The Hebrew University of Jerusalem

Syllabus

Mechanics 1 - 77133

Last update 23-01-2024

HU Credits: 5

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Physics

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Prof Yitzchak Tuchman

Coordinator Email: tuchma@mail.huji.ac.il

Coordinator Office Hours: By individual appointment.

Teaching Staff:

Prof Yitzchak Tuchman,
Mr. Saar Beck,
Mr. Daniel Ben Hamo,
Mr. Itay Gomelski,
Mr. Mamoon Safadi,
Dr. Reuven Perel,
Dr. Amir Erez

Course/Module description:

This is an introductory course of mechanics.
Main topics are: kinematics, dynamics, work and energy, momentum, hydrostatics, hydrodynamics, statics of a rigid body.

Course/Module aims:

Understanding the basic concepts and laws of mechanics will allow the students a better understanding of the physical world in general and of physical phenomena in medicine and biology in particular.
Students will be able to participate in the following semester's course dedicated to further topics of physics, such as electromagnetism and waves.

Learning outcomes - On successful completion of this module, students should be able to:

•Explain the basic concepts and laws of mechanics and be able to apply them.
•Participate in continuation courses in physics, e.g. electricity and waves, based on the knowledge acquired in this course.
•Explain the meaning of physical concepts relevant to medicine and biology.

Attendance requirements(%):

Attendance recommended, not required.

Teaching arrangement and method of instruction: Lectures and tutorials.

Course/Module Content:

•Introduction:
Dimensions and units
scalars, vectors and algebra of vectors.

•Kinematics:
Velocity and acceleration,
motion along a straight line,

motion in two/three dimensions,
motion with constant acceleration,
circular motion,
relative motion.

•Dynamics:
mass, force,
Newton's laws,
various forces,
circular motion,
friction,
Newton's universal law of gravitation.

•Work & Energy:
work, kinetic energy,
conservative forces,
potential energy,
conservation of mechanical energy,
general law of conversation of energy,
power.

•Harmonic oscillations

•Systems of particle:
momentum,
internal forces,
center of mass,
conservation of momentum,
collisions (elastic and inelastic).

•Fluids:
pressure, density;
hydrostatics:
Pascal's principle,
Archimedes' principle; hydrodynamics:
ideal fluid,
continuity equation,
Bernoulli's equation
viscosity and Poiseuille's law.

•Statics of a rigid body:
torque,
equilibrium,
the requirements for equilibrium.

Required Reading:
No required literature.
Recommended books are, inter alia:
1. Halliday ,Resnick, Walker, “Fundamentals of Physics”.
2. Paul A. Tipler, “Physics for Scientists and Engineers”.

Additional Reading Material:
None

Grading Scheme:
Written / Oral / Practical Exam 90 %
Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 10 %

Additional information:
Weekly tutorial exercises have to be submitted.
Before the beginning of the course, it is recommended to refreshen the knowledge of calculus (derivatives and integrals) as required by the Israeli Mathematics “Bagrut”, at the level of 3 units or more.