

Department of Physics, IIT Kanpur

693A-INTRODUCTION TO SPINTRONICS (2022-23, 2nd Semester)

Objective:

The course will systematically introduce the basic framework of spin-dependent transport phenomena which includes magnetoresistance, magnonic waves, and domain wall propagation and their device applications. The different methods of generation and detection of spin currents will be covered in the course. Finally, the design and development of new emerging spin-based logic and memory devices with their functionality will be also covered. This course will be useful for PG as well as advanced UG students

Instructor:

Rohit Medwal (Southern Lab 204, rmedwal@iitk.ac.in, Ph.2309)

Lecture Schedule:

Monday, Wednesday, and Friday 9:00 AM – 10:00 AM

Classes start on 5th January 2023

Content:

1. Review of magnetism, quantum mechanics and condense matter physics.
2. Spin-orbit interactions in condensed matter systems.
3. Spin-dependent transport in solids.
4. Spin dynamics and spin relaxation.
5. Electrical detection of spin current.
6. Spin-based devices and their functionalities.

Grading:

1	Project (report +presentation):	30%
2	Assignment 1	10%
3	Midsem Exam	20%
4	Assignment 2	10%
5	Final Presentation	30%

References:

- **Physics of Ferromagnetism**, Soshin Chikazumi
- **Nanomagnetism and Spintronics**, Teruya Shinjo
- **Introduction to Spintronics**, S. Bandyopadhyay and M. Cahay
- **Spin Current**, Sadamichi Maekawa, Sergio O. Valenzuela, Eiji Saitoh, Takashi Kimura
- **Spintronics: Fundamentals and applications**, I. Zutic, J. Fabian, and S. Das Sarma, Reviews of Modern Physics 76, 323 (2004)