مـركـز الاعـتـماد
وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Theory of Special Relativity	
2	**Course number**	0302360	
3	**Credit hours**	2h	--
	Contact hours (theory, practical)	2h, 0h	
4	**Prerequisites/corequisites**	0302351	
5	**Program title**	B.Sc. Physics	
6	**Program code**	0302	
7	**Awarding institution**	University of Jordan	
8	**School**	School of Science	
9	**Department**	Physics	
10	**Course level**	Bachelor	
11	**Year of study and semester (s)**	3rd year	
12	**Other department (s) involved in teaching the course**	--	
13	**Main teaching language**	English	
14	**Delivery method**	☑Face to face learning ☐Blended ☐Fully online	
15	**Online platforms(s)**	☑Moodle ☑Microsoft Teams ☐Skype ☐Zoom ☐Others…………	
16	**Issuing/Revision Date**	2024	

17 Course Coordinator:

Name: Dr. Khaled Bodoor Contact hours: 12:30-1:30 pm Sun,Tue and by appointment
Office number: Phone number: 22023

Email: kbodoor@ju.edu.jo

18 Other instructors:

Name: Office number: Phone number: Email: Contact hours: Name: Office number: Phone number: Email: Contact hours:

19 Course Description:

Unification of space and time (space-time), inertial frames of reference, Lorentz transformation, length contraction and time dilation, Relativity of simultaneity, time travel, causality, unification of momentum and energy, transformation of mass and energy, preliminary introduction to curved space: general relativity.

مركز الاعتماد وضمان الجودة

20 Course aims and outcomes:

A- Aims:

This course is a basic introduction to the special theory of relativity. After presenting Newtonian mechanics and Galilean relativity and frames of reference, experiments that expose the limitations of Newtonian mechanics are described in detail, including the Michelson-Morley experiment and experiments revealing the speed of light as the upper limit on speed of particles and signals. Einstein's two postulates and thought experiments are presented, from which the formulas of Special Relativity are derived in detail, including relativity of simultaneity, length contraction, time dilation, addition of velocities, etc. Relativistic dynamics are then introduced. World lines and four vectors are also introduced. Then, applications and technical consequences of Special Relativity are introduced and discussed. Providing students with a scientific details and deep understanding of physics oceanography for further studies or work in physics, oceanography, engineer and technology.

B- Students Learning Outcomes (SLOs):

For purposes of mapping the course SLOs to the physics program SLOs, at the successful completion of the physics program, graduates are expected to be able to:

SLO (1) Master professionally a broad set of knowledge concerning the fundamentals in the basic areas of physics: Quantum Mechanics, Classical Mechanics, Electrostatics and Magnetism, Thermal Physics, Optics, Theory of Special Relativity, Mathematical Physics, Electronics.

SLO (2) Apply knowledge of mathematics and fundamental concepts in the basic areas of physics to identify and solve physics related problems.

SLO (3) Utilize computers and available software in both data collections and data analysis.

SLO (4) Utilize standard laboratory equipment, modern instrumentation, and classical techniques to design and conduct experiments as well as to analyze and interpret data.

SLO (5) Develop a recognition of the need and ability to engage in life-long learning.

SLO (6) Demonstrate ability to use techniques, skills, and modern scientific tools necessary for professional practice.

SLO (7) Communicate clearly and effectively in both written and oral forms.

SLO (8) Apply proficiently team-work skills and employ team-based learning strategies.

SLO (9) Apply professional and ethical responsibility to society

مـركـز الاعـتـماد
وضمان الجودة

Course SLOs \ Program SLOs	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
Understand observers, events, frames of reference, and differentiate between inertial and non-inertial frames.	✓	✓					✓		
Understand the difference between Newtonian and Galilean concepts of space and time. Perform Galilean transformations between different inertial frames of reference.	✓	✓					✓		
Understand the Michelson-Morley experiment and its main result, namely, that the speed of light is isotropic in any given inertial frame.	✓	✓					✓		
Understand the experimental evidence for departures from Newtonian mechanics and Galilean relativity for speeds approaching the speed of light. Understand the experimental evidence for the speed of light as an upper speed limit.	✓	✓					✓		
Be able to state the fundamental postulates of special relativity.	✓	✓					✓		
Understand qualitatively the distinction between covariance and invariance of physical quantities. Be able to explain with a thought experiment the origin of the relativity of simultaneity. Be able to derive time dilation, length contraction, and other relativistic effects using light clocks and thought experiments. Derive lorentz transformations. Be able to perform velocity addition relativistically. Be able to understand the new concept of spacetime.	✓	✓					✓		
Be familiar with the concept of a space-time diagram and its use to solve elementary problems in special relativity. Understand the four-vector construct and its use in	✓	✓					✓		

relativistic calculations. Understand the new relativistic formulations and know expressions for relativistic energy, momentum, mass, force and show their relationship to their newtonian counterparts. Understand and derive Einstein's mass energy relationship.									

مـركـز الاعـتماد
وضمان الجودة

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Chapter 1 The experimental background of the theory of special relativity		Face to Face			Exams	
	1.2							
2	2.1							
	2.2							
3	3.1							
	3.2							
4	4.1							
	4.2							
5	5.1							
	5.2							
6	6.1	Chapter 2 RELATIVISTIC KINEMATICS						
	6.2							
7	7.1							
	7.2							
8	8.1							
	8.2							
9	9.1							
	9.2							
10	10.1	Chapter 3 RELATIVISTIC DYNAMICS						
	10.2							
11	11.1							
	11.2							
12	12.1							
	12.2							
13	13.1	CHAPTER IV RELATIVITY AND ELECTROMAGNETISM						
	13.2							
14	14.1							
	14.2							
15	15.1							
	15.2							

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First Exam	20%				Paper Exam
Midterm Exam	30%				Paper Exam
Final Exam	50%	All topics			Paper Exam

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

Textbook, computer, Internet access, Microsoft Teams

24 Course Policies:

A- Attendance policies:

Students are expected to attend all classes. Absence should not exceed 15%.

B- Absences from exams and submitting assignments on time:

Exam makeups will be arranged for students with valid absence excuses.

C- Health and safety procedures:

Students are required to abide by all mandated health and safety procedures.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

Cheating, plagiarism, and misbehavior will be dealt with according to University regulations.

E- Grading policy:

First: 20%, Midterm Exam: 30%, Final Exam: 50%.

F- Available university services that support achievement in the course:

Microsoft Teams, E-Learning platform, Moodle.

25 References:

مـركـز الاعـتـماد
وضـمـان الجـودة
ACCREDITATION & QUALITY ASSURANCE CENTER

A- Required book(s), assigned reading and audio-visuals:

1) Resnick, Robert. *Introduction to Special Relativity*. New York: Wiley, 1968. ISBN: 9780471717256 (required)

2) French, Anthony Philip. *Special Relativity.* New York, NY: Norton, 1968. ISBN: 9780393097931.

B- Recommended books, materials, and media:

26 Additional information:

Name of Course Coordinator: Dr. Khaled Bodoor Signature: Date: 2024
Head of Curriculum Committee/Department: ------------------------- Signature: ----------------------------------
Head of Department: -- Signature: -----------------------------
Head of Curriculum Committee/Faculty: -------------------------------------- Signature: --------------------------
Dean: -- Signature: --