Science Academies Virtual Lecture Workshop

on

Elements of Quantum Information

12-14 March, 2021

Organised by

Department of Physics, Christ Church College, Kanpur (UP)

The Department of Physics, Christ Church College, Kanpur is going to organize a three days virtual lecture workshop on **"Elements of Quantum Information"** sponsored by ***Indian Academy of Sciences, Bengaluru; Indian National Science Academy, New Delhi & The Indian National Academy of Sciences, India, Allahabad*** from ***12-14 March, 2021.*** It is intended for the benefit of students and faculty members at UG, PG and research level. The main objective of the workshop is to provide the participants an opportunity to learn basics of quantum mechanics from renowned experts and make them aware of the excitement and importance of quantum mechanical applications. The following topics will be covered.

Photoelectric Effect, de Broglie relation, Schrödinger equation, Particle in a box – eigen values and eigenvectors, Linear superposition of states, average values of observables, time development of states. Bra-Ket notation and connection of the state vector to one particle wave function, Spin half system and possible states, operators and the need for Hermitian operators, Pauli matrices and their use, Variational principle for a two-level system and application to Hydrogen atom, Harmonic oscillator and Anharmonic oscillator, Bell's work on hidden variable theories and Bell's inequality.

Introduction to quantum gates, quantum circuits, quantum computers, Hands on session on IBM quantum computer, Quantum cryptography or quantum information, Quantum Optics, Spectroscopy and quantum mechanics with hands-on demonstration of Gaussian, Schrödinger, Gromas and similar tools with a stress on the role of these simulators in designing drugs for COVID-19 and similar problems.

Course Director: Professor H. S. Mani, FASc, FNASc, Adjunct Professor, Chennai Mathematical Institute (CMI), Chennai – 603 103 (Tamil Nadu).

Lecture and Laboratory Coordinators: 1. Prof. Anirban Pathak, FNASc, Jaypee Institute of Information Technology, Noida

2. Prof. Anuradha Misra, FNASc, University of Mumbai, Mumbai

The interested teachers teaching undergraduate and postgraduate courses along with motivated students with keen interest in research from university and academic institutions are required to register for the workshop using the following link. The registration is free. The maximum number of seats for the workshop will be 120.

Registration Link: https://docs.google.com/forms/d/1EtKVnTrH_wMKztgLx70DInPB0qp-bgL7TZ0rPcA-b00/edit

Workshop link will be sent to all selected participants by e-mail.

E-letter of attendance will be issued to all the participants after successful completion.

Course Co-ordinator: Dr. R. K. Dwivedi, Associate Professor & Head, Department of Physics, Christ Church College, Kanpur. Contact: 09936966543; E-mail: rkdwivedi1963@gmail.com	**Co Co-ordinator**: Dr. S. P. Singh, Associate Professor, Department of Physics, Christ Church College, Kanpur. Contact:*09415477516*; E-mail: sprakash_1203@rediffmail.com

Last Date of registration is 28 February, 2021.

Selected participants will be intimated by e-mail by 05 March 2021.

The Department of Physics, Christ Church College, Kanpur

cordially invites you to the

INAUGURAL SESSION *of*

Science Academies Virtual Lecture Workshop

on

Elements of Quantum Information

(12-14 March, 2021)

Sponsored by

Indian Academy of Sciences, Bengaluru,
Indian National Science Academy, New Delhi,
The National Academy of Sciences, India, Prayagraj

March 12, 2021 at 10:00 am

On Google meet platform
http://meet.google.com/ybu-gjyz-qwn

CHIEF GUEST

Prof. H. S. Mani, FNA, FNASc, CMI, Chennai
Course Director

GUESTS OF HONOUR

Prof. Anirban Pathak, FNASc, JIIT, NOIDA
Prof. Anuradha Misra, FNASc, University of Mumbai

The session is being presided over by

Rev. S. P. Lal
Hon'ble Secretary, College Governing Body

Dr. Joseph Daniel
Principal

Dr. R. K. Dwivedi
Course Convener

Dr. S. P. Singh
Course Co-Convener

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Department of Physics, Christ Church College, Kanpur (UP)

Sponsored by

INDIAN ACADEMY OF SCIENCES, BANGALORE
INDIANNATIONAL SCIENCEACADEMY, DELHI
NATIONAL ACADEMY OF SCIENCES, INDIA, PRAYAGRAJ

TIME TABLE

Day and Date	10:00-10:45 am	10:45-12:00	12:15-1:30	2:15-3:30	3:45:5:00
Friday March 12, 2021	Inaugural Function	**L-1**	**L-2**	**L-3**	**L-4**
	10:00-11:15 am	11:30-12:45	1:45-3:00	3:15-4:30	
Saturday March 13, 2021	**L-5**	**L-6**	**L-7**	**L-8**	**Special Lecture**
Sunday March 14, 2021	**L-9**	**L-10**	**L-11**	**L-12**	Valedictory

Lectures by Resource Person

Resource Person	Lectures	Topics to be covered
Dr. Anuradha Mishra, FNASc University of Mumbai	**L-1**	*Photoelectric Effect, de Broglie relation, Schrödinger equation, Particle in a box – eigen values and eigenvectors*
	L-2	*Linear superposition of states, average values of observables, time development of states.*
	L-5	*Bra-Ket notation and connection of the state vector to one particle wave function, Spin half system and possible states*
	L-6	*Operators and the need for Hermitian operators, Pauli matrices and their use*
	L-9	*Variational principle for a two-level system and application to Hydrogen atom, Harmonic oscillator and Anharmonic oscillator*
	L-10	*Bell's work on hidden variable theories and Bell's inequality*
Dr. Anirban Pathak, FNASc JIIT, Noida	**L-3**	*Introduction to quantum gates, quantum circuits, quantum computers*
Dr. Aditi De HRI, Prayagraj	**L-4**	*Quantum communication*
Dr. C. M. Chandrashekhar IISc, Bengaluru	**L-7**	*Quantum Simulations*
Dr. R. Vijayraghavan TIFR, Mumbai	**L-8**	*How to build a quantum computer?*
Dr. Anirban Pathak, FNASc JIIT, Noida	**L-11**	*Introduction to Quantum Cryptography: Where we stand and how to perform quantum cryptography in the laboratory?*
	L-12	*To be announced*

Course Director: Prof. H. S. Mani, FNA, FNASc, CMI Chennai