

SYLLABUS

Climate dynamics: Radiative heat transfer. Greenhouse effect. Enhanced greenhouse effect. Convection. Energy balance models. Weathering, the carbon cycle. Ice ages.

Rivers: Chezy and Manning flow laws. Slowly varying flow; flood hydrograph. Rapidly varying flow, St. Venant equations. Steady states; waves, shocks; instability, roll waves. Tidal bores.

Sediment transport: Patterns and bedforms. Bedload transport; the Exner equation. Suspended sediment. Potential flow model. St. Venant type models. Anti-dunes and dunes. Bars, meanders, deltas.

Convection: Mantle convection. Rayleigh-Benard convection: linear stability, boundary layer convection. Double diffusive convection. Convection in a slot: volcanic vents, fingering. Plumes.

Glacier dynamics: Glacier flow, ice sheets. The shallow ice approximation. Ice shelves, the grounding line. Waves and surges. Surface waves. Subglacial sliding. Subglacial drainage. Seasonal waves. Linked cavity systems and surges.

Prime Text/s:

- 1.K. Richards 1982 Rivers. Methuen.
- 2.G. B. Whitham 1974 Linear and nonlinear waves. Wiley, New York.
- 3.W. S. B. Paterson 1994 The physics of glaciers, 3rd edition. Pergamon
- 4.Press.
- 5.J. T. Houghton 2002 The physics of atmospheres, 3rd ed. C.U.P., Cambridge.
- 6.J.S. Turner, Buoyancy effects in fluids, C.U.P., Cambridge (1973).
- 7.G.K. Batchelor, H.K. Moffatt and M.G. Worster (eds.), Perspectives in fluid dynamics, C.U.P., Cambridge (2000).