BarKoushik

INSPIRE Scholar

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TOEFL iBT Scores
Reading-29
Listening-27
Speaking-26
Writing-25

Education

2013 - **BS-MS Dual Degree** Indian Institute Of Science Education & Research, Kolkata
• 1st and 2nd semester: Physics, Chemistry, Mathematics, Biology, Earth Science, Computer Science • 3rd and 4th semester: Physics, Mathematics, Earth Sciences • 5th-9th semester: Major: Physics, Minor: Mathematics • Majoring in physics, with present CGPA 8.15

2011 - 2013 **Higher Secondary (XIIth)** Jawahar Navodaya Vidayalaya, Nadia, W.B (India)
Physics, Maths, Chemistry, Biology, English. Grade obtained(Physics+Maths+Chemistry): 89%

2006 - 2011 **Secondary (Xth)** Jawahar Navodaya Vidayalaya, Howrah, W.B (India)
Maths, Physics, Chemistry, Geography, Economics, History, Civics, Hindi, Biology, English, Bengali. Grade obtained: 9.2

2001 - 2006 **Primary Education** Ananda Nikatan Vidyamandir, Bagnan, Howrah, W.B (India)
Maths, Sciences, Geography, History, English, Bengali

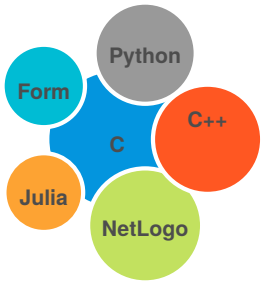
Courses Completed

5th Year **Semester 9th & 10th**
PH5101: MS Thesis, PH5102: Quantum Electrodynamics, PH5103: Optics and Electrodynamics

4th Year **Semester 7th & 8th**
PH4203: Research Methodology, PH4204: High Energy Physics, PH4205: General Theory of Relativity and Cosmology, PH4207: Quantum Information Processing, ID4201: Evolutionary Dynamics, :Differential Geometry and Manifolds
PH4101: Basic Condensed Matter Physics, PH4102: Introductory Astrophysics, PH4103: Condensed Matter Laboratory, PH4105: Advanced Mathematical Methods of Physics, PH4106: Basics of Field Theory and Relativistic Quantum Mechanics, ID4109: Inverse Theory

3rd Year **Semester 5th & 6th**
PH3201: Basic Statistical Mechanics, PH3202: Intermediate Electricity and Magnetism, PH3203: Advanced Quantum Mechanics, PH3204: Advanced Optics Laboratory, PH3205: Basic Nuclear Physics (Theory and Laboratory), ES3203: Seismology, ES3202: Geotechnical Engineering.
PH3101: Intermediate Classical Mechanics, PH3102: Intermediate Quantum Mechanics, PH3103: Mathematical Methods of Physics, PH3104: Electronics Laboratory, PH3105: Computational Physics (C), MA3104: Elementary Number Theory, MA3105: Computer Laboratory

Programming



2nd Year

Semester 3rd & 4th

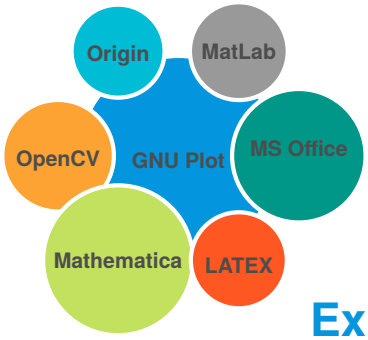
PH2201: Classical Mechanics and Introduction to Quantum mechanics, PH2202: Thermal Physics, PH2203: Physics Laboratory IV, MA2201: Probability and Statistics, MA2202: Analysis II, MA1203: Maths Foundation II, ES2201: Geophysics, ES2202: Structural Geology and Tectonics.
PH2101: Physics III (Waves and optics), PH2102: Electricity and Electronics, PH2103: Physics Laboratory III, MA2101: Analysis I, MA2101: Linear Algebra, MA2103: Maths Foundations I, ES2101: Biogeochemical Surface Processes, ES2102: Hydrology and Geomorphology.

1st Year

Semester 1st & 2nd

PH1201: Special Theory of Relativity and Nuclear Physics, PH1202: Physics Lab II, MA1201: Mathematics II, ES1201: Earth and Planetary Sciences II, CS1201: Introduction to Computer Programming II (Python), LS1201: Introduction to Biology II, LS1202: Introduction to Biology (Laboratory) II, CH1201: General Physical Chemistry, CH1202: Physical Chemistry Laboratory.
PH1101: Physics I(Basic Mechanics), PH1102: Physics Laboratory I, MA1101: Mathematics I, ES1101: Earth and Planetary Sciences I, CS1101: Introduction to Computer Programming (Python) I, LS1101: Introduction to Biology I, LS1102: Biology Laboratory I, CH1101: Elements of Chemistry, CH1102: Chemistry Lab I.

Packages



OS Preference

Linux ★★★★★
Windows ★★★★★
MacOS ★★★☆☆

Languages

Bengali ★★★★★
English ★★★★☆
Hindi ★★★★☆

Experience

2017

MS Project Guide: Dr. S Gangopadhay

We have studied the formulation of density matrix elements and computation of entanglement entropy for continuum QFT using replica trick, and performing calculations for 2D CFT. We are trying to study the holographic computation of the entanglement entropy from AdS/CFT correspondence. We are exploring how entanglement entropy of small subsystems follows an analogous property to that of first law of thermodynamics when the system is excited, and how entanglement entropy changes with increase in energy of a certain region.

2017

Summer Project Guide: Dr. Shankhadeep Chakroborty

Aspects of Conformal Field Theory: We have studied conformal transformations, their generators; the group algebra for $d \geq 3$ and $d = 2$; correlation functions, their form and changes under conformal transformations; radial quantization; creation of states in radial quantization and its cylindrical interpretation; interpretation of SCT operator and the momentum operator as the lowering and raising operator for scaling dimensions; action of dilatation operator as hamiltonian, and operator product exapansion.

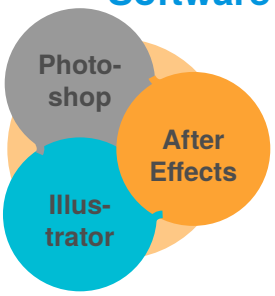
Teaching Experience

2016

Teaching Assistant: PH1202, Physics Laboratory II.

Teaching high school students [9th and 10th Standard], Under EkPahel (An initiative to teach underprivileged students free of cost)

Other Software



Personal Skills

2016

Project Guide: Professor P.K Panigrahi

Combination of Fermionic and Bosonic oscillator to form Supersymmetric oscillator, and Supersymmetric partner potential: We have studied the meaning of symmetry in physics and what supersymmetry is. Then we discuss bosonic and fermionic quantum harmonic oscillators, which are combined with the next section to show the formation of a supersymmetric oscillator. We studied the generators of supersymmetry, how supersymmetry operation converts bosonic system into fermionic system and vice versa, and the formalism to obtain supersymmetric system from two systems, termed as supersymmetric partners. Later we studied that a non-trival potential can be solved using its supersymmetric partner potential, where we have used the example of a particle in an infinite potential well.

2016

Laboratory Project Guide: Dr. Nirmalya Ghosh

Measurement of Linear Retardance and Optical Rotation of SLM using Stokes Vector & Mueller matrix formalism: The state of polarization of a beam of light can be represented by four measurable intensities (Stokes Vector). The Mueller matrix describes the transfer function of any medium in its interaction with polarized light. We have constructed the stokes vector for two different liner polarization of a beam of light after passing through the SLM material. Combining the two reasults we have obtained the linear retardance, the orientation of axis of retardance, and the optical rotation.

2016

Project Guide: Dr.Bipul Pal

In this project we use the property of neutron that it do not interact with electromagnetic waves. We present possible mechanisms by which free neutrons can be produced and detected, by means of nuclear reactions involving laboratory scale experiments. We also look into the effectiveness of the different mechanisms of different sizes of neutrons.

2015

Summer Project Guide: Professor P.K Panigrahi

Coherent states, Renyi entropy, Analysis of Cat State & Basics of Quantum Information and Qubits: We have studied the concept of Von Neumann entropy and Renyi entropy and the procedure for calculation of the same. Coherent states, formation of Cat state, photon distribution function of the coherent states were also studied. We have have converted the Cat state in momentum space, found the corresponding density operators and found the Renyi entropy for position and momentum space. We visualised the entropy variation by changing different parameters of the Cat state.

2014

Summer Project Guide: Dr. Arindam Kundragami

Vector Analysis and visualization of Curl, Divergence, Gradient and analysis of different Solution of Laplace's equation: We have discussed and the properties of Curl, Divergence & Gradient and provided physical interpretation. We studied the Helmholtz theorem, properties of irrotational and solenoidal field. We studied the Laplace equation as a special case of Poisson's equation. Finally we studied the solution of Laplace's equation and used it to determine the potential in different problems.

Academic Projects

2017 **PH4204** Guide: Dr. Ritesh K. Singh
For SU(3) gauge group I had to identify the massive and massless gauge bosons for three different Higgs Field.

2017 **PH4201** Guide: Dr.Kamaraju Natarajan
We have checked the validity of Drude model in the Terahertz range by comparing different simulated reasults of GaAs with experimental data.

2015 **PH3105** Guide: Dr. Ritesh K. Singh
Deterministic Evolution: A model of Opinion among a population (C Simulation).

2015 **PH3105** Guide: Dr. Ritesh K. Singh
Study of different random number distribution and proving Central Limit Theorem (C simulation).

2015 **PH3105** Guide: Dr. Ritesh K. Singh
Comparision of degree of error associated with different numerical methods(C simulation).

2015 **MA3105** Guide: Dr. Koel Das
Creating programme interface for library book storage (C simulation).

2014 **PH2101** Guide: Dr. Bipul Pal
Pendulum Wave (Practically Created).

2014 **CS1202** Guide: Dr. Rangeet Bhattacharyya
Nuclear decay Of Uranium (Python simulation).

2013 **CS1201** Guide: Dr. Ananda Dasgupta
Study of fractals, Koch curve, Cantor Dust, Sierpinski Triangle and their properties. (Python simulation).

2013 **CS1201** Guide: Dr. Ananda Dasgupta
Motion of a football under Magnus force (Python simulation).

Conferences, Camps and Seminars Attended

2011 **National Science Camp** PEC University of Technology Auditorium, Chandigarh
Intel IRIS National Fair (Initiative for Research and Innovation in Science) from 17th Nov. to 20th Nov. Organised by Intel at PEC University of Technology, Chandigarh.

2013 **National Science Camp** J N Tata Auditorium, Sir CV Raman Avenue, Bangalore
National Science Camp, Vijyoshi, in December organized by KVPY and INSPIRE in association with IISc, Bangalore.

2014 **National Science Camp** Science City Auditorium, JBS Haldane Avenue, Kolkata
National Science Camp, Vijyoshi, in December organized by KVPY and INSPIRE in association with IISER Kolkata.

2014 **International Camp** Hyatt Regency Kolkata, Sector III, Salt Lake City
ASPC - Asian Student Photonics Conference, organised by the International Society for Optics and Photonics (SPIE), 8-21 July, Kolkata.

2016 **Regional Camp** LHC Complex, Mohanpur, IISER-K
Synchrotron Radiation: Application to Condensed Matter Physics in January, organised by Dept. of Physical Sciences, IISER Kolkata.

2016 **Institute Organised** LHC Complex, Mohanpur, IISER-K
Stability Of Solar System: By Cedric Villani in August, organised by Dept. of Mathematical Sciences, IISER Kolkata

Scholarships and Extracurricular Activities

INSPIRE Scholarship by Govt. of India

Innovation in Science Pursuit for Inspired Research (INSPIRE), Scholarship sponsored and managed by the Department of Science Technology, for the top 1% students in India at 12th standard.

Students' Coordinator of IISM'16 Core Committee

IISM is Inter IISER Sports Meet, an annual event among the basic science institutes of India. Where all the 10 institutes, 7 IISER's IISc, NISER, and CEBS takes part. IISM hosting institute hosts more than 1000 students with about 40+ sporting events. IISM Core Committee is responsible for organising the event in association with the host institute.

Core Committee Member of Inquivesta'15

Inquivesta is annual Science Fest Of IISER-Kolkata, it is the largest Science Fest in India organised by students of any institute. The 12 member Inquivesta Core Committee is responsible for organising the fest along with publlicity and sponsorship.

Designing Committee, Inquivesta'15

The Designing Committee takes care of social media, posters, banners, website, promos, brochures, templates, etc, for about more than 30+ events.

Sceretary of FCIK, 2014-2015.

The Football Club of IISER Kolkata (FCIK), takes care of all football related activites in the institute. It is responsible for the formation of the Institute Football Team.

Organiser of LOST'14

LOST - Land of Secret Treasure, the mega event of Inquivesta'14. A treasure hunting event with lots of science and puzzles, it alone draws participants from more than 25+ institutes.

School Captain of My Secondary School, from 2008 to 2011

Participation in Arts, Culture and Science Competetions

Winner of Face painting competition 2016 IISER-Kol, Winner of Clay Modelling Competition, 2016 IISER-K, Art Exhibition 2016 IISER Kolkata,
Winner of Water colour painting competition Regional level 2010, Winner of Cluster level Water colour painting competition 2007, 2008, 2010,
Representing My Secondary School at regional level in Drama Competition, Drama competition winner at cluster level 2009.
Cluster level junior-debate winner 2006, Cluster level debate winner 2009.
Regional Science exhibition winner 2009. Cluster level science Exhibition winner 2009.

Participation in Sports

Two times Inter IISER Sports Meet Football Champion 2014,2016, Two times Inter IISER Sports Meet Football Runners Up 2013,2015,
Three times Inter IISER Sports Meet Kho-Kho Runners Up. 2013, 2014, 2015.
Inter IISER Sports Meet Sports-Quiz winner 2015.
Cluster level Kho-Kho champion 2006, 2007, 2008. Regional level Kho-Kho champion 2007
Clustel level Table-Tenis Champion 2009
Regional level Cricket team Runners Up 2009.

Nov 12th, 2017

Koushik Bar