

PHYS 601 Course Outline F2003

Newton's laws

 Mechanics of a system of particles

 Conservation Laws

 Lagrange's equations

Constraints

 D'Alembert's principle

 Constants of motion

 Examples

Variational Principles

 Hamilton's principle

 Calculus of variations

Two body central force

 Lagrangian approach

 Periodic and quasiperiodic orbits

 Inverse square law potential

 Scattering - collisions

Exam #1

Kinematics of rigid body motion

 Coordinates

 Orthogonal transformations

 Euler's theorems

 Rate of change of a vector - Coriolis force

Rigid body equations of motion

 Energy and Angular momentum

 Inertia tensor

 Torque free motion

Small oscillations

 Free motion- normal modes

 Driven motion

Special Relativity

 Lorenz transformations

 Four vectors

 Relativistic motion of charged particles

Exam #2

Hamilton's equations

 Construction

 Relativistic motion

- Cyclic coordinates and conservation laws
- Variational principles
- Geometric optics
- Phase space
- Synplectic notation
- Canonical transformations
- Action angle variables - quantization
- Liouville theorem
- Adiabatic invariants
- Perturbation theory
- Chaos
- Continuous systems
 - Vibrations in mechanical systems
 - Electromagnetic fields

Final Exam