1.	Title of the course	Magnetism and Superconductivity
2.	Course number	PH607L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To PH6023/9
6.	To be offered by	Department of Physics
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	**Course Objective(s):** To provide the quantum description of magnetism and superconductivity. Magnetism part includes various magnetic orderings with microscopic descriptions and their application. Superconducting part will be an introductory level which includes type I and II superconductors, phenomenological models, high-temperature superconductivity, and applications.	
10.	**Course Content:** Magnetism: magnetic dipole moment, orbital and spin contributions, paramagnetism, exchange interactions and different types of magnetic order, mean field approximation, magnetic anisotropy, magnetic domains and wall, single domain particles, magnetization reversal mechanisms, hard magnets, soft magnets, magnetostriction, magnetoresistance, Hubbard model. Superconductivity: experimental observations - transition temperature, Meissner-Ochsenfeld effect, type I and II superconductors; phenomenological description - thermodynamics, London and Pippardâ€™s equations, Ginzburg-Landau theory; microscopic theory - Cooper pairs, Bardeen-Cooper-Schrieffer ground state, excitation, energy gap, tunneling, critical current; flux quantization - Josephson effect, pair tunneling, quantum interference, high-temperature superconductors.	
11.	**Textbook(s):** 1. Blundell S, *Magnetism in Condensed Matter*, 1st Edition, Oxford (2001). 2. Enss C and Hunklinger S, *Low-Temperature Physics*, 1st Edition, Springer (2005).	
12.	**Reference(s):** 1. Ashcroft N W and Mermin N D, *Solid State Physics*, 1st Edition, Cengage (2003). 2. Buckel W and Kleiner R, *Superconductivity: Fundamentals and Applications*, Taylor & Francis (1999). 3. Kittel C, *Introduction to Solid State Physics*, 12th Edition, Wiley (2012). 4. de Gennes P G, *Superconductivity of Metals and Alloys*, Taylor & Francis (1999).	