CSE 541

ELEMENTARY NUMERICAL METHODS

Winter 2012

Rick Parent

CLASS INFORMATION

Rick Parent
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DL787
tentative office hours: T, Th 2:00-3:00

Grader:?

www.cse.ohio-state.du/~parent/classes/541/index.html

CSE 541: ELEMENTARY NUMERICAL METHODS

Survey of numerical methods: number systems, errors of finite representation, solution of single non-linear equation, interpolation, numerical integration, solution of linear systems.

Prereqs: CSE221, Math153

CSE 541-0010 LEC 11848
DL369; T, Th 3:30-4:48

Grading

30%	Homeworks - w/ minimal C/C++ programming
30%	Midterms (2)
40%	Final

Textbook

Numerical Mathematics and Computing
By Cheney and Kincaid, Fifth Edition, 2004
(or Sixth Edition, 2008)

Schedule

www.cse.ohio-state.du/~parent/classes/541/shedule.html

assignments
due dates
exam dates
pdf's of lecture slides*

*slides are not a tutorial!

my home page
class web page
schedule

Rules

responsible for what's covered in class!

no late homeworks accepted

missing unexcused quiz or test => 0
unless you can document 'valid' reason
something beyond your control

no curving, no rounding
you get what you get
if you need a certain grade - earn it!

Other info.

Academic Misconduct - Don’t

Office of Disability Services

online

Course Topics

Horner's method

Taylor's Theorem

Computer representation of real numbers

Interpolation (e.g. Lagrange)

Root finding: solve for zeros: $f(x) = 0$

Numerical differentiation & integration

Solving linear system of equations

Analytic v. Numerical Methods

analytical
deriving an expression using symbolic manipulation (and assumes infinite precision)

numerical
approximating a quantity while maintaining a reasonable bound on the error

brief general introduction to the material
analytic v. numerical approaches
math classes - mainly analytic

Elementary Numerical Methods

doing math on a computer

representing infinite precision values in computer

$\pi, e, \sqrt{2}$

considerations about computing some function

increase efficiency

usually by approximations

reducing error

estimating error

bounding error

very deep subject - lots of material on numerical methods
this course is just an introduction
try to touch on several issues

Discretization and finite computation

intrinsic to computers!

finite bit representation

tracking function values at discrete intervals

discrete numerical estimates of integral and derivative

iterative approximations to solution

approximations!

Topics: solving common problems

root finding

interpolating

computing derivatives & integrals

interpolation

solutions to systems of linear equations

Classic text: *Numerical Recipes in C*

numerical methods are very common
have lots of libraries for numerical methods
important to know how to use them, tradeoffs, etc.
also useful to be able to program basics yourself
NR is very useful reference; comes in different programming lang.

Motivation

optimization: finding zeros of derivative

physical simulation
integrating force to get acceleration
integrating acceleration to get velocity
integrating velocity to get position

resource allocation
networks, AI, operational research

very important in application programming