BOSE LECTURE SERIES
BLS02 NON-RELATIVISTIC QUANTUM MECHANICS

SPEAKERS - DEVANG BAJPAI, UTKARSH KASHYAP, ANURAG RATHOR,
PURNIMA TIWARI, AAYUSH VERMA, KRISHNAKANT YADAV

DATES - 21 MARCH 2025 - TBA
VENUE - SBS

THEORETICAL NEXUS
https://sites.google.com/view/theoreticalnexus/lecture-series/bls/bls02-non-relativistic-quantum-mechanics

This will be our spring tutorial series in Bose Lecture Series (BLS). This series will motivate discussions and lectures on the non-relativistic quantum mechanics (as well as some of the field theory). Highlighting some of the key topics, we have, scattering, energy levels, Schrödinger equation, applications to the models, Casimir effect, Feynman diagrams, scattering matrix, Uncertainty principle, non-determinism, Spin-Orbit coupling and so on

COURSE DESCRIPTION

One of the most misunderstood subject of physics is quantum mechanics because of the naive enthusiasm around the subject and its philosophy. Quantum mechanics is not really a subject understand completely by anyone, but there has been a very exciting history of the subject. Initial hero of this subject could be Einstein himself, but also Heisenberg, Planck, Schrödinger, Bohr, Born, Hilbert, Oppenheimer, de Broglie, Bose and more. But even before them, Young and his experiment shed the light on quanta and Kirchoff with his radiation theory. After the intial developments around physics, von Neumann and Murray came up with rigorization of quantum mechanics in mathematics and thus came the field of von Neumann algebra in operator algebra. To this day, Quantum Mechanics suffers from indeterminacy both inside the subject and outside. And its coupling with the other pillar of physics, called General Relativity, has not been satisifed yet on experimental levels. There have been speculations though.

Note to attendants: You are suggested to keep checking the https://sites.google.com/view/theoreticalnexus/lecture-series/bls/bls02-non-relativistic-quantum-mechanics for updated syllabus and schedule. No registration is required; you can just join us at the given venue and the lectures will also be recorded and uploaded on our youtube.

In this series in Bose Lecture Series, second edition BLS02, we will explore the basics of quantum mechanics and interplays with classical mechanics, special relativity and mathematical physics. No prerequisites are involved, but an active participant is expected to know bits of classical mechanics (mostly about equations of motions), linear algebra, and some statistical mechanics. However, due to the nature of these series, these prerequisites are only formal and will not be assumed. We aim for discussions around the topics like - revisiting classical mechanics, statistical mechanics, non-relativistic quantum mechanics, interpretation in QM, ground and basis state in QM, pictures in QM, hydrogen atom, uncertainty, quantum information theory, infinite dimensional Hilbert spaces, operator algebra, quantum field theory introduction and so forth. We note that these are only keywords and the discussions must not limit to these keywords.

Tentative Schedule

For the up-to-date schedule, please keep checking the series webpage. We will send more suggested readings (decided by individual speakers) with our each email announcement.

- Lecture 1: **TBA** by **Utkarsh Kashyap** *(21 Mar 2025, Fri)*
- Lecture 2: **TBA** by **Utkarsh Kashyap** *(26 Mar 2025, Wed)*
- *Discussion Session 1 (TBA)*
- *Lecture 3:* ***TBA*** *by* **Utkarsh Kashyap** *(29 Mar 2025, Sat)*
- *Lecture 4:* ***TBA*** *by* **Utkarsh Kashyap** *(02 Apr 2025, Wed)*
- *Lecture 5:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 6:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 7:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 8:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 9:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 10:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 11:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 12:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 13:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 14:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 15:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 16:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 17:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 18:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 19:* ***TBA*** *by* **TBA** *(TBA)*
- *Lecture 20:* ***TBA*** *by* **Aayush Verma** *(TBA)*

The complete schedule will be announced as we go along in the series.

Suggested Readings and References

- Introduction to Quantum Mechanics by David Griffiths

- Principles of Quantum Mechanics by Ramamurti Shankar
- Local Quantum Physics by Rudolf Haag
- Modern Quantum Mechanics by J. J. Sakurai
- Classical Mechanics by A. Raychaudhury
- Principles of Quantum Mechanics by P. Dirac
- Quantum Mechanics with Applications by Ajoy Ghatak
- Mastering Quantum Mechanics: Essentials, Theory, and Applications by Barton Zwiebach
- Taylor, J. R. - Classical Mechanics
- Landau, L. D., Lifshitz, E. M., Mechanics: Volume 1 (Course of Theoretical Physics)