

مختصر توصيف المقرر

(Course Information)

معلومات المقرر*

اسم المقرر:	الميكانيكا الكلاسيكية 1
رقم المقرر:	فيز 2112
اسم ورقم المتطلب السابق:	رياض 1022-فيز 1032
اسم ورقم المتطلب المرافق:	--
مستوى المقرر:	الثالث
الساعات المعتمدة:	3(0+0+3)
Module Title:	Classical Mechanics I
Module ID:	PHYS 2112
Prerequisite:	MTH 1022 and PHYS 1032
Co-requisite:	--
Course Level:	Third
Credit Hours:	3 (3+0+0)

Module Description

ف المقرر :

<p>Kinematics of particle motion, introductory remarks, frame of reference, Velocity and Acceleration in polar coordinates problems.</p> <p>The Newtonian formulation of mechanics, 1st, 2nd and 3rd law of motion, laws of rotation, work, energy and conservation laws, system of particles.</p> <p>Integration of Newton's equations of motion, motion under a constant force, motion under a force that is a function of time, velocity and position, time varying mass system.</p> <p>General force motion, The two-body problem, general properties of central force motion, effective potential and classification of orbits, general solutions of the problem of motion, Kepler's laws, application of general force, Newton's law of gravity, stability of circular orbits, the Apsides and the advance of perihelion, hyperbolic orbits.</p> <p>Linear oscillations, the simple harmonic oscillator, harmonic oscillations in two and three dimensions, the damped oscillator, relaxation time phenomena.</p>
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Module Aims

أهداف المقرر :

1	The students will learn the calculus of variations, and learn how the two body central force works and solved problems.	1
2	To study mechanics in non-inertial frames and the rotational motion of rigid bodies.	2
3	Solve linear oscillations problems.	3

Learning Outcomes:

مخرجات التعليم:

1	Knowledge Understand Newton's laws of motion. Describe and understand the motion of a mechanical system.	1
2	Cognitive Skills	2

	Solve the Newton's equations for simple configurations using various methods. Apply Newton's laws of motion to solve the problems.	
3	Interpersonal Skills & Responsibility Work in a group and learn time management. Learn how to search for information through library and internet. Present a short report in a written form and orally using appropriate scientific language	3
4	Communication, Information Technology, Numerical Students will be able to ask questions during the lecture and will be fully confident to solve the problems related to Newtonian mechanics Illustrate deal with confidence with differential equations, integrations, and differentials.	4
5	Psychomotor Not applicable.	5

Course Contents:

محتوى المقرر:

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
9	3	Chapter 1: Vectors, Velocity and Acceleration Mechanics, kinematics, dynamics and statics; Axioms foundations of mechanics; Mathematical models; space, time and matter; Scalars and vectors; vector algebra; laws of vector algebra, unit vectors, rectangular unit vectors, components of a vector; dot or scalar product; cross or vector product; triple product; derivatives of vectors; integrals of vectors; velocity; acceleration; relative velocity and acceleration; tangential and normal acceleration; circular motion; notation of time derivatives; gradient, divergence and curl; line integrals; independence of path; free sliding and bound vectors.
9	3	Chapter 2: Newton's Law of Motion, Work, Energy and Momentum Newton's Laws; definitions of force and mass; units of force and mass; inertial frame of references; absolute motion; work; power; kinetic energy; conservative force fields; potential energy or potential; conservation of energy; impulse; torque and angular momentum; conservation of momentum; conservation of angular momentum; non-conservative forces; statics or equilibrium of particle; stability or equilibrium.
6	2	Chapter 3: Motion in Uniform Field, Falling Bodies and Projectiles Uniform force fields; uniformly accelerated motion, weight and acceleration due to gravity; gravitational system of units; assumption of a flat earth; freely falling bodies; projectiles; potential and potential energy in a uniform force field; motion in a resisting medium; isolation the system; constrained motion; friction; statics in a uniform gravitational field.
6	2	Chapter 4: The simple harmonic oscillator and the simple pendulum The simple harmonic oscillator; amplitude; period and frequency of simple harmonic motion; energy of a simple harmonic oscillator; the damped harmonic oscillator; over damped, critically damped and under damped

		motion; forced vibrations; resonance; the simple pendulum; the two and three dimensional harmonic oscillator.
9	3	Chapter 5: Central forces and planetary motion Central forces; some important properties of central force fields; equations of motion for a particle in a central field; important equations deduced from the equations of motion; potential energy of a particle in a central field; conservation of energy; determination of the orbit from the central force; determination of the central force from the orbit; conic sections; ellipse; parabola and hyperbola; some definitions in astronomy; Kepler's laws of planetary motion; Newton's universal law of gravitation; attraction of spheres and other objects; motion in an inverse square field.
6	2	Chapter 6: Moving coordinate systems Non-inertial coordinate systems; rotating coordinate systems; derivative operators; velocity in a moving system; acceleration in a moving system; Coriolis and centripetal acceleration; motion of a particle relative to the earth; Coriolis and centripetal force; moving coordinate systems in general; the Foucault pendulum.
		EXAMS

Textbook and References:

الكتاب المقرر والمراجع المساندة:

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
1995	Wiley	Tai L. Chow	Classical mechanics
سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
1980	Addison-Wesley	Goldstein	Classical Mechanics
1998	Cambridge University Press	Hand L. N., Finch J. D.	Analytical mechanics
2005	University Science Books	Taylor J.R.	Classical Mechanics