

School of Mathematics

Course MA3469 - Practical numerical simulations
(SS Theoretical Physics, JS & SS Mathematics)

2009-10

Lecturer: Dr. D. Grigoriev

Requirements/prerequisites: none

Duration: One semester (10 weeks)

Number of lectures per week: 3

Assessment: The continuous assessment contributes to 35% of the final mark.

End-of-year Examination: 2-hour end of year exam

Description: The course will cover the basics of computer simulations with the emphasis on demonstration of how specific physical problems can be solved numerically using only g++ compiler and gnuplot plotting tool.

Specifically, we will consider problems from nonlinear dynamics together with the relevant techniques for solving ordinary differential equations, quantum mechanics (partial differential equations) as well as Monte-Carlo methods in statistical physics/lattice field theory.

During the course, the students will be given several assignments related to practical use of the course material. The assignments will contribute to 35% of the final mark; they can be done on the Maths system or elsewhere – the relevant software is free and is available for virtually any kind of a computer. There is also an option to take a course-related project, worth 5 ECTS credits marked independently of the course, to be done during the 2nd semester.

The detailed course outline as well as the handouts and assignments are available at the course webpage <http://www.maths.tcd.ie/pub/coursework/3469>.

Recommended books:

1. W.H.Press, S.A.Teukolsky, W.T.Vetterling and B.P.Flannery, "Numerical Recipes", Cambridge University Press, 3rd edition (2007) or 2nd edition in C++ (2002);
2. E.Hairer, S.P.Noersett and G.Wanner, "Solving Ordinary Differential Equations. Nons-tiff Problems", Springer (1986,1993);
3. Any C++ primer of your choice. Good lecture notes on C/C++ by Martin Emms from the CS Dept. are available at https://www.cs.tcd.ie/Martin.Emms/NLP/C++_notes/ .

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