



MHRD scheme on Global Initiative for Academic Network (GIAN)

(www.gian.iitkgp.ac.in)

From August 26th to September 1st, 2017

An Introduction to Topological Insulators and Superconductors



Government of India
Ministry of Human Resource
Development

Overview: Department of Physics, IIT Delhi-110016

Topology is a branch of mathematics that describes the global geometrical properties unaffected by continuous change of geometrical features of a figure. Nobel Prize in Physics in 2016 recognizes that as early as in late sixties, using the concept of topology, physicists were able to show that in lower dimensional thin films novel type of superfluid and superconducting phases can occur that are fundamentally different from their counterpart in usual three spatial dimensions. The discovery of Quantum Hall Effect (awarded Nobel Prize in 1985 and 1998) is considered as a hallmark achievement in this direction where physicists used the concept of topology to understand a very novel type of phase in “dirty” condensed matter systems. As was emphasized in the press release accompanying the Nobel Prize in Physics in 2016, “Over the last decade, this area has boosted frontline research in condensed matter physics, not least because of the hope that topological materials could be used in new generations of electronics and superconductors, or in future quantum computers.”

What the course is about?

To provide a pedagogical and simultaneously in-depth understanding of the field of Topological Insulators and Superconductors. The course will cover topics like “Berry Phase, Time Reversal Symmetry, Chern insulators and Z_2 Topological Insulators, Bulk Edge Correspondence, Observable Properties of Topological Insulators, Topological Superconductors, Classification of free fermion Hamiltonians.”

The course will consist of seven two-hour lectures. Each lecture will be followed by a tutorial /problem solving session that will be conducted with the help of teaching assistants. The course participants will learn the subject matter by attending the lectures as well as solving the home-work problem in the tutorial session.

Registration: Register at [http:// www.gian.iitkgp.ac.in](http://www.gian.iitkgp.ac.in) by 30th of July, 2017
Selected Candidates will be informed by 4th August, 2017

Modules	<ul style="list-style-type: none"> A: Lectures - August 26,2017-September 01, 2017 (Forenoon) B: Tutorial – August 26, 2017- September 01, 2017 (Afternoon) Number of participants (outside IIT Delhi) for the course will be limited to thirty.
Who Should Attend	<ul style="list-style-type: none"> Ph.D. students and Post Doctoral fellows working in the relevant area in various academic institutes (supported by a recommendation letter sent to giantopology@gmail.com) Faculty members working in academic institutions having interest in relevant field /members of industry or research organizations with proven interest in the relevant field Exceptionally bright undergraduate and masters students with strong interest in the relevant field (need to be supported by recommendation letter)
Fees	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> IIT Delhi students and Faculty(Free) Ph.D. and Post Doctoral Fellows from other Academic Institutes : Rs. 5000 Faculties from Academic Institute: Rs. 10000 Professionals from Industry/ Research Organizations: Rs. 15000 Participants from abroad: US \$ 500 <p>Fees will be accepted through Demand Draft drawn in favour of “IITD CEP Account” or through e-transfer to IITD CEP ACCOUNTS. The above fee include all instructional materials, computer and internet use, honorarium to Teaching Assistants, tea and lunch for the participants. Limited number of accommodation may be available on payment basis. For that participants need to send request giantopology@gmail.com with subject “accommodation request” well in advance</p>

Teaching Faculty



• Prof. Shivaji L. Sondhi is a renowned Theoretical Condensed Matter Physicist and Professor in the Physics Department of Princeton University. He worked extensively in the field of Quantum Hall Systems, Frustrated Magnetic Systems, Cuprate Superconductors, Topological Phases in Condensed Matter systems and in several other fields. A number of theoretical predictions made by his research group in condensed matter systems was later on experimentally confirmed. He is a fellow of American Physical Society, recipient of “William L. McMillan Award”, Bergman Award, Alfred P. Sloan Fellowship, David and Lucille Packard Fellowship and many other distinctions.

The Course Co-ordinator



• Dr. Sankalpa Ghosh is an Associate Professor in the Department of Physics, IIT Delhi. and a Theoretical Condensed Matter Physicist. His field of interest is low dimensional condensed matter systems and quantum phases in ultra cold atomic systems.
• Teaching Assistants: Adhip Agarwala (IISC, ICTS) and Ronak Soni (TIFR)

Course Co-ordinator

Dr. Sankalpa Ghosh
Phone: 011-2659-1322
E-mail: giantopology@gmail.com/
sankalpa@physics.iitd.ac.in

<http://www.gian.iitkgp.ac.in/GREGN>