3	Information Theory, Coding and Cryptography by Ranjan Bose **McGraw Hill Education**	2008
4	Elements of Information Theory by Thomas M. Cover and Joy A. Thomas / Wiley	2013
5	Fundamentals of Information Theory and Coding Design by Roberto Togneri and Christopher J.S deSilva/ Chapman and Hall	2003
6	Introduction to Coding and Information Theory by Steven Roman / Springer	1997

S. No.	Contents	Contact Hours
1.	**UNIT-I:** Basic Numerical Methods and Classical Simulations: Review of differentiation, integration (quadrature), and finding roots. Integration of ordinary differential equations. Monte Carlo simulations, applications to classical spin systems. Classical Molecular Dynamics. .	**08**
2.	**UNIT-1I:** Quantum Simulations: Time-independent Schrodinger equation in one dimension (radial or linear equations). Scattering from a spherical potential; Born Approximation; Bound State solutions. Single particle time-dependent Schrodinger equations.	**08**
3.	**UNIT-III:** Hartree-FockTheory: restricted and unrestricted theory applied to atoms. Schrodinger equation in a basis: Matrix operations, variational properties; applications of basis functions for atomic, molecular, solid-state and nuclear calculations.	**08**
4.	**UNIT-IV:** Mini-projects on different fields of physics, e.g., Thermal simulations of matter using Car-Parrinello molecular dynamics; Many-Interacting-Particle Problems on Hubbard and Anderson model for electrons using Lanczos method (exact diagonalisation) for the lowest states	**09**
5.	**UNIT-V:** Quantum Monte Carlo methods; Computational methods for Lattice field theories; Microscopic mean-field theories (Hartree-Fock, Bogoliubov and relativistic mean-field); methods in nuclear many-body problems.	**09**
	Total	**42**

1. Subject Code: **EP-411** Course Title: **Advanced Simulation Techniques in Physics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DEC-5
8. Pre-requisite : Nil
9. Objective : To develop the numerical skill of advanced level for solving the problem related to theoretical physics.

10. Details of Course:

11.Suggested Books

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1	Introduction to Fortran 90 and 95 by S. J. Chapman/ McGraw Hill, Int. Ed.	1998