Scattering Theory

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This is a short course of 6 lectures in weeks 7 and 8 of MT02. It is intended primarily for

- first year graduate students in (experimental) Particle Physics, for whom it forms part of their graduate lecture course on Particle Physics;
- fourth year undergraduates reading Physics or Physics and Philosophy and who are taking the fourth-year option B6 (Theoretical Physics), for whom it covers the part of the syllabus *Quantum Mechanics: scattering theory for non-relativistic particles*;
- first year graduate students in Theoretical Physics, if they have not covered the material already and would find it useful.

Topics to be covered:

Stationary state formalism via the time-independent Schrodinger equation. Scattering amplitude; differential cross section. Partial wave expansion. Phase shifts. Unitarity. Optical Theorem. Resonances.

Green function approach. The Lippmann-Schwinger equation in coordinate space. Expression for the scattering amplitude. Born approximation. Born series. Operator version of L-S equation. Green function in momentum space.

Time-dependent formulation via the Interaction Picture. Time-dependent Green function. S matrix, T matrix. Unitarity.

Books (in order of increasing difficulty) :

Aitchison and Hey 'Gauge Theories in Particle Physics' 3rd edtn (2002) Vol 1 Appendix F, Appendix G, Appendix H.

Shankar 'Principles of QM' (Plenum, 1980) ch 19

Schiff Q.M. 3rd edition chs 5, 9

Merzbacher QM 3rd edition chs 13, 20

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