Instructor: Prof. Ismail Turan
Room 413, **Extension:** x5083
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Textbook: ***Classical Mechanics***, Third Edition by Herbert Goldstein, Charles P. Poole, and John L. Safko. Printed copies are available at the library.

Web Page: Follow the homeworks and posts about the course on ODTUClass:
https://odtuclass.metu.edu.tr/

Supp. Books:
- ***Analytical Mechanics***, by Louis N. Hand and Janet D. Finch.
- ***Mechanics***, by Lev D. Landau and Evgeny M. Lifshitz

Prerequisite: PHYS 336 or equivalent

Schedule: **Friday 12:40-14:45 via zoom meeting**
Link: https://zoom.us/j/7580320731?pwd=akJjc1FqYUdhcEZsQ0RwWlltdVpOdz09

Recitations: TBA

TA Info: Onur Uçanok, **Room** 127, **Extension:** x4327, **Email:** ucanoko@metu.edu.tr

Lectures: I will upload weekly videos to the ODTUClass web page. This part of the class will be asynchronously but in these videos I will deliver the lectures in real time (no slides) so that I will make sure that you will get just one week's material, not more.
Online sessions: Since the course material will be covered through video recordings, we may not need three lecture-hour long online meetings. However, a weekly meeting would still be useful to have a chance for further discussion on the material presented on videos, answer your questions, discussing homework problems etc.

Exams: All the exams are going to be organized in a face to face manner.

Grading: There will be two midterm exams and a final as well as weekly short homeworks. Midterms and homeworks will each count 20% and the final counts 40%.

Topics:
- **Survey of Elementary Principles:** Single particle and system of particles, types of constraints (holonomic, nonholonomic systems), D'Alembert's principle, Lagrangian formulation, generalized potentials, generalized forces, applications.
- **Variational Principle and Lagrange equations:** Calculus of variations, Lagrange's equations from Hamilton's principle, symmetries and conserved quantities.
- **The Central Force Problem:** Equivalent one-body formulation, equivalent one-dimensional problem, effective potential and classification of orbits, stability analysis, Bertrand's theorem, virial theorem, Kepler's problem, the Runge-Lenz vector.
- **The Rigid Body Motion:** The Euler angles, Newton's second law in noninertial frames, Centrifugal and Coriolis force terms, Angular momentum and kinetic energy of a rigid body, inertia tensor, diagonalization and principal axes, Euler equation for rigid body.
- **Coupled Oscillations:** Linearizing the problem, eigenvalues and normal modes.
- **The Hamiltonian Formulation:** Legendre Transformations and Hamiltonian formulation, canonical equations, symplectic formulation, cyclic coordinates and conservation theorems, applications.
- **Canonical Transformations:** Equations of Canonical transformation, generating functions and their basic types, examples, symplectic approach, Poisson brackets approach.
- **Hamilton-Jacobi Theory and Action-Angle Variables:** Hamilton-Jacobi Equation for both Hamilton's principal and Hamilton's characteristic functions, examples, separation of variables and ignorable coordinates, action-angle variables and connection with the frequency of systems.

Exam Dates: 1st Midterm Exam: **Friday, April 23, 2021 at 12:40** ($\sim$ after covering Chapter 3)

2nd Midterm Exam: **Friday, May 30, 2021 at 12:40** ($\sim$ after covering Chapter 8)

Final Exam: TBA

Code of Integrity: All students are expected to have academic integrity principle in all academic works. That is, a student must submit work only the student's own. Students shall comply with academic integrity codes and shall avoid situations likely to violate this code since academic dishonesty diminishes credit to the academic community.