Quantum Field Theory for Mathematicians

- Hamiltonian Mechanics and Symplectic Geometry

- Lagrangian Mechanics

- Quantum Mechanics
  - Survey of Approaches to Quantum Mechanics and Quantization
  - Examples of Quantization
    * Canonical Quantization: Quantization of Linear Phase Space
    * Canonical Quantization: Anti-commuting variables and Clifford Algebras
    * Quantization of Spin and Flag Manifolds
  - Path Integral Quantization
  - Supersymmetric Quantum Mechanics
  - Introduction to Scattering Theory

- Classical Field Theory

- Relativistic Fields, Poincaré Group and Wigner Classification

- Free Quantum Fields: Scalar Fields

- Free Quantum Fields: Spinor Fields

- Free Quantum Fields: Maxwell Theory

- Feynman Diagrams and Perturbation Theory

- Outline of Renormalization Theory

- Two-dimensional quantum fields: Conformal Field Theory

- Virasoro and Kac-Moody algebras and their Representation Theory

- 2d-fermions, Ising Model

- Wess-Zumino-Witten Models, Gauged Wess-Zumino-Witten Models

- Classical Yang-Mills Theory, Self-duality Equations

- Quantization of Yang-Mills Theory: Exact Solution of 2d Case

- Gauge Anomalies and Chiral Fermions

- BRST Quantization and Lie algebra Cohomology

- Topological Quantum Field Theories: Jones-Witten Theory

- Topological Quantum Field Theories: Gromov-Witten Invariants

- Topological Quantum Field Theories: Donaldson Theory, Floer Homology, Seiberg-Witten