

2020 OUTLINE: CLASSICAL MECHANICS F4051

TEXT : Classical Mechanics by John R. Taylor ISBN-13:978-1-891389-22-1

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MON. & WED 8:30-9:50AM : 'VIRTUALLY' GOOGLE MEET

Parallel Mathematics: Vector Algebra Vector Calculus Gradient, Divergence and Curl
Line integral, Gauss', Divergence, and Stokes Theorems

The differential equations necessary for the course will be given in class.

I. Introduction to Mechanics (Chapter 1)..

Vector Algebra

CURVILINEAR COORDINATES Polar and cylindrical. **(HW 1)**

Given a transformation $x = x(u,v,w)$, $y = y(u,v,w)$, $z = z(u,v,w)$ find the

Basis set $\mathbf{a}_u, \mathbf{a}_v, \mathbf{a}_w$; the scale factors, h_u, h_v, h_w and $\mathbf{e}_u, \mathbf{e}_v, \mathbf{e}_w$

II. Projectiles and Charged Particles (Chapter 2)

Motion in velocity dependent forces. Linear drag for a spherical body in a fluid.

Projectiles Linear and quadratic air resistance

Motion of Charged particle in Uniform Magnetic Field ..Coupled differential equations and complex numbers. Euler's Formula...**(HW2)**

III. Momentum, Angular Momentum (Chapter 3)

Conservation Momentum. Develop the 'Rocket Equation

Center of Mass. Moments of Inertia **(HW3)**

IV. Kinetic Energy and Work (Chapter 4)

Work and Energy. Work energy theorem;

Define the 'Effective Potential' for two dimensional motion under a central force.
(HW4)

EXAM 1

VIa. Gravitation (Special Topic)

A.. Newton's Calculation of Central Forces; The solution of the Kepler Problem.

B. The Gravitational Field and the Gravitational Potential.

(HW 5)

V. Simple Harmonic Oscillator (Chapter 5)

D. Damped Oscillations

E. Driven Oscillators

F. Resonance **(HW 6)**

VI Introduction to Calculus of Variations

A. Feynman's lecture of the Principle of Least Action

B. The Euler-Lagrange Equations and Fundamental Lemma

C. Lagrange multipliers and calculations with Constraint **(HW7)**

EXAM 2 (During exam period)

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