Phy102: Physics I - Syllabus

July 30, 2012

1 Course content:

Broadly, the course content is as follows:

Transformation of Vectors, Newton's Second Law, Conservative and Non-Conservative Forces; Central Force Motion, Harmonic Oscillator Non-Inertial Frames of Reference, Angular Momentum and Rigid Body Dynamics, Special Theory of Relativity.

Details follow.

2 Lecture-wise break-up (rough)

#	Topic	Lectures
1	Transformation of Scalars and Vectors under Rotation, Newton's Second Law, Forces of Nature	2
2	Solving Newton's Equations of Motion in Polar Coordinates for problems involving Constraint and Friction, extension to Cylindrical and Spherical Coordinates	6
3	Potential Energy Function, $\mathbf{F} = -\nabla V$, Conservative and Non-Conservative Forces	3
4	Central Forces, Conservation of Angular Momentum, Centrifugal Term and Effective Potential Energy, Energy Equation and Energy Diagrams, Elliptical, Parabolic, and Hyperbolic Orbits, Satellite Maneuvers	3
5	Harmonic Oscillator, Damped Harmonic Motion, Forced Oscillations and Resonance, inclusion of Nonlinear Force and Chaotic Motion, Phase- Space Description	5
6	Non-Inertial Frames of Reference, Principle of Equivalence, Centrifugal and Coriolis Forces, Weather Systems, Foucault Pendulum	3
7	Angular Momentum and Torque, Rigid Body Dynamics, Degrees of Freedom, Angular Velocity Vector, Moment of inertia Tensor, Principal Axes, Torque-Free Precession, Gyroscopes, Euler's Equations	8
8	Special Theory of Relativity, Michelson-Morley Experiment, Postulates, Derivation of Lorentz Transformation, Concept of Simultaneity, Length Contraction, Time Dilation, Velocity Addition, Relativistic Dynamics, Energy-Momentum Conservation in Collisions, Energy-Mass Relation	10