Jimma University
College of Natural Science
Department of Phys
Classical Mechanics-II Cource Outline

Course Title and Code: *Classical Mechanics II (Phys 2042)*
Credits 3 Cr.hrs _ Lecture: (3 hrs) + Tutor: (1 hrs)
Prerequisite(s): Phys 2041
Academic Year: 2012 / Semester: II
Students' Faculty: *Natural Science* Department: *Physics*
Program: Undergraduate Enrollment: Regular
Instructor's Name: Gashaw D.(MSc)

1) **Dynamics of System of Particles** (11 hrs)
1.1) System of particles and center of mass
1.2) Conservation of linear momentum
1.3) Conservation of angular momentum
1.4) Conservation of energy
1.5) Motion of systems with variable mass
1.6) Elastic collisions and conservation laws
1.7) Inelastic collisions
1.8) Two body problem in center of mass coordinate system
1.9) Collision in center of mass coordinate system
1.10) Inverse square repulsive force: Rutherford scattering

2) **Rigid Body Dynamics** (14 hrs)
2.1) Introduction
2.2) Angular momentum and kinetic energy
2.3) Inertia tensor
2.4) Moments of inertia for different body system
2.5) Principal moment of inertia and principal Axes
2.6) Inertial ellipsoid
2.7) More about the properties of the inertial tensor
2.8) Angular velocity and Eulerian angles
2.9) Eulerian equations of motion for a rigid body
2.10) The principle of virtual work

3) **Theory of Small Oscillations** (13 hrs)
3.1) Equilibrium and potential energy
3.2) Two coupled oscillators and normal coordinates
3.3) Theory of small oscillations
3.4) Small oscillations in normal coordinates
3.5) Tensor formulation for the theory of small oscillations
3.6) Weak coupling

3.7) General problem of coupled oscillations
3.8) Sympathetic vibrations and beats
3.9) Molecular vibrations
3.10) Loaded string
3.11) Dissipative systems and forced oscillations

4) **Wave Propagation** (7 hrs)
4.1) Introduction
4.2) Wave equation
4.3) Reflection
4.4) Transmission
4.5) Interference
4.6) Polarization

Assessment
_ Homework will consist of selected end of chapter problems: 20%
_ In-class participation (asking questions, discussing homework, answering questions): 5%
_ quizzes and Tests (25%),
_ All in all the continuous assessment covers 50 %
_ Final Semester Examination (50%)

Recommended References
Course Textbook
1. Walter Hauser, Introduction to principles of mechanics, Addison Wesley, 1966.
2. Jery Marion, Classical Dynamics of Particles and Systems, 1994.

References
1. Marion Thoronton, Classical Dynamics of Particles and Systems, 4th ed., 1995
2. Murrey R. Speigle, Schaum's Outline series: Theory and problems of theatrical mechanics
3. Devid Morin, Introduction to Classical Mechanics: with problems and solutions, Cambridge University Press, 2008.
4. R. Taylor, Calassical Mechanics, Universal Science, 2005
5. H. Goldstein, Classical Mechanics, Addison Welsey 3rd ed., 2001.
6. K. R. Symon, Mechanics, Addison Welsey 3rd ed., 1971.