

# Physics 603 - Classical Mechanics

## Dr. Ian Balitsky, Spring 2017

### Course information

#### 1. Information:

- Office: OCNPS 323
- Phone: 683-5814, 269-7383 (JLab)
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- Office hours: TBD

#### 2. Textbook:

- A.L. Fetter and D. Walecka *Theoretical Mechanics of Particles and Continua*, ISBN-13: 978-0486432618

#### 3. Grade (out of 100%):

- Homework: 40% (collaboration is permitted only at the stage of discussion)
- Midterm : 20%
- Final (comprehensive): 40%

### Course Outline

#### 1. Basic Principles

- Newton laws
- Systems of particles
- Central forces
- Two-body motion with a central potential
- Scattering

#### 2. Accelerated Coordinate Systems

- Rotating coordinate systems
- Infinitesimal rotations
- Accelerations
- Newton's laws in accelerated coordinate systems

### 3. Lagrangian Dynamics

- Constrained motion and generalized coordinates
- D'Alembert principle
- Lagrange equations
- Variational formulation and Hamilton principle
- Symmetry principles and conserved quantities

### 4. Small Oscillations

- Formulation
- Normal modes
- Many degrees of freedom
- Transition from discrete to continuous systems

### 5. Rigid Bodies

- General theory
- Euler equations
- Euler angles
- Torque free motion

### 6. Hamiltonian Dynamics

- Hamilton equations
- Canonical transformations
- Hamilton-Jacobi theory
- Action-angle variables
- Poisson brackets