Archisman Panigrahi

3rd year Undergraduate · Physics Major

Indian Institute of Science, Bangalore, India

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Education

B.S. (Research) in Physics   *Bangalore, India*

INDIAN INSTITUTE OF SCIENCE   *Aug. 2017 - Apr. 2021 (expected)*

- Current C.G.P.A - $9.7/10$

Higher Secondary Examination (XIIth standard)   *West Bengal Counsil of Higher Secondary Education, India*

HOOGHLY COLLEGIATE SCHOOL   *2015 - 2017*

- Obtained 1st rank in Board

Secondary Examination (X^{th} standard)   *West Bengal Board of Secondary Education , India*

HOOGHLY COLLEGIATE SCHOOL   *2005 - 2015*

- Obtained 2nd rank in Board

Skills

Strong in Topics	Classical Electromagnetism, Statistical Mechanics, Quantum Mechanics, Classical Thermodynamics
Mathematical skills	Integral Calculus, Linear Algebra, Trigonometry
	Able to perform long algebraic calculations
Softwares	Familiar with MATLAB/Octave, Mathematica, Microsoft Excel
Computer languages	Familiar with basic data structures and numerical computation in C
Languages	Fluent in English, Bengali, Hindi

Projects

Nano Heat Engines   *IISc, Bangalore*

WITH PROF. H. R. KRISHNAMURTHY   *May 2019 - July 2019*

- Studied how harmonic oscillators, two state systems can be used as efficient heat engines
- Read Articles claiming they surpassed Carnot efficiency with "squeezing", and figured out the sense in which Carnot efficiency is surpassed
- Studied how one can produce such a squeezed state of a harmonic oscillator using "squeezed thermal bath"
- Studied about Brownian Motion and Langevin equation
- Solved the Langevin equation for a special kind of random force, for which a classical harmonic oscillator behaves like a squeezed state
- Created a computer simulation to verify the nature of this solution

Various topics on the Special Theory of Relativity   *IISc, Bangalore*

WITH PROF. SUBROTO MUKERJEE   *May 2018 - June 2018*

- Studied basics of Special theory of relativity - four vector notation, Lorentz transformations, relativistic momentum and energy
- Studied how electric and magnetic field behave under change of reference frames
- Worked out a detailed example of how a signal travelling faster than light can violate causality (see *Articles* section below)
- Studied relativistic Doppler effect of an electromagnetic wave travelling in a medium

Relevant Courses Taken

Textbooks are given in brackets to indicate the level of the course

SEMESTER I

- **Introductory Physics I – Mechanics, Oscillations and Waves** (An Introduction to Mechanics - **Kleppner & Kolenkow**)
- **Analysis and Linear Algebra I** (Calculus, Volume I - **Apostol**; Linear Algebra and its Applications - **Strang**)
- **Algorithms and Programming (in C)**

SEMESTER II

- **Introductory Physics II – Electricity, Magnetism and Optics** (Introduction to Electrodynamics by **David J. Griffiths**)
- **Analysis and Linear Algebra II** (Calculus, Volume II - **Apostol**; Linear Algebra and its Applications - **Strang**)
- **Introduction to Electrical and Electronics Engineering**

Semester III

- **Introductory Physics Ill - Thermal and Modern Physics** (Thermodynamics - **Enrico Fermi**; Fundamentals of Physics - **Halliday**, **Resnick** and **Walker**; PHYSICS For Scientists and Engineers - **Serway & Jewett**)
- **Probability and Statistics** (An Introduction to Probability Theory and its Applications - Vol. I - **Feller**; Intoduction to Probability and Statistics for Scientists and Engineers)
- **Introduction to Materials Science (Semester 3)**

Semester IV

- **Intermediate Mechanics, Oscillations and Waves** (The **Feynman** Lectures, Vol I,II;)
- **Intermediate Electromagnetism and the Quantum Physics of Radiation** (The **Feynman** Lectures, Vol I,II; Introduction to Electrodynamics by **David J. Griffiths**)
- **Intermediate Thermal Physics and the Physics of Materials** (Thermodynamics and Introduction to Thermostatistics - **Callen**; Fundamentals of Statistical and Thermal Physics - **F. Reif**)
- **Numerical methods for solving differential equations**

Semester V

- **Classical Mechanics** (Classical Mechanics - **Goldstein**; Mechanics **Landau and Lifshitz**)
- **Quantum Mechanics I** (Quantum Mechanics - **Cohen-Tannoudji, Diu** and **Laloe**; Principles of Quantum Mechanics - **Shankar**)
- **Mathematical Methods of Physics** (Mathematics for Physicists - **Dennery** and **Krzywicki**; Mathematical Methods for Physicists - **Arfken, Weber** and **Harris**)
- **Fundamentals of Astrophysics** (Astrophysics for Physicists - **Rai Choudhuri**; Astrophysics in a Nutshell - **Maoz**)
- **Solid State Physics** (The Oxford Solid State Basics - **Simon**, Solid State Physics - **Ashcroft & Mermin**)

Semester VI

- **Statistical Mechanics**
- **Quantum Mechanics II**
- **Quantum Measurements**
- **Quantum Computation**
- **Electromagnetic Theory**
- **Physics at Nanoscales**

Topics of Interest

- **Theoretical Condensed Matter Physics**
- **Emergent phenomena in Condensed Matter due to topological effects**
- **Nano Heat Engines**
- **Brownian Motion**
- **Applications of Statistical Mechanics in classical and quantum systems**
- **Photonics**

Achievements

2017-19	**C.G.P.A** 9.7/10	*IISc, Bangalore*
2017	**I rank (99.2 %) in Board** in Higher Secondary Examination	*West Bengal, India*
2017	**10th Rank** in National Entrance Screening Test (NEST)	*India*
2017	Qualified for JEE Mains (All India Rank - 381) - an all India Engineering entrance	
2017	Qualified for JEE Advanced examination (All India Rank- 543), Entrance examination of Indian Institutes of Technology (IIT)	
2017	Qualified for Indian Statistical Institute, Kolkata and Chennai Mathematical Institute	
2015	Qualified for K.V.P.Y (All India Rank - 128)	
2015	**II rank (97.57 %) in Board** in Secondary Examination	*West Bengal, India*

Articles

These are some articles I have written (not published anywhere, click on the title to download)

- A Study of Generation of Classical Squeezed States Using Stochastic Force, and Their Applications in Building Highly Efficient Heat Engines (2019)
- Review article - A detailed example of how causality is violated when information travels faster than speed of light in vaccum (2018)
- Review article - Doppler effect of electromagnetic waves in refractive medium (2018)
- A Geometric Method to obtain Harmonic Mean of Two numbers (2016)

References

- Prof. **Hulikal Ramaiengar Krishnamurthy**, Dept. of Physics, Indian Institute of Science, Bangalore.
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