# Archisman Panigrahi

3rd year Undergraduate · Physics Major
*Indian Institute of Science, Bangalore, India*
(+91) 7980591664 | archismanp@iisc.ac.in

## 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 ($XII^{th}$ standard)

*West Bengal Counsil of Higher Secondary Education, India*

Hooghly Collegiate School

*2015 - 2017*

- Obtained $1^{st}$ rank in Board

### Secondary Examination ($X^{th}$ standard)

*West Bengal Board of Secondary Education , India*

Hooghly Collegiate School

*2005 - 2015*

- Obtained $2^{nd}$ 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 III - 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**)

## 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)

- 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.
  Email Address - hrkrish@iisc.ac.in