DIRAC EVOLUTION IN CURVED SPACE-TIMES AND SECOND QUANTISATION

by

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Lecture 1: *CAR Algebra and Quantization of Fermionic Fields*
I will explain the theory of quantisation of the fermionic fields based on the CAR-algebra approach. I will discuss the most basic properties of Fock representations and implementability of unitary time evolutions in Fock space.

Lecture 2: *Dirac Operators and Evolution in Globally Hyperbolic Spacetimes*
I will review the properties of fundamental solutions of the Dirac equation on globally hyperbolic space-times with spin structure. This entails the solution of the Cauchy problem and propagation of singularity theorems.

Lecture 3: *Hadamard States, Currents and Time Evolution of Fields*
I will explain how the the Dirac equation on a globally hyperbolic space-time gives rise to a natural CAR algebra structure and I will discuss certain representations associated with Cauchy surfaces. The time-evolution from one Cauchy surface to another will be analysed and connected to the index of the Dirac operator.