האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

ANALYTICAL MECHANICS - 77303

Last update 07-10-2014

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 Barak Kol

Coordinator Email: barak_kol@phys.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Prof Barak Kol
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(%):
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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:

• הקורס מבוסס על רשימות הקורס המבוססות בתורן על הספרים שבהמשך. חומרים מסוימים של הקורס יופיעו באתר הקורס במערכת moodle http://moodle.huji.ac.il .

• Classical Mechanics, H. Goldstein,C. Poole and J. Safko (2002)

• Mechanics, Landau & Lifshitz (1960)

• Analytical Mechanics, L. Hand and J. Finch (1998)

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Course/Module evaluation:

End of year written/oral examination 90 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 10 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:

None