F004	**Classical Mechanics 1**	L	S	P	ECTS
		2	0	1	4

Course objective.

1. To demonstrate knowledge and understanding of the following fundamental concepts in: Newtonian mechanics in one, two and three dimension, oscillations, particle motion under central forces, Newton's law of motion in non-inertial frame of reference.
2. To develop students math skills as applied to physics.

Prerequisites. General Physics 1. Differential and integral calculus at basic level.

Course content.

1. Introduction; definition and basic properties of the vector; addition of vectors; vector multiplication; mirroring; derivative and integral of a vector field.
2. Gradient; divergence and Gauss's theorem; rotation and Stokes' theorem; Laplace operator.
3. Cylindrical coordinate system; spherical coordinate system.
4. Velocity and acceleration in rectangular, cylindrical and spherical coordinate systems; circular motion;
5. Newton's axioms; inert and heavy mass; work, power, kinetic energy; conservative forces and potential energy, conservation of mechanical energy, impulse, torque and angular momentum, equilibrium of a particle.
6. Motion in a uniform force field: falling bodies and projectiles: attenuation; motion of charged particles in the Lorentz force field.
7. Free, damped and forced harmonic oscillator; resonance; two-dimensional harmonic oscillator; the mathematical pendulum.
8. Gravitational force, field, potential energy and potential; equations of motion for a particle in central force field, potential energy, energy conservation, energy graph; equivalence of Kepler's laws and the laws of gravity; virial theorem.
9. Time derivative of vectors in inertial and non-inertial systems, speed and acceleration in non-inertial systems; the equation of motion in non-inertial systems connected to the surface of the Earth; examples of motion in non-inertial systems connected to the surface of the Earth.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Apply vector calculus to solve the basic problems of classical mechanics.
2.	Understand and apply Newton's axioms.
3.	Describe the properties of the free, damped and forced harmonic oscillator.
4.	Understand the law of gravity.
5.	Understand the connection between the inertial and non-inertial frame of reference.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Class attendance	0	-	Class attendance	Evidence list	0	0
Knowledge test (preliminary exam)	2	1-5	Preparation for written examination	Written preliminary exam	25	50
Final exam	2	1-5	Repetition of teaching materials	Oral exam (and written exam)	25	50
TOTAL	4	1-5			50	100

Teaching methods and knowledge assessment. Lectures (30 hours) and auditory exercises (15 hours). Three preliminary exams (90 min.) during the semester (50% weighting) and oral exam (50% weighting), or one 2-hour written examination (50% weighting) and oral exam (50% weighting).

Can the course be taught in English: Yes

Basic literature:

1. Klasična mehanika, uvod - Z. Glumac, http://www.fizika.unios.hr/~zglumac/utm.pdf
2. Theory and Problems in Theoretical Mechanics - M. Spiegel

Recommended literature:

1. Teorijska mehanika - Z. Janković
2. Classical Mechanics - H. Goldstein
3. Mehanika - L. D. Landau, E. M. Lifšic
4. Teorijska fizika i struktura materije - I. Supek
5. Mathematical Methods of Classical Mechanics - V. I. Arnold
6. Teorijska mehanika - S. M. Targ
7. A Guided Tour of Mathematical Physics - R. Snieder, http://samizdat.mines.edu/snieder/