

CONDENSED MATTER PHENOMENA IN LOW DIMENSIONAL MATERIALS (PHY 642) 2024-25, 2nd Semester

Instructor: Sudipta Dubey

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Prerequisite:

PHY 543

Course Content:

Fundamental concepts of geometric quantities: Berry curvature, Berry phase, intrinsic orbital magnetic moment. Aharonov-Bohm effect. Geometric effects in Bloch bands, Anomalous velocity and connection with the Berry curvature. Boltzmann transport equation. Hall effect: Classical and quantum Hall effects. Concept of chiral edge states. Spin-orbit coupled semiconductor system. Dirac materials: Tight-binding Hamiltonian in honeycomb lattice: Graphene and h-BN materials. quantum Hall effect in graphene. Current research

Class Schedule:

Every Monday, Wednesday, from 5.15 p.m. – 6.30 p.m.

Division of Marks

Tentative:

- In-class assessment: 50 pts
- Mid-Sem: 20 pts
- End-Sem: 30 pts

There would be regular presentations and substantial points allocated to them as part of in-class/mid-sem/end-sem assessments. There will be no make-up for in-class and mid-sem assessments. Negative marking will not be there except for end-sem assessment make-up. The detailed modality of the presentation will be decided after the add/drop period once the total number of students is known, and may change as course progresses.

Attendance policy:

Institute rule will apply. Appropriate action will be taken in case the attendance of a student in the course is not found satisfactory. Attendance may be taken any time during the class.

This is a first course handout and there may be changes as the course progresses depending on the student's performance.