12998-344(16) Computational Physics C (Monte Carlo Methods in Physics) (3l, 3p)

2014

Course summary:

Generation and testing of random numbers. Statistics of data analysis. Analytic solutions, computer simulation and analysis of random systems such as random walks and the Ising model.

Continuous assessment
P Physics 214 or 314

Outcomes of course:

- Insight into the physics of stochastic physical systems.
- Appreciation of the importance and role played by random number generators and their pitfalls.
- Basic knowledge of the application of statistical sampling theory to physics.
- Working knowledge of Monte Carlo simulation and its applications in physics and beyond.
- Familiarity with the operating system currently used in the module and a numerical computer language.
- The ability to write and debug computer simulations of stochastic physical systems.
- Developed skills in compiling and maintaining a record of own work and thoughts.

Lecturer:

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Course content:

Basic concepts of statistics, central limit theorem. Sampling theory and its application to experimental data. Generation and testing of random numbers. Importance sampling and the Metropolis algorithm; Analytical solution and simulation of random systems such as random walks and the Ising model. Simulation and analysis of second order phase transitions.

Tutorials:

One afternoon per week, used mainly for computer simulations.

Study material:

Lecture notes

Assessment:

Methods of Assessment
Continuous Assessment, based on
- evaluation of students' notes and computer programs.
- homework assignments and test based on the formal and analytical work covered.

Venue and time of assessment opportunities
Two to four evaluations of the student's notes and programs, spread evenly throughout the semester.

Availability of marks:
Turnaround time is typically one week. Feedback is given in terms of written and oral commentary as soon as possible.

Calculation of class mark:
40-60 percent of mark: results and interpretation of computer simulations.
40-60 percent of mark: analytical work covered.
0-20 percent of mark: oral presentation