

PHY690M (Transport in Mesoscopic Systems) 2009-10-I

Instructor: Anjan Gupta (SB107C) (anjankg@iitk.ac.in)

Schedule: T 09:00-10:00; Th 11:00-12:00; F 12:00-13:00; TB-111

Course Content:

This is a first course in Mesoscopic Physics. The students must have a background in quantum mechanics at least at the level of Phy204 or Phy431. Some basic understanding in condensed matter physics is also desirable.

Tentatively, I plan to discuss the following topics in this course:

- 1) Ballistic and diffusive transport
- 2) Experimental Fabrication and Measurement Techniques
- 3) Phase coherence and interference effects
- 4) Interaction effects and dephasing (e-e interactions, exchange effects and impurity scattering)
- 5) Quantum dots, Quantum point contacts and Coulomb Blockade
- 6) Quantum Hall Effect (in 2DEG and Graphene)
- 7) Mesoscopic Superconductivity
- 8) Noise in mesoscopic systems
- 9) Spin transport

Reference Books:

- 1) Introduction to mesoscopic physics, by Y. Imry
- 2) Electronic Transport in Mesoscopic Systems, by Supriyo Datta
- 3) Mesoscopic Physics: An introduction, by Harmans (available online).

Evaluation: Out of 200 marks

Homeworks: 20 marks

1st Mid-Sem: 40 marks

2nd Mid-Sem OR Term Paper: 40 marks

End Sem: 100 marks