General Information:

Name of Course:	**BASIC LAWS, EQUATIONS AND MODELS 1**
Course Code:	IVB288ANVM
Semester:	**1**
Number of Credits:	4
Allotment of Hours per Week:	2 Lectures, 2 Seminars/Week
Evaluation:	Signature (with grade)
Prerequisites:	**None**

Instructor: **Dr. Gergely Nyitray**
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Introduction, General Course Description:

The aim of this course is to present the basic concepts of physics that students need to know for later courses and future careers. To emphasize that physics is a tool for understanding the real world. To teach transferable problem solving skills. Physics is the branch of science that describes matter, energy, space, and time in the most fundamental level. The goal is to find the most basic laws that govern the universe and to formulate those laws in the most precise way possible. The topics are the following: Kinematics, Newton's Laws, Forces, Work-Energy Theorem, Conservation of Energy, Conservation of Momentum, Multi-particle Dynamics, Rotational Dynamics, Conservation of Angular Momentum, Oscillatory Motion, Lagrangian Formalism.

Learning Objectives:

Problem-solving skills are central to an introductory physics course, these include:

- Thinking logically and analitically,
- Making simplifying assumptions,
- Constructing mathematical models,
- Using valid approximations,
- Understanding the basic laws of the universe.

Methodology:

- **Lectures**: will give an introduction to the Newtonian Mechanics.
- **Homework:** The students will receive homework to be prepared.
- **Exams:** Accumulated knowledge is tested on the one hand in during the semester as a writing exam: the students have to solve physical problems. In case the exam fails or the student want to improve the result a retake exam will be organized (up to two times). If someonen's performance (during the semester) is better than 50% the student may recive a final grade (or improve it during the examination period). If necessary, project tasks can be given and their solutions are also acceptable.

Schedule:

Week	Topic of lecture
Week 1	Course description. Orientation. Kinematics: position, displacement, velocity, acceleration.
Week 2	Kinematics in 1D, equations

Week 3	Kinematics in 2D, circular, projectile motion
Week 4	Newton's axioms, Law of inertia, Second Law, inertial frames
Week 5	Forces, applications of Newton's laws
Week 6	Work-energy theorem, principle of conservation of mechanical energy, power
Week 7	Laws of conservation, collision of two bodies
Week 8	Planetary motion, Kepler's Laws
Week 9	*Break – no class*
Week 10	Mechanics of a rigid body, rotation, moment of inertia, torque
Week 11	Problems connected with rolling objects, rolling and skidding
Week 12	Oscillations, simple harmonic motion, damped oscillations, forced oscillations
Week 13	Lagrangian formalism, Lagrange's equation, Hamilton's equation, Phase plane
Week 14	**Final exam**
Week 15	**Second exam** (only if required).

Attendance:

To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

Grading:

50%-100% - Writing Exam or PROJECT WORK

Grade:	5	4	3	2	1
Evaluation in percents:	89%-100%	77%-88%	66%-76%	46%-65%	0-45%

Students with Special Needs:

Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

Readings and Reference Materials:

Gambiattista, Richardson, Richardson: "College Physics" McGraw-Hill International Edition 2007
ISBN-13 978-0-07-110608-5

Gergely Nyitray: "Fundamental Laws, Equations and Models I"
ISBN:978-963-429-347-7