PATH INTEGRAL AND FUNCTIONAL METHODS IN QUANTUM PHYSICS

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TYPE OF COURSE : New | Elective | UG/PG
COURSE DURATION : 8 weeks (29 Jul'19 - 20 Sep'19)
EXAM DATE : 29 Sep 2019

PRE-REQUISITES : Relativistic Quantum Mechanics and free scalar field quantisation.
INTENDED AUDIENCE : Physics, Engineering Physics, Theoretical Chemistry

COURSE OUTLINE :

Path Integral Method is an important formal development in Quantum Mechanics. The first half of the course is useful for any student of quantum mechanics, providing deeper insights into the theory. The second half of the course discusses the path integral method in its functional form applied to space-time fields and brings out connection of quantised fields to elementary particles.

ABOUT INSTRUCTOR :

Prof. Urjit A. Yajnik is faculty at IIT Bombay since 1989. His primary research interest is in Elementary Particle Physics and Cosmology with Primary teaching interest being mathematical and theoretical physics. He likes to design instructional material so that the essentials of the advanced material become accessible to interested undergraduates.

COURSE PLAN :

Week 1: Review of Quantum Basics - I,II&III, Fock-Dirac "second" quantisation I&II
Week 2: Time Evolution as Canonical Transformation Time slicing and Path Integral - I,II,III,IV
      Expectation Values
Week 3: Interaction with external field -I,II&III functional formalism for relativistic fields -I&II
Week 4: Functional method – free fields, Connected diagrams, effective potential - I,II&III
Week 5: Functional method – interactions - I&II The S-matrix and cluster decomposition - I,II&III
Week 6: The asymptotic condition - I,II Kallen-Lehmann representation - I&II, Effective action -
      Connected diagrams - I
Week 7: Effective action - Connected diagrams, Effective action – diagrammatics -I&II, Irreducible
      vertices cluster decomposition
Week 8: S-matrix – causal fields -I,IIandIII, Course summary and revision I&II