האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

ANALYTICAL MECHANICS - 77303

Last update 25-02-2014

HU Credits: *5*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *Physics*

Academic year: *2*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Prof Lazar Friedland*

Coordinator Email: *lazar@vms.huji.ac.il*

Coordinator Office Hours: *By appointment*

Teaching Staff:

Prof Lazar Friedland
Nimrod Shaham
Paz Beniamini

Course/Module description:
A course in analytical mechanics

Course/Module aims:
See learning outcomes

Learning outcomes - On successful completion of this module, students should be able to:
Solve mechanics problems using Lagrangian and Hamiltonian formalisms.

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Lecture and recitation and problem sets.

Course/Module Content:
1. Lagrange equations: generalized coordinates, Hamilton's variation principle for holonomic systems, velocity dependent forces, non-holonomic systems.
2. Conservation Laws: energy, linear momentum, angular momentum, the virial theorem.
3. Integration of the equations of movement: problems with one degree of freedom, two body problem, movement in a central field, scattering in a central field.
4. Small oscillations: the small oscillation approximation, modes and eigen-frequencies, parametric resonance, a-harmonics oscillators.
5. Rigid Body: angular velocity, euler angles, the moment of inertia tenzor' Euler's equations, symmetric dreidel with no forces, symmetric dreidel in a gravitational field.
6. Hamilton-Jacobi theory: Hamilton equation, Poisson brackets,canonical generating transformations, Liousville theorem, Hamilton-Jacobi theorem, separation of variables, action-angle variables, adiabatic invariants.

Required Reading:
None

Additional Reading Material:

Landau and Lifshits, Mechanics, 3rd edition (Pergamon, 1976)

H.Goldstein, Classical Mechanics, 2nd edition (Addison-Wesley,1980)

Course/Module evaluation:

End of year written/oral examination 100 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:

None