Prerequisites You should make sure you are familiar with relativistic notation including four-vectors, and the Dirac formulation of quantum mechanics, including the Fermi Golden Rule.

Concept of a scattering cross section §2.4.1, Quantum mechanical scattering §4.1; The Born approximation §4.1.2. Feynman rules in quantum mechanics §5, Yukawa potential §4.3, propagator, virtual particle exchange §5.2.4. Resonance scattering, Breit-Wigner; decay widths §2.4.2. Fermi's golden rule §2.B.1. Use of invariants in relativistic particle decay and formation §5.

Elastic and inelastic scattering §2.3; form factors §2.4.3. Structure of the nucleus: nuclear mass & binding energies §2.2; stability, radioactivity §2.2.1, α §2.3.1 and β decay §2.3.2; measurement of radioactivity with semiconductor detectors §8.C.1; Fermi theory §2.3.2, the (A, Z) plane §2.2.1.

Energy production through fission (nuclear reactors) §7.1, fusion ($p - p$ and $D - T$) in the Sun and Tokamaks §7.2. The $p-p$ & CNO cycles §7.3. Solar neutrinos §7.3,§6.5. Stellar structure §7.3; formation of heavier elements §7.3.4.

Quark model of hadrons §3: the light meson §3.3.2 and baryon §3.3.1 multiplets; nucleons as bound states of quarks; §3.1 quarkonium §3.6; the ratio of cross-sections ($e^+ + e^-$ to hadrons) to ($e^+ + e^-$ to muons) §6.3.2; phenomenology of deep inelastic scattering §6.3.1.

The Standard Model: quark and lepton families §6.1, fundamental interactions and flavour mixing §6.3,§6.4. The strong interaction and qualitative discussion of confinement §3.4,§6.3. Weak interaction §6.4; decay of the neutron §6.4 and parity violation §6.4.3. Production, experimental detection, and decay of the W and Z bosons §6.4.2; the width of the Z and the number of neutrino types §6.4.2; neutrino oscillation §6.5.