هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Special Theory of Relativity**
Course Code:	**PHY4405**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☒ Others ☐ **b.** Required ☐ Elective ☒
3. Level/year at which this course is offered: 4th year
4. Pre-requisites for this course (if any):
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course will introduce you to the concepts of special theory of relativity including, but not limited to, length contraction, time dilation, the Lorentz transformation, relativistic kinematics, Doppler shifts, and even so-called "paradoxes."

2. Course Main Objective

The objective of the course is to study the fundamental concept of special theory of relativity and its applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate knowledge and broad understanding of Special Relativity	K1-I

CLOs		Aligned PLOs
1.2	Explain the meaning and significance of the postulate of Special Relativity	K2-P
1.3	Explain true nature of Lorentz transformation and Doppler effect	K2-P
1...		
2	**Skills :**	
2.1	Derive Lorentz transformations from the two postulates of special theory of relativity.	S2-I
2.2	Use the Lorentz Transformation equation todescribe events and how it will be reported by different observers in different frames of reference.	S1-P
2.3	Determine proper time and dilated time;	S1-I
2.4	Determine proper length and contracted length; Proof the invariability of physical laws;	S1-P
3	**Values:**	
3.1	Provide realistic visualization of relativistic effects	V1
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Galilean Transformations - Newtonian relativity- Electromagnetism and Newtonian relativity.	3
2	Absolute frame- The Michelson Morely experiment.	3
3	Einstein and the origin of relativity theory- The postulates of special theory of relativity.	3
4	Velocity Transformation and addition of velocities- A Three Event Problem	3
5	Relativity of simultaneity. Derivation of Lorentz transformations.	3
6	Doppler effect, space-time diagrams, time order and space-time separation of events, null cone, the twin-paradox.	3
7	Minkowski Space and Four Vectors- Proper Time a Four Scalar Momentum Energy Four Vector	3
8	Relook at Collision Problems- Zero Rest Mass Particle and Photon.	3
9	Electric & Magnetic Field Transformation	3
10	Current Density Four Vector and Maxwell Equation.	3
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate knowledge and broad understanding of Special Relativity		Short

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Explain the meaning and significance of the postulate of Special Relativity	Lectures Discussion-solve problems	quizzes, periodical and final exams.
1.3	Explain true nature of Lorentz transformation and Doppler effect		
2.0	**Skills**		
2.1	Use Michelson-Morley Interferometer Experiment to: -refute the existence of a referenced stationary aether; -proof the constancy of the speed of light.	Lectures Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Use the Lorentz Transformation equation to: -describe events and how it will be reported by different observers in different frames of reference		
2.3	Determine proper time and dilated time;		
3.0	**Values**		
3.1	Provide realistic visualization of relativistic effects	Lectures Discussion-solve problems	Short quizzes, periodical and final exams
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises and Homework	All weeks	10%
2	Participation in activities	All weeks	10%
3	Mid-term exam	5th week	30%
4	Final exam	12th week	50%
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1-Resnick Robert, Introduction to Special Relativity. New York, NY: Wiley, 1968. ISBN: 97804717172562-French, Anthony Philip. Special Relativity. New York, NY: Norton, 1968. ISBN: 9780393097931.
Essential References Materials	
Electronic Materials	https://www.space.com/36273-theory-special-relativity.html
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom • Laboratory • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show • Black Bord
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Questionnaire
Effectiveness of Student evaluation	Instructor	Exams
Extent of achieving course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Prof. Khaled Abdel-Waged
Reference No.	
Date	