# Jwalit N Panchal

Roll No.: M.Sc 0211522
Integrated M.Sc Physics
UM-Department of Atomic Energy CEBS, Mumbai

+91-9585234073
jwalit.panchal@cbs.ac.in


## Education

### UM-Department of Atomic Energy CEBS, Mumbai

*Integrated M.Sc Physics* — *CGPA*

- **Semester 4 (Jan,2023-May,2023)** 8.90
- **Semester 3 (Aug,2022-Dec,2022)** 8.94
- **Semester 2 (Jan,2022-May,2022)** 8.98
- **Semester 1 (Aug,2021-Dec,2021)** 9.24

### Chinmaya Residential School, Coimbatore

*Central Board of Secondary Education Percentage*

- **12th (2020)** 95.20
- **10th (2018)** 94.00

## Technical Skills and Research Interests

### Programming

- C++
- Fortran-90
- Python
- C
- LaTeX programming

### Laboratory-Skills

- MCU programming and automation
- DIY-ing electronics
- Using Bread-Boards and PCBs
- Handling standard optical equipment
- Spectrometer

### Softwares

- MATLAB
- LabView
- Gnuplot
- Root

### Languages

- English
- Hindi
- Gujarati

### Softskills

- Poetry-writing
- Prose-writing
- Communication

### Coursework

- Numerical methods in Physics (computational Physics)
  Solving linear and non-linear ODEs using RK-4 method, YEE algorithm to solve coupled Maxwell-PDEs, Matrix-inversion, Tridag-solution, Root-finding using, Golden-section search for Minima and maxima finding.
- Advanced Classical Mechanics
  Lagrangian Mechanics, Hamiltonian Mechanics, Discrete to continuous system, Klein-Gordon equation for fields
- Quantum Mechanics
  Wave-mechanics picture, Particle in a box, Abstract-algebra picture of QM, Dirac-notations, Quantum-Harmonic Oscillator, Heisenberg and Schrodinger picture, Angular momenta- orbital and spin.
- Statistical Mechanics and condensed matter physics
- Mathematical-Physics
  Multi-variable calculus, Tensor analysis, Reciprocal Basis, Groups, O(3) and SO(3) spaces, ODEs, power-series solutions, special functions, Linear Vector spaces
- Linear Algebra Courses
- Multi-variable Calculus
- Computational and Statistical Physics- about quantum statistics of Basons, Fermions. Photon statistics, occupation number.

### Research Interest

- **High Energy Physics**
  High-energy Heavy-ion Collision Physics, QCD Phase diagram studies, studies about QGP cross-over at low Baryon densities, and $2^{nd}$ order phase transition at high baryon denisty, mechanism of formation of light nuclei in Hadron Resonance Gas (coalescence models), Excited Resonance signals in Collision data.
- **Quantum-computation**
  Quantum-many body Physics, Quantum-chaos, Qunatum-transport process, integrable systems, entanglement, Potential Qubit systems, coupling of qubits, correction algorithms, factorization of integers using Qubits, enhancing cooling in quantum refrigerators.
- **Computational Astrophysics** Modelling and Analysing data from observation-stations, Simulation of Astrophysical-fluid dynamics, effects of magnetic fields on plasma (like solar-flairs), evolution of neutron-stars, accreation proccesses.

## Past Work Experience and Projects

**•Introduction to HRG and its Applications** *May 2024 - July 2024*

*With **Prof. Victor Roy**, School of Physical Sciences, NISER, Bhubaneshwar*

– Hadron Resonance Gas (HRG) was studied. The statistical thermalization model equations were used to predict number densities, particle-yields out of the fireball. Using data from **ALIC collaboration groups** and plots as guideposts, a comparative study of the same was done. Ideal Hadron Resonance gas was studied along with its short-coming. Pressure and number-density under Boltzmann approximation were studied.

**•Implementing FDTD method for Transformation Optics** *May 23 - July 23*

*With Prof.Bhooshan Paradkar, Department of Physics, UM-DAE CEBS*

– YEE algoritm, a particular implementation of FDTD method, was used to make a Maxwell-solver. It was used to simulate cylindrically symmetric waves, plane waves and waves incident on and travelling in anisotropic media.

**•Numerical Solution to Coupled-PDEs** *Dec 22 - Jan 23*

*With Prof.Bhooshan Paradkar, Department of Physics, UM-DAE CEBS*

– Coupled PDE-systems and numerical methods for solution approximation were studied like Euler-method, RK method. Then Lorenz-attractor equations were numerically approximated using python.

**•Study of Hilbert Spaces (Reading Project)** *May 16th, 2023 - June, 2023*

*With Prof.Ameeya Bhagwat, Department of Physics, UM-DAE CEBS*

– Study of Metric-spaces, vector-spaces, inner-product spaces, finite-dimensional Hilbert spaces was done.

# GitHub Repository

These are some GitHub repositories:

https://github.com/darkknight200211/ASM.git

## Scholarships

**•–DISHA**

Department of Atomic Energy, GoI

## Referees

**–Prof. Bhooshan Paradkar**

Professor, Department of Physics, UM-DAE CBS, Mumbai
**Email -** bhooshan.paradkar@cbs.ac.in

**–Prof. HM Antia**

Retired Scientist at TIFR and Professor at UM-DAE CBS
**Email -** antia@cbs.ac.in