MODULE **DESCRIPTOR**

MODULE TITLE	INTRODUCTION TO MECHANICS		
MODULE CODE	AP1841 (L4)	**CREDIT VALUE**	20 CREDITS (10 ECTS)
CAMPUS	UCLAN CYPRUS		
SCHOOL	SCHOOL OF SCIENCE		

MODULE **AIMS**

To provide a basic introduction to Mechanics including the presentation of Newton's laws of motion and the application of these, and their consequences, to simple configurations.

MODULE **CONTENT**

Units, dimensions: Definitions of velocity and acceleration for one-dimensional motion.
Kinematics in one dimension: Velocity – time diagram. Relative velocity. Uniform accelerations. Acceleration due to gravity.
Kinematics in two dimensions: Relative velocity, Motion under gravity – projectiles, Range etc. Projectile on an inclined plane. Definition of angular velocity for two-dimensional motion.
Forces: Examples of forces – reaction, tension, friction. Their vector nature. Forces in Equilibrium. Principle of moments.
Work and power: Definitions, Examples in one dimension.
Energy: Kinetic energy, potential energy. Examples in one dimension. Examples in two dimensions.
Impulse and momentum: Definitions, Conservation of momentum. Examples.
Dynamics: Newton's laws of motion for a particle – statement and examples of mainly one-dimensional motion.
Interactions: Newton's third law, Impulsive forces, bouncing – coefficient of restitution, Hard balls colliding.
First Order Differential Equations
Linear equations; integrating factors, Separable equations, Applications such as population growth and decay, reaction rates, motion under gravity with resistance, Newton's law of cooling.
Second Order Differential Equations
Solution of linear homogeneous equations with constant coefficients. Inhomogeneous equations, complementary functions, particular integrals. Simultaneous equations. Application to vibrating systems and electric circuits.
Dynamics revisited: Euler's approach to Newton's Laws
Kinematics in two dimensions: Projectiles revisited, Motion with air resistance. Motion in a circle, velocity and acceleration, vertical and horizontal, Simple pendulum.
Simple Harmonic Motion: Differential equation, solution, properties of solution. Examples of its occurrence.
Oscillations & Resonance: Linearly damped oscillator, Resonance of an undamped oscillator, Resonance of a linearly damped oscillator.
Planetary orbits: Kepler's laws. Gravity.
Rotational Motion: Moment of Inertia, Equations of Motion, Torque, Conservation of Angular Momentum, Gyroscopic Motion, Rigid Body Statics.
Special Relativity: Time dilation, length contraction, relativistic kinematics, Lorentz transform for position and velocity.

INTENDED **LEARNING OUTCOMES**

On successful completion of this module a student will be able to:	
1.	Describe and apply the concepts of mechanics.
2.	Mathematically derive certain standard results based on the laws of mechanics covered.
3.	Solve theoretical problems relating to material, including new situations.
4.	Recognise and solve various types of 1st order differential equations, including some which require transformation to standard forms
5.	Recognise and solve 2nd order, linear, constant coefficient differential equations.

TEACHING **METHODS**

The class contact will consist of lectures together with tutorials. Lectures will introduce the theory and provide examples of its application. Key elements of the learning strategy are regular worksheets in which students are encouraged to practice their Physical problem solving and mathematical techniques. These will be discussed in the tutorials.

The module will be assessed principally by examination. However, to facilitate and monitor the formative learning process selected questions from the worksheets will be submitted for assessment (some on-line) and make up the coursework component of the module. The worksheets will diagnose any deficiencies students may have in their learning and skills development and will be fed back to the students. The exams at the end of each semester will provide practice in solving problems under exam conditions.

ASSESSMENT **METHODS**

The module is assessed through Worksheets including some on-line assessment (included in coursework component) and a written examination.