Master of Science in Physical Sciences
Department of Physical Sciences
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Education

BS-MS Dual Degree
Indian Institute of Science Education & Research, Kolkata, 2012-2017
Major: Physics
CGPA : 8.96/10

Research Interests

Differential Geometry, Algebraic Topology, Mathematical formulation of Gauge Theory & String Theory and Geometries in Physics.

Research Objective

To give a mathematical structure which can unify quantum field theory and general relativity.

Current Works

Attending courses on Measure Theory, Ring and Field Theory, Geometry of Curves & Surfaces, Differential Geometry and having regular discussions with Dr. Somnath Basu on Vector Bundles and Algebraic Topology.

Research Works

Masters Thesis (Aug 2016 - May 2017): *On Einstein-Gauss-Bonnet gravity in five dimensional space-time*
Advisor: Prof. Narayan Banerjee, Department of Physical Sciences, IISER Kolkata.
Abstract: Schwarzschild exterior solution in vacuum and Birkhoff's Theorem are well-known in 4-D Einstein's General Relativity Theory. We investigated Schwarzschild analogue solution, Birkhoff's Theorem and TOV equations for 5D Gauss-Bonnet Gravity. We also found that there exists the global monopole metric associated with the field equation $H_{\mu\nu} = 0$.

Independent Study (Aug 2016 - December 2016): *Grassmannian as a metric space.*
Advisor: Dr. Somnath Basu, Department of Mathematics and Statistics, IISER Kolkata.
Work: We showed grassmannian $(G_k(\mathbb{R}^n))$ to be a metric space and discussed it's topological properties.
Detailed Report: link
Independent Study (Jan 2017 - May 2017): *Tautological bundle on Grassmannian*
Advisor: Dr. Somnath Basu, Department of Mathematics and Statistics, IISER Kolkata.
Work: We showed that Grassmannian is a smooth manifold and obtained the tautological bundles over grassmannian.

Summer Projects

Summer 2015: *Simulation of experimental setup using Finesse and gravitational waves data analysis.*
Advisor: Dr. Rajesh Kumble Nayak, Department of Physical Sciences, IISER Kolkata.

Summer 2014: *A brief study on the stability of the orbits of LISA.*
Advisor: Dr. Rajesh Kumble Nayak, Department of Physical Sciences, IISER Kolkata.
Detailed Report: link

Semester Projects

Nov 2016: *A brief study of linear driven damped oscillator.*
Advisor: Dr. Rajesh Kumble Nayak, Department of Physical Sciences, IISER Kolkata.
Detailed Report: link

Jan-May 2016: *Observation of two-photon absorption using Z-scan measurement.*
Advisor: Dr. Bipul Pal, Department of Physical Sciences, IISER Kolkata.
Detailed Report: link

Feb-April 2015: *Designing Neutron source in laboratory scale.*
Advisors: Dr. Bipul Pal & Prof. Narayan Banerjee, DPS, IISER Kolkata.
Detailed Report: link

Oct-Nov 2013: *Magnetic Lift.*
Advisor: Dr. Dibyendu Nandi, Department of Physical Sciences, IISER Kolkata.
Description: We used the induced magnetic field (which is generated by the current passing through a coil) to build a magnetic lift.

Theoretical Background

Physics: Classical Mechanics (Lagrangian & Hamiltonian Formalism); Basic & Advanced Quantum Mechanics; Waves & Optics; Electromagnetism; Basic & Advanced Statistical Mechanics; Mathematical Methods for Physics (Differential Equations, Fourier & Laplace transform, Complex Analysis, Group Theory); Basic Astrophysics; Non-linear Dynamics; Special & General Theory of Relativity; Condensed Matter Physics; Quantum Field Theory; Higgs Mechanism.

Mathematics: Real Analysis; Linear Algebra; Topology; Graph Theory; Probability & Statistics (theory and laboratory); Differential Geometry; Analysis-III; Multivariable Calculus; Group Theory.

Workshops & Schools attended

Workshop on J-holomorphic curves and Gromov-Witten Invariants
National Institute of Science Education and Research Bhubaneswar, Odisha, India, July 2017
Winter School on Radio Astronomy
Ooty Radio Astronomy Center, NCRA-TIFR, Ooty, India, June 2016
Workshop on Optics
National Institute of Technology, Goa, India, March 2013

Academic Achievements

Recipient of *INSPIRE Fellowship*, awarded by Department of Science and Technology, Govt. of India for pursuing sciences at IISER Kolkata, 2012-2017.

Received *Ananta Charitable Trust Scholarship* and *West Bengal Merit Cum Means Scholarship* in Class 10th, 2010.

Recipient of *Raksha Bandhan Scholarship* from Jadavpur University for Class 10th Board Examination, 2010.

Computational Skills

Programming Languages: Python 2 & 3, Gnuplot, C and Mathematica
Platforms: Linux Bash & Windows Command Prompt

Languages

I am well versed in English and can communicate in English fluently. I got a TOEFL score of 95/120, with 26 in writing and 23 in speaking. My mother tongue is Bengali and I can speak Hindi and Oriya fairly well.

Teaching & Extracurricular Activities

Teaching assistant of 4th year students in General Relativity.

Taught at Ek-Pehal (an IISER Kolkata student initiative to teach financially weak children), 2015.

Convener of the chess club at IISER Kolkata, 2014-2015.

Event Organizer of Biommemetics at Inquivesta (college fest), 2013.

Hobbies

Teaching, playing Chess and Go, reading detective novels and non-fictions.