizio Pinto
Course Assistants	-

Course Objectives	The objective of this course is to introduce students to the physical and mathematical structure of the theory of special relativity, which is considered as one of the most fundamental and central theories in physics.
Course Learning Outcomes	The students who succeeded in this course; * describe the fundamental properties of Einstein's theory of special relativity. * solve relativistic physics problems using the laws of relativistic kinematics. * analyze relativistic physics problems using the four-vector representation.

	* derive the laws of relativistic dynamics. * discuss the Maxwell's equations and their solutions within the framework of relativistic physics.
Course Description	The discussions in this course will involve the topics of Michelson-Morley experiment, Einstein's fundamental axioms, speed of light, Lorentz transformations, absolute time, time dilation, length contraction, relativistic optics, drag and Doppler effects, four-vector notation, four-velocity, four acceleration, four-momentum and mass-energy equivalence, de Broglie waves and photons, relativistic dynamics, Maxwell's equations in four-vector notation, and field transformations.

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	Fundamentals of special relativity and Michelson-Morley experiment	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 1.1-2. ISBN: 9780198539520
2	Inertial frames and Einstein's two axioms	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 1.4. ISBN: 9780198539520
3	Speed of light and Lorentz transformations	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 1.5-6. ISBN: 9780198539520
4	Absolute time, time dilation, length contraction	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 2. ISBN: 9780198539520

5	Relativistic optics, drag and Doppler effects	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 3. ISBN: 9780198539520
6	Spacetime and four-vectors	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 4.19-21. ISBN: 9780198539520
7	Four-vectors: four-velocity and four-acceleration	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 4.22-23. ISBN: 9780198539520
8	Four-momentum and mass-energy equivalence	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 5.25-28. ISBN: 9780198539520
9	Midterm/Project 1	
10	Four-force and relativistic dynamics	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 5.29-35. ISBN: 9780198539520
11	Maxwell's equations in four-vector notation	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 6.37-28. ISBN: 9780198539520
12	Project 2	
13	Transformations of electric and magnetic fields	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). Chapter 7.39-43. ISBN: 9780198539520
14	Project 3	
15	Semester review	
16	Final Exam	

SOURCES

Course Notes / Textbooks	Wolfgang Rindler, Introduction to Special Relativity, 2nd edn. (Clarendon, 1991). ISBN: 9780198539520
Suggested Readings/Materials	

EVALUATION SYSTEM

Semester Activities	Number	Percentage of Grade
Participation	-	-
Laboratory / Application	-	-
Field Work	-	-
Quiz/Studio Critic	-	-
Portfoilo	-	-
Homework Assignment	-	-
Presentation/Jury	-	-
Project	3	40
Seminar/Workshop	-	-
Oral Exam	-	-
Midterm	1	20
Final	1	40
Total	5	100

WEIGHTING OF SEMESTER ACTIVITIES ON THE FINAL GRADE	**4**	**60**
WEIGHTING OF END-OF-SEMESTER ACTIVITIES ON THE FINAL GRADE	**1**	**40**
Total	5	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	3	42
Field Work	-	-	-
Quiz / Studio Critique	-	-	-
Portfolio	-	-	-
Homework / Assignment	-	-	-
Presentation / Jury	-	-	-
Project	3	6	18
Seminar / Workshop	-	-	-
Oral Exam	-	-	-
Midterm	1	12	12
Final	1	14	14
		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,					
9	To be able to refresh his/her gained knowledge and capabilities lifelong, have the consciousness to learn in his/her whole life,			X		
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