INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Chittoor District, Andhra Pradesh - 517 619

1.	Title of the course	Many-body theories of electron correlation
2.	Course number	PH614L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	New
5.	To be offered by	Physics
6.	Prerequisite	CoT
7.	**Course Objective(s):** To outline basic concepts of many-particle quantum systems and their applications to the theory of quantum computing and quantum algorithm.	
8.	**Course Content:** Basic concepts in many-particle quantum systems: indistinguishability of identical particles, permutation symmetry, bosons and fermions; Mean-field theory: Hartree-Fock formalism, Brillouin's theorem, Koopmans' theorem, beyond mean field model, configuration interaction, wave operator, Bloch equation; Many-body perturbation theory: occupation number representation, creation and annihilation operators, Wick's theorem, diagrammatics; Coupled cluster theory: size extensivity, similarity, unitary transformed coupled cluster methods; Coupled cluster theory in quantum computing: variational quantum eigen solver algorithm, quantum equation of motion algorithm.	
9.	**Textbook(s):** 1. Crawford T D and Schaefer III H F, *An Introduction to Coupled Cluster Theory for Computational Chemists*, John Wiley and Sons, Ltd (2000). 2. Norman P, Ruud K, and Saue T, *Principles and Practices of Molecular Properties: Theory, Modeling, and Simulations*, Wiley (2018).	
10.	**Reference(s):** 1. Shavitt I and Bartlett R J, *Many-body methods in Chemistry and Physics*, Cambridge University Press (2010).	