

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
PROFORMA FOR NEW COURSE

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| 1. | Title of the Course | Quantum Mechanics II |
| 2. | Course Number | ID6102 |
| 3. | Status of the Course | Elective |
| 4. | Structure of Credits | 3 – 0 – 0 – 3 |
| 5. | Offered to | PG |
| 6. | New Course/ Modification to | New |
| 7. | To be offered by | Prof. P. C. Deshmukh |
| 8. | To take effect from | July 2018 |
| 9. | Prerequisite | CoT (Consent of Teacher) |
| 10. | Whether approved by the Program | Yes |
| 11. | Course Objective: To provide a few advanced tools in quantum mechanics to post-graduate/PhD students in Physics and Chemistry. | |
| 12. | <p>Course Content:</p> <p>Quantum Collision Theory. Partial Wave Analysis. Angular Distributions in Scattering. Levinson's Theorem and Seaton's Theorem. Resonance states. Analysis of Breit Wigner Resonances. Fano and Generalized Fano Parametrization of Resonances.</p> <p>Relativistic Quantum Mechanics. Dirac Equation. Foldy-Woutheyesen Transformations and interpretation of spin-orbit coupling, zitterbewegung, Darwin terms, Lamb shift.</p> <p>Hartree-Fock Self-Consistent Field Formalism. Koopmans Theorem. Exchange and Coulomb Correlations.</p> <p>Many-electron Correlations. Approximate solutions of the many-body problem. Random Phase Approximation, Density Functional Theory, Diagrammatic Perturbation Theory.</p> | |
| 13. | <p>Text Book:</p> <ol style="list-style-type: none"> 1. C. J. Joachain, <i>Quantum Collision Theory</i>, Elsevier Science Ltd. (1979). 2. L. D. Landau and E. M. Lifshitz, <i>Quantum Mechanics: Non-Relativistic Theory</i>, Vol. 3, 3rd Edition, Butterworth-Heinemann (1981). 3. J. D. Bjorken and S. D. Drell, <i>Relativistic Quantum Mechanics</i>, McGraw-Hill Inc. (1964). 4. S. Raimes, <i>Many-Electron Theory</i>, Elsevier Science Publishing Co. Inc. (1972). | |
| 14. | <p>References:</p> <ol style="list-style-type: none"> 1. A. L. Fetter and J. D. Walecka, <i>Quantum Theory of the Many-Particle Systems</i>, Dover Publications (2012). 2. D. Sholl and J. A. Steckel, <i>Density Functional Theory –a practical introduction</i>, Wiley-Blackwell (2009). | |