

King Fahd University of petroleum and minerals

Department of Physics

Physics 507- Classical Mechanics

First Semester (131)

(1) **Course Description:**

Phys 507 (3-0-3): An advanced course in “Classical Mechanics”. Topics discussed include variational principles, Lagrange equations, the rigid body equations of motion, Hamilton’s equations, canonical transformations, Hamilton-Jacobi theory, small oscillations and normal coordinates, and continuous systems and fields.

(2) **Text Book**

Classical Mechanics, 3rd edition (2002), by Goldstein, Poole & Safko

(3) **Reference Books**

- 1- Classical Dynamics of Particles and Systems, by Marion and Thornton
- 2- Classical Mechanics: a contemporary approach, by Jose and Saletan
- 3- Classical Mechanics, by Corban and Stehle
- 4- Classical Mechanics [especially volume-2], by Desloge
- 5- Classical Mechanics, by Matzner and Shepley
- 6- Mathematical Methods of Classical Mechanics, by Arnold
- 7- Physical Mechanics, by Lindsay
- 8- Classical Mechanics: a modern perspective, by Barger and Olsson
- 9- The Variational Principles of Mechanics, by Lanczos
- 10- Classical Mechanics, by Kibble
- 11- Mechanics, by Landau and Lifshitz
- 12- The Feynman Lectures on Physics, by Feynman, Leighton and Sands

(4) **Evaluation:**

MID TERM EXAM	15%
FINAL EXAM	30%
HOMEWORK	35%
TERM-PAPER	10%
INTERACTION	10%

Physics 507 Lecture Schedule
Semester (131)

Week	Topics	Chapter
1	Introduction (Mathematical and Physics)	
2	Basic Mechanics	
3	Variational Calculus	2
4	Lagrangian Formulation in Proper Generalized Coordinates	2
	Lagrangian Formulation with Constraints	2
5	Hamiltonian and Routhian Formulation	8
6	Applications: Central Force Problem	3
7	Applications: Central Force Problem	3
8	Coupled (small) Oscillations	6
9	Canonical Transformations	9
10	Canonical Transformations	9
11	Poisson Bracket Formulation	9
12	Hamilton-Jacobi theory	10
13	Action-Angle Variables	10
14	Term paper presentation(s)	
	Chaos or continuous systems and fields, or relativity	11
15	Chaos	11

Notes:

Term paper title and abstract are due by the last class in Week-2

Term paper presentation due at the beginning of Week-12

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Please visit me for consultation on term papers.

INSTRUCTOR:

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