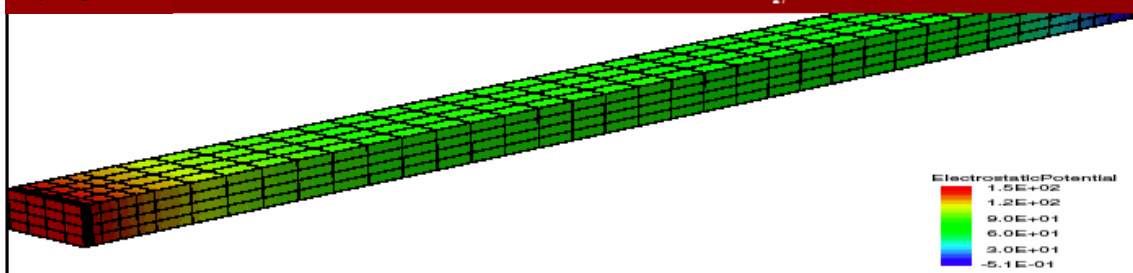


Spring 2006

# Numerical Methods for Physicists 171.416



## Purpose of the course

The analytical techniques usually taught in most physics courses can only be used to solve idealized problems. The problems encountered in research and industry are often more complex and require numerical techniques. The course is designed to give students familiarity and practice with an array of commonly used numerical techniques.

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## Textbook

*Numerical Recipes*, 2nd edition, by W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery (Cambridge University Press: Cambridge). It exists in Fortran, C, and C++ versions: any is acceptable. The Fortran and C versions are also available in pdf format and can be legally downloaded (for free) in small chunks from <http://www.library.cornell.edu/nr/>

## Assignments

There will be approximately weekly problem sets distributed Fridays and due the following Thursday. Solutions will be posted on the course website soon after they are turned in. Many (most) of the problems will be made much easier by incorporating routines from *Numerical Recipes*; a complete set [in Fortran, ANSI C, KR C (original C dialect), and C++] can be found at [eta:/usr/site/numerical-recipes](http://eta.usr/site/numerical-recipes). Grades will be based entirely on the problem sets; there will be no final exam.

## Technical Prerequisites

Inevitably, practical implementations of numerical methods are accomplished through computer programs. To write them, you need to be adept in a programming language. As far as this course is concerned, Fortran, C, and C++ are equally good. Frequently, in order to grasp the numerical tables produced by your program, you'll need to graph them; familiarity with any of the many plotting packages available is therefore also necessary.

Preliminaries	Chap 1
Linear Equations	Chap 2
Integration	Chap 4
Random Numbers	Chap 7
Root Finding	Chap 9
Minimization	Chap 10
Eigenvalues/Eigenvectors	Chap 11
Fourier Transforms	Chap 12
Ordinary Diff. Eqs	Chap 16
Partial Diff. Eqs	Chap 19
Statistical Methods	Chaps 14+15 + notes
Neural Networks	notes

## Ethics

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor. You may consult the associate dean of students and/or the chairman of the Ethics Board beforehand. See the guide on "Academic Ethics for Undergraduates".