

SYLLABUS

The course covers at least the first four chapters of the textbook entitled “Relativistic Quantum Mechanics” by Bjorken and Drell, namely:

1. The Dirac Equation:
 - Formulation of a Relativistic Quantum Theory
 - Early Attempts
 - The Dirac Equation
 - Nonrelativistic Correspondence
2. Lorentz Covariance of the Dirac Equation
 - Covariant Form of the Dirac Equation
 - Proof of Covariance
 - Space Reflection
 - Bilinear Covariants
3. Solutions to the Dirac Equation for a Free Particle
 - Plane Wave Solutions
 - Projection Operators for Energy and Spin
 - Physical Interpretation of Free-particle Solutions and Wave Packets
4. The Foldy-Wouthuysen Transformation
 - Introduction
 - Free-particle Transformation
 - The General Transformation
 - The Hydrogen Atom

The grade will be based on:

- weekly oral presentations consisting of the details of the derivations involved in the development of the course material;
- a final report compiling all the oral presentations; and
- one hour talk open to physics students and faculty pertaining to the foundation of relativistic quantum mechanics.