

Subject Matter : Analytical Mechanics

Code/Credit : FIS 316/3

Prerequisite : Mechanics

Competences : After completing this course, student should have ability and be able to understand, analyze and to achieve concepts of analytical mechanics in daily activities.

Description : This course will give fundamental concepts system particles, plane motion and space motion of rigid bodies, non-inertial coordinate systems, Lagranges' equation and Hamiltonian Theory.

References:

Arya, A. 1990. *An Introduction: Classical Mechanics*. Allyn and Bacon: USA

Spiegel, Murray R.1983. *Theory and Problems of Theoretical Mechanics, Schaum's Outline Series*. McGraw-Hill International Book Co.: Singapore.

Fowless, GR. 1998. *Analytical Mechanics*. Saunders College Publishing: New York

Learning Activities

Day	Section	Part	Activities
1,2,3,4	Systems of Particles	a. System of particle and center of mass b. Motion of center of mass c. Motion of system with variable mass d. Conservation of momentum e. Angular momentum of a system particle f. An elastic and non elastic collision g. Oblique collision and scattering center of mass coordinates	Discussion, assignments and test
5,6,7	Plane motion of rigid bodies	a. Rigid bodies b. Center of mass of rigid bodies c. Motion of rigid bodies about a fixed axis d. Moment of inertia e. Parallel axis theorem	Discussion, assignments and test

		f. Perpendicular axis theorem g. Pendulum	
8	Midterm 1 test		
9,10,11	Space motion of rigid bodies	a. Angular momentum b. Tensor inertia c. Moment of inertia d. Product of inertia e. Euler's equation	Discussion, assignments and test
12,13,14	Non inertial coordinate system	a. Non-inertial coordinate system b. Translation coordinate system c. Rotating coordinate systems d. Motion of a particle relative to the earth e. Foucault pendulum	Discussion, assignments and test
15,16	Lagrangian and Hamiltonian	a. Generalized coordinates b. Lagrange's equation for a single particle c. Lagrange's equation for system of particle d. Hamiltonian methods	Discussion, assignments and test

Evaluation:

Components	Portion (%)
Assignments	20%
Attendance	10%
Participation	20%
Midterm examination	25%
Final Examination	25%