

Courses Physics NOC:A brief course on Superconductivity (Video) Syllabus Co-ordinated by: IIT Guwahati

Available from : 2018-11-20 Lec :1

Modules / Lectures	
Intro Video	
Introduction of Superconductivity and BCS Theory	
o Historical introduction of superconductivity	
o Meissner effect, Electrodynamics of Superconductors, coherence length and penetration depth	
Electron Pairing, Basics of BCS Theory	
BCS Theory and thermodynamics properties	
Unconventional Superconductivity	
Non-Fermi Liquid Theory, Josephson Junctions	
Live Session	
PMRFivesession	

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A brief course on Superconductivity [Intr... Superconductivity]

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Physics IIT Guwahati

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Prof. S. Basu

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A BRIEF COURSE ON SUPERCONDUCTIVITY

PROF. SAURABH BASU

Department of Physics

IIT Guwahati

TYPE OF COURSE : Rerun | Elective | UG/PG

COURSE DURATION : 4 weeks (24 Jan' 22 - 18 Feb' 22)

EXAM DATE : 27 Mar 2022

PRE-REQUISITES : Solid State Physics

INTENDED AUDIENCE : B.Tech (Material Science) and M.Sc (Physics, Material Science) and PhD students, lecturers (Solid state Physics)

INDUSTRIES APPLICABLE TO : Companies into material science and ceramic research will be benefitted.

COURSE OUTLINE :

The course deals with the basics of superconductivity, including Meissner effect, electrodynamic response, -type-I and type-II superconductors etc. BCS theory, the only microscopic theory of superconductivity is discussed in details with a view to understand superconducting transition temperature and its relation to the pairing gap. Further Ginzburg Landau theory is introduced which is a phenomenological theory that is applicable in general to second order phase transitions. A few experimental methods to explore the superconducting gap are discussed. Unconventional superconductivity is elaborately talk about with regard to the unusual normal phase of the high T_c cuprates and ramification due to the breakdown of Landau's Fermi liquid theory therein is emphasized. Finally Josephson effect is introduced and its applications to superconducting circuits are studied. Special emphasis is given to DC SQUID which uses Josephson junctions and has a variety of applications, such as sensors, amplifiers, magnetometers etc .

ABOUT INSTRUCTOR :

Prof. Saurabh Basu is a professor at the Department of Physics, IIT Guwahati. The area of expertise is Theoretical Condensed Matter Physics, with special emphasis on the correlated boson and fermion systems, topological insulators. He has about 90 research publications in different refereed international journals.


COURSE PLAN :

Week 1: Principles of Superconductivity, London equations, Penetration depth, Coherence Length

Week 2: Type-I and Type-II superconductors, linear response theory, BCS theory, Boundary value problems at high frequencies

Week 3: Basics of Josephson junctions, SQUIDS, Application of SQUIDS, Quantum Logic circuit

Week 4: Introduction to High- T_c superconductivity, Graphite superconductors, Fe- based superconductors


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Department: Basic Sciences

201820-20191

REPORT


FDP on "A Brief Course on superconductivity"

Date of program: 20-11-2018 to 20-12-2018

Resource person: Saurabh Basu

About the Program: NPTEL Course on Superconductivity that refreshes and enhances knowledge on superconductors and the research on superconductors

Signature of the Faculty member


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