

First Year Physics*Special Relativity - 10 lectures: Dr R A Taylor***SYNOPSIS**

The search for the Ether and the Michelson-Morley experiment. The speed of light. A historical perspective of the development of the special theory of relativity.

Einstein's two postulates of special relativity. The Lorentz transformation and elementary consequences thereof, including length contraction and time dilation.

Minkowski diagram. Proper time and invariant space-time intervals. The twins paradox.

Addition of velocities. Importance of momentum. Energy, momentum and rest mass. Transformation of E and p. Invariants.

Collision problems. Threshold energies. LAB and CM frames of reference. Unstable particle decays at rest and in flight.

The photon and other massless particles. Compton scattering and the Doppler effect (longitudinal only).

As I have ten lectures available I shall work through several selected problems to demonstrate the application of some of the concepts introduced during the course of the lectures, as well as spending some time on the so-called paradoxes of special relativity.

BOOKS

There are very many titles to choose from at various levels of difficulty and with different approaches so don't feel restricted to the list below; consult tutors and libraries. The standard introductory texts for Special Relativity are (1 & 3).

- 1) "Special Relativity", A P French, MIT Physics Series, Nelson 1968 (PB).
- 2) "Introducing Special Relativity", W S C Williams, Taylor and Francis 2002 (PB)
- 3) "Spacetime Physics", E F Taylor & J A Wheeler, (2nd ed) Freeman 1992 (PB) An introduction to both special and general relativity.
- 4) "Introductory Special Relativity", W G V Rosser, 1991 (PB) Gives good coverage of both the first and second year courses on Special Relativity, if in a slightly odd order.

More advanced books for reference:

- 5) "Lectures on Special Relativity", M G Bowler, Pergamon 1986 (PB).
- 6) "Special Theory of Relativity", H Muirhead, Macmillan 1973 (PB).

General Interest:

- 7) "Relativity - The Special and General Theory", Albert Einstein, University Paperbacks 1960 (PB)
- 8) "Subtle is the Lord - The Science and the Life of Albert Einstein", Abraham Pais, OUP 1982 (PB)

There are usually good sections on special relativity in many of the general physics text books that are in print.