

PHYSICS 504 Spring 2025

ELECTRICITY & MAGNETISM II
(Prerequisites)

(I) Graduate Classical Mechanics at the level of Physics 507 or
Rutgers challenge exam program:

- **Basic:** Lagrangian mechanics, invariance under point transformations, generalized coordinates and momenta, curved configuration space, phase space, dynamical systems, orbits in phase space, phase space flows, fixed points, stable and unstable, canonical transformations, Poisson brackets, differential forms, Liouville's theorem, the natural symplectic 2-form and generating functions, Hamilton-Jacobi theory. integrable systems, adiabatic invariants.

(II) Graduate E&M at the level of Physics 503
(A. Zangwill, "Modern Electrodynamics", First Edition; Chapters 1-10) or
Rutgers challenge exam program:

- **Basic:** Gauss law, differential and integral form Poisson and Laplace equations, Green's theorem, Dirichlet and Neumann boundary conditions, boundary value problems with cylindrical and spherical symmetry, Laplace equation in cylindrical and spherical coordinates, steady current, Biot and Savart Law, Ampère's law, vector and scalar potentials, Faraday's law, Maxwell's equations.