✓ **Chapter 4**: The Formal Theory Of Potential Scattering

- The time-dependent
  - The free wave packet state
  - The time-dependent scattering state
- The time-independent formalism
  - The stationary scattering states
  - The Lippmann-schwinger equation
  - Orthogonality and completeness
  - The T-matrix
  - The S-matrix
  - The unitary of the S-matrix. The optical theorem
- Asymptotic properties and the cross section
  - The asymptotic stationary scattering wave function
  - Asymptotic wave packet. The cross section
- Coherence properties of particle beams
  - The structure of the physical probability current
  - A model for the incident beam

✓ **Chapter 5**: The Formal Theory Of Reactions

- The general formalism for two-body channels
  - Channel
  - Reaction state
  - The T and S-matrices
  - The optical theorem
  - The cross section
  - The principle of micro-reversibility
- The differential reaction cross section
  - Spin-coupled channel state
  - Spin-coupled scattering matrices
  - The unpolarized differential cross section
- Single step-approximation
  - The plan wave born approximation(PWBA)
  - The distorted wave born approximation(DWBA)

- Coupled channels
  - The Coupled channel formalism for inelastic scattering
  - The Coupled channel Born approximation (CCBA)
  - Coupled reaction channels

✓ **Chapter 6**: The Optical Model

- The generalized optical model (GOP)
  - The general form of the GOP operator
  - A schematic model: the model space
  - Derivation of the model-GOP
  - Analyticity, non-locality and the pauli principle
- The optical potential
  - The elastic S-matrix
  - Compound-elastic and shape-elastic scattering
  - The optical potential in the proper sense
  - The relation between the GOP and the optical potential
- The equivalent local optical potential
  - The trivially equivalent local potential
  - The equivalent local potential in WKB
- Dispersion relation
  - Derivation of the dispersion relation
  - An application of the dispersion relation